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Image-guided Robot Targets Brain Tumors

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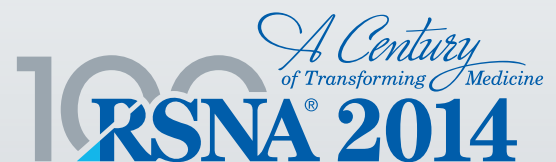
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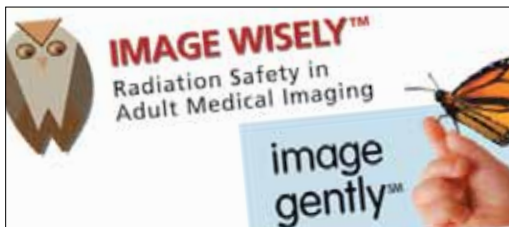
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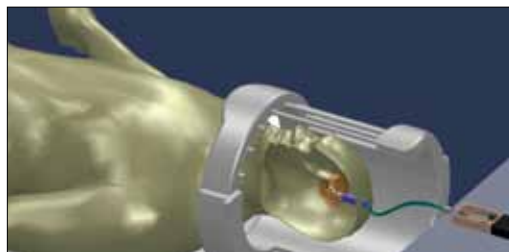
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100 YEARS RSNA® CENTENNIAL SNAPSHOTS

During this year as RSNA celebrates its 100th Scientific Assembly and Annual Meeting, *RSNA News* will take a look back at milestones in the Society's history.



1945: 50th Anniversary of X-ray Discovery

On account of World War II, RSNA had planned just a business session and a reading of the scientific program by title only for its 1945 meeting in Chicago. When the war ended before the scheduled start of the meeting, however, RSNA was able to turn the 31st scientific assembly into a celebration of Roentgen's discovery. A special issue of *Radiology*, Volume 45, Issue 5, detailed the history.

1991: *RSNA News* Debuts

In the beginning, *RSNA News* was an eight-page quarterly newsletter. "It is hoped that *RSNA News* will not only better identify and explain the workings of the Society, but also provide a forum for member comment and reflect the spirit of volunteerism that is essential to the success of all RSNA activities," wrote 1991 RSNA President Carl J. Zylak, M.D., in his introduction.



1968: Projector Allows for Large Scale Presentations

Growth in annual meeting attendance prompted the need for lecturers to effectively reach ever-larger audiences. A carousel projector, first used in the Palmer House main ballroom and rapidly expanded to other courses, was a marvel with its dual projection capability to enhance presentation quality.

2003: Public Information Advisors Network Established

In recognition of radiology's—and RSNA's—ever-growing profile within the news media, RSNA formed the Public Information Advisors Network, volunteers from all radiology subspecialties who assist in communications with editors and reporters.



1978: RSNA Moves to Oak Brook, Illinois

Although founded by Midwesterners in St. Louis, RSNA had been headquartered for many years in Syracuse, N.Y., the hometown of longtime RSNA Secretary-Treasurer **Donald S. Childs, M.D.** A desire to make travel easier for Society volunteers prompted RSNA to contemplate relocating. RSNA Meetings Director George Schuyler suggested the growing Chicago suburb of Oak Brook, where RSNA would lease a couple spaces before moving into its **permanent headquarters** in 1998.



SRU Presents Awards

At the recent Society of Radiologists in Ultrasound (SRU) annual meeting in Chicago, **Peter L. Cooperberg, M.D.**, received the Lawrence A. Mack Lifetime Achievement Award. Dr. Cooperberg is professor emeritus in the Department of Radiology at the University of British Columbia in Vancouver.

Christopher R.B. Merritt, M.D., was awarded the Distinguished Service Award. Dr. Merritt is a research professor and vice-chair for quality assurance and performance improvement at the Thomas Jefferson University Hospital in Philadelphia. He is a member of RSNA's Public Information Advisors Network.

Eric J. May, M.D., of the Mayo College of Medicine, Rochester, Minn., received the Member-in-Training Research Award.



Cooperberg



Merritt



May

REGISTER NOW FOR HOSPICE AND PALLIATIVE MEDICINE EXAM

Registration will be open for the Hospice and Palliative Medicine Examination March 1, 2014, through May 1, 2014, for those candidates who have completed a fellowship in Hospice and Palliative Medicine accredited by the Accreditation Council for Graduate Medical Education and are interested in taking the subspecialty examination.

The official American Board of Medical Specialties (ABMS) certification in Hospice and Palliative Medicine is administered through the American Board of Internal Medicine (ABIM). Recognizing that a wide range of specialists is involved in this discipline, 10 member boards of the ABMS, including the American Board of Radiology, are co-sponsors of this new ABMS-recognized discipline. Although the program is primarily administered through the ABIM, diplomates of any of the co-sponsoring boards are eligible to obtain certification, if they meet essential eligibility requirements and pass a certifying examination.

The exam will be administered on October 2, 2014, at Pearson VUE Test Centers. For more information, go to www.theabr.org/ic-hpm-landing, or email lmorris@theabr.org.

AAWR Announces 2013 Awards

The American Association for Women Radiologists (AAWR) has announced its 2013 award recipients:

Lori J. Pierce, M.D., a professor of radiation oncology and vice-provost for academic and faculty affairs at the University of Michigan, Ann Arbor, received the Marie Skłodowska-Curie Award.



Pierce

Nina A. Mayr, M.D., professor and chair of the Department of Radiation Oncology at the University of Washington School of Medicine, Seattle, received the Alice Ettinger Distinguished Achievement Award. Dr. Mayr is a member of the RSNA Public Information Advisors Network and the Refresher Course Committee.



Mayr



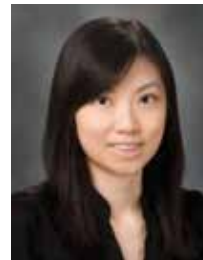
Sanelli

Pina C. Sanelli, M.D., associate professor of radiology and public health at Weill Cornell Medical College, New York, and an associate attending radiologist at the New York-Presbyterian Hospital-Weill Cornell Campus, received the Women in Neuroradiology Leadership Award. Dr. Sanelli is a member of the RSNA Research Development Committee.

Elizabeth Asch, M.D., a fourth-year radiology resident at the Beth Israel Deaconess Medical Center in Boston, received the Lucy Frank Squire Distinguished Resident Award in Diagnostic Radiology.



Asch



Tsai

Chiaojung Jillian Tsai, M.D., Ph.D., a fourth-year radiation oncology resident at the MD Anderson Cancer Center in Houston, was honored with the Eleanor Montague Distinguished Resident Award in Radiation Oncology.

Joint Commission Approves Revised Imaging Requirements

The Joint Commission has approved a number of revisions to its requirements for ambulatory care centers and hospitals providing diagnostic imaging services. The requirements, effective July 1, 2014, address:

- Safety and security risks associated with MR imaging
- Staff radiation exposure levels in CT, PET and nuclear medicine
- Equipment inspection, testing and maintenance, including dose verification
- Performance evaluation of CT, MR imaging, PET and nuclear medicine equipment, "including metrics such as image uniformity, high-and low-contrast resolution and artifact evaluation
- Space management during demolition, renovation and new construction
- Staff qualifications and ongoing education and training
- Protocol development



While proposed revisions to requirements were still under review, members of the Image Wisely coalition asked The Joint Commission to remove elements pertaining to the tracking of individual patient dose data. Dose tracking requirements were ultimately approved.

In a letter to The Joint Commission in fall 2013, coalition co-chairs James A. Brink, M.D., and Richard L. Morin, Ph.D., noted that imaging equipment provides only dose indices for standard phantoms, which may differ significantly from the patient dose. In addition, they noted, manufacturers and modalities use different test phantoms or methodologies to determine dose information.

"We are concerned that tracking the supplied dose indices that are not related to the dose actually received by the patient may have an adverse impact on patient care," Drs. Brink and Morin wrote. "Most patients and many physicians do not have the expertise or data to estimate patient dose from the radiation exposure data put forth by most CT scanners. This may cause patients to refrain from having examinations that might be critical to their care, or, it may discourage physicians from ordering those examinations. Furthermore, providing such numbers encourages the erroneous determination of cumulative risk through simple addition of sequential dose estimates."

Revisions to Joint Commission requirements are published in semiannual updates to the accreditation standards in both print manuals and in the online E-dition®. Accredited organizations and paid Joint Commission subscribers may also view them in the monthly periodical *The Joint Commission Perspectives*. For more information go to www.jcrinc.com.



Kukreja

Texas Children's Hospital Names Kukreja Chief of Interventional Radiology

Kamlesh U. Kukreja, M.D., has been named chief of interventional radiology of the Department of Pediatric Radiology at Texas Children's Hospital, Houston, and has also been appointed as assistant professor of radiology at Baylor College of Medicine, Houston. Dr. Kukreja is currently a reviewer for *RadioGraphics*.

RSNA Board of Directors Report

At meetings during RSNA 2013, the RSNA Board of Directors reflected upon a year of accomplishments and looked ahead to exciting new developments for the Society, including the first year of the RSNA Centennial celebration.

Annual Meeting Excitement Already Building

While already eagerly anticipating its 100th Scientific Assembly and Annual Meeting, where attendees will be invited to help celebrate the RSNA Centennial, RSNA is also taking stock of the last annual meeting. Some 54,000 people representing 130 countries attended RSNA 2013 in Chicago, while Virtual Meeting registrations numbered nearly 5,700. More than 650 companies participated in the RSNA 2013 Technical Exhibition, including 105 exhibiting for the first time. Nearly 100,000 course evaluations were submitted via CreditEval, RSNA's new online system for claiming meeting attendance and continuing education credit.

Centennial activities planned for RSNA 2014 include a pavilion where attendees can learn about RSNA and radiology history and a special celebratory reception on Wednesday night. More information will be posted on *RSNA.org*, in upcoming issues of *RSNA News* and on RSNA's social media feeds. Speaking of social media, users were busy during the last annual meeting, with the hashtag #RSNA13 receiving some 25 million impressions on Twitter.

Collaborations Drive Growth

Working with organizations around the world, RSNA is helping to advance radiologic education and research and promote breakthroughs in healthcare in general. RSNA looks forward to the São Paulo



Richard L. Baron, M.D.
Chairman, 2014 RSNA
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Radiological Meeting in May, having partnered with the Radiological and Diagnostic Imaging Society of São Paulo for meetings in 2014, 2016 and 2018. RSNA is helping develop material and courses not traditionally covered at the meeting and offering prominent speakers from its membership. (See opposite page.)

In another partnership, RSNA's Research Development Committee is working with the American Society for Clinical Pathology to envision the field of integrated diagnostics. RSNA will also work with the European Society of Radiology and the American College of Radiology to sponsor the third International Day of Radiology in November 2014, with a focus this year on brain imaging.

NIBIB Funds Critical Work

RSNA has received grants from the National Institute for Biomedical Imaging and Bioengineering (NIBIB) for two projects critical to radiology's future. NIBIB has funded a project to create a single, nationally recognized medical lexicon by merging the RSNA RadLex radiology lexicon with the Logical Observation Identifiers Names and Codes (LOINC®), a universal code system for identifying laboratory and clinical observations.

The NIBIB also recently awarded RSNA a contract to support research groundwork and profile development by the Quantitative Imaging Biomarkers Alliance. Included are projects that characterize the performance and sources

of variability associated with quantitative imaging, as well as planning and development of digital reference objects, physical phantoms and profile field testing.

Publications

Editors of RSNA's scientific and education journals look to build this year on recent successes, which include the ever-growing popularity of mobile apps for both publications—downloads for the *Radiology* and *RadioGraphics* apps now total more than 52,000 and 48,000, respectively. A podcast hosted by *Radiology* Editor Herbert Y. Kressel, M.D., also has proved popular, with more than 50,000 downloads as of late last year.

The perennially well-received *RadioGraphics* monograph, published each year in October, will feature chest imaging in 2014.

Education

In response to the demand for the RSNA Scan: 2012 Year in Review at the last annual meeting, a new edition is being developed. To be released later this year, RSNA Scan: 2013 Year in Review will feature a collection of scientific and educational material, including most-viewed journal articles, most misdiagnosed Cases of the Day, award-winning education exhibits, plenary sessions and more.

RSNA membership now tops 53,000. I know I speak for all my colleagues on the RSNA Board of Directors when I say we look forward to serving each and all of you, and the specialty at large, throughout the coming year.

RICHARD L. BARON, M.D.
Chairman, 2014 RSNA Board of
Directors

My Turn

My Turn is on hiatus and will return in the April 2014 issue.

RSNA BOARD MEMBERS AMONG JPR LECTURERS

RSNA has partnered with the Radiological and Diagnostic Imaging Society of São Paulo (SPR) for the joint planning of Jornada Paulista de Radiologia (JPR) in 2014, 2016 and 2018. JPR is among the leading medical imaging meetings in Latin America. The 2014 meeting will be held May 1–4, in São Paulo, Brazil.

Members of the RSNA Board of Directors are among those lecturing on various radiologic topics at the meeting:



- **Richard L. Baron, M.D.**, RSNA Board Chairman: abdominal and genitourinary radiology
- **Richard L. Ehman, M.D.**, RSNA Board Liaison for Science: abdominal and genitourinary radiology, radiology research
- **Vijay M. Rao, M.D.**, RSNA Board Liaison for Information Technology and Annual Meeting: head and neck radiology
- **Valerie P. Jackson, M.D.**, RSNA Board Liaison for Education: breast imaging

Drs. Baron, Rao and Jackson are also speaking about professionalism and management in radiology.

RSNA has worked with SPR to plan meeting content, provide speakers and assist in developing materials and courses that are not typically offered at JPR. Learn more about the meeting at RSNA.org/JPR2014.

IN MEMORIAM

William S. Hare, M.D.

Australia's first professor of radiology and an internationally recognized pioneer in the field, **William S. Hare, M.D.**, died May 31, 2013. He was 89.

Dr. Hare began his career within the Department of Radiology at the Royal Melbourne Hospital in 1954. In 1963, he recognized the need for strong academic leadership in radiology by establishing the Department of Radiology and the Edgar Rouse Chair of Radiology, the first radiology chair in Australia. As inaugural chair, Dr. Hare created a comprehensive postgraduate radiology teaching program, greatly elevating the standard and practice in Australia.

Dr. Hare introduced transfemoral cerebral angiography and coronary angiography techniques to Australia. He became a leader in analgesic nephropathy and his



Photo courtesy of The Royal Melbourne Hospital Archives

expertise in diagnosis and treatment of kidney diseases made him a world expert in interventional urology.

Dr. Hare was awarded RSNA honorary membership in 1984 and International Society of Radiology honorary membership in 1994. He received numerous awards from the Royal Australian and New Zealand College of Radiologists (RANZCR), served as president in 1986–87 and was awarded the gold medal, RANZCR's highest honor, in 1988.

Dr. Hare helped organize 19 countries to form the Asian Oceanian Society of Radiology in 1971 and served as foundation president and secretary. His comprehensive world leadership in radiology was recognized in his appointment as an officer in the Order of Australia in 1990.

THIS MONTH IN THE RSNA NEWS TABLET

Get more of this month's news with the *RSNA News* Tablet edition, available for download through the App Store and Google Play.

As part of this month's cover story on a minimally invasive neurosurgical intracranial robot (MINIR) that aids in detecting and removing brain tumors, we feature a video demonstration of the technology developed at the University of Maryland.

Access the *RSNA News* tablet edition on the App Store at itunes.apple.com/us/app/rsna-news/id444083170?mt=8 and Google Play at <https://play.google.com/store/apps/details?id=air.org.rsna.rsnaNews&hl=en>.



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Medical Ozone Improves Condition of Patients with Herniated Disks

Medical ozone injections improve symptoms in almost 75 percent of patients with herniated disks in their lower backs, according to new research presented at RSNA 2013.

OZONE IS A STRUCTURALLY MODIFIED form of oxygen present in small amounts in the atmosphere. Research has shown that it has a destructive effect on substances called proteoglycans that make up a major component of the nucleus pulposus, the jelly-like substance in the middle of a spinal disk. The nucleus pulposus can be forced out of the disk, exerting pressure on the nerve located nearby, leading to sciatica.

“The water-binding capacity of the proteoglycans is the main force that holds water to the nucleus pulposus,” said study author Thomas Lehnert, M.D., from the Department of Diagnostic and Interventional Radiology at the Goethe University in Frankfurt, Germany. “Destruction of the proteoglycans reduces the hold water and therefore diminishes the size of herniation.”

Ozone also has an effect on disk inflammation by altering the breakdown of arachidonic acid, a fatty acid found in tissues, to inflammatory prostaglandins. “Therefore, by reducing the inflammatory components, there is a corresponding reduction of pain,” Dr. Lehnert said.

Dr. Lehnert and colleagues recently evaluated the effects of ozone on 371 patients with lumbar radiculopathy, a condition in which compressed nerves in the spine cause pain and numbness.

Patients received one injection of a mixture of 97 percent oxygen and 3 percent ozone into the disk, and another perian-glionically, or around a mass of ganglion nerve cells. The ozone injections were performed under CT guidance and followed by corticosteroid and anesthetic injections in the same session.

The researchers assessed clinical outcomes six months after treatment and used MR imaging to evaluate disk matrix and disk volume. Treatment was successful in 268 patients, or slightly more than 72 percent. Among those patients, outcome was excellent in 133 patients (49.6 percent) and good in the remaining 135 patients.

“The ozone did not cause any complications in patients,” Dr. Lehnert said.

MR imaging findings revealed that the majority of patients had a statistically significant reduction of volume in their herniated lumbar disks. On average, patients with excellent outcomes experienced a 20 percent reduction in disk volume, while those with good outcomes had a 7 percent volume reduction.



Lehnert

Daily Bulletin coverage of RSNA 2013 is available at RSNA.org/bulletin.

This volume-reduction effect correlated negatively with the patient’s age and positively with initial disk volume.

“Our study shows that the combined intradiskal and periganglionic injection of medical ozone and periganglionic injection of steroids affects both the mechanical and the inflammatory components of pain caused by disk herniation,” Dr. Lehnert said. “For this reason, oxygen-ozone injections are a therapy option for treating lumbar disk herniation that has failed to respond to conservative management, before recourse to surgery or when surgery is not possible.”

The ease of execution and noninvasiveness of medical ozone therapy make it a potentially useful tool for outpatient procedures, Dr. Lehnert said. Because of its toxicity, medical ozone is currently approved only for research purposes in Europe and the U.S., though Dr. Lehnert added that approval for clinical use may be only a few years away. □

“Oxygen-ozone injections are a therapy option for treating lumbar disk herniation that has failed to respond to conservative management, before recourse to surgery or when surgery is not possible.”

Thomas Lehnert, M.D.

3D Reconstruction Can Unlock Vertigo Mysteries

Three-dimensional reconstruction of high-resolution MR imaging sequences can be used to measure volume in the vestibular system in patients with vertigo, and help explain the symptoms, according to research presented at RSNA 2013.

VERTIGO IS A COMMON SYMPTOM in patients seeking medical help from ear, nose and throat physicians, said Nagy N. Naguib, M.Sc., of the Johann Wolfgang Goethe University Hospital in Frankfurt, Germany, and the Department of Radiology, Alexandria University in Alexandria, Egypt. In fact, according to Dr. Naguib, vertigo and headache account for two of the most common complaints of patients seeking medical help.

“While MRI is a useful tool in the evaluation of vertigo patients, there are still some cases that don’t show any detectable structural changes on MRI,” Dr. Naguib said. “We thought it would be helpful to assess the volume of the vestibular system as a part of patients’ evaluation for cases presenting with vertigo and referred to radiologists for MR imaging assessment.”

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The research began as an attempt to make use of the available software and available resolution delivered by MR imaging in order to obtain a 3D reconstruction of the inner ear structures. The aim of these reconstructions was to provide the reading radiologist and referring clinician with an easy way to evaluate 3D images of the inner ear structures, which are located in the three planes and have a complex anatomy, Dr. Naguib said.

In performing the reconstructions, Dr. Naguib and colleagues noticed that in certain cases, some of the semicircular canals seemed to be interrupted, were absent or looked thinner than usual. While some of these structural differences—such as a missing semicircular canal—are easily evaluated, others require more experienced readers.

“Based on this we tried to assess all cases with an objective method of measurement—namely the volumetric assessment of the 3D figure obtained,” Dr. Naguib said. “The sequence used for the reconstruction is already integrated in many of the examination protocols for the inner ear, and the new application of this routinely performed sequence represents the core of the current research.”

Dr. Naguib and colleagues retrospectively studied 153 patients with a mean age of 48.9 years, 61 of whom presented with vertigo and 92 of whom presented with other diseases of the ear and normal vestibular function. In patients with vertigo, the mean volume of the semicircular canals was 0.258 cm³ and the mean volume of the vestibule was 0.069 cm³. In patients without vertigo, the mean volume of the semicircular canals was 0.306 cm³ and the mean volume of the vestibule was 0.075 cm³.

Researchers concluded that the reduced volume of the vestibular system in patients presenting with vertigo could account for their symptoms.

Dr. Naguib pointed out that most studies addressing the subject in the past have relied on assessing the bony part of the inner ear using CT and that this method—while beneficial—does not accurately reflect the status of the contents of the bony cavities.



Naguib

In addition, use of 3D reconstructions can be more than just a tool to impress other clinicians, Dr. Naguib said. “We think adding 3D reconstructions might open the horizon for other studies addressing the subject of inner ear pathology in general, and the subject of vertigo in particular. It’s important to have the ability to assess the structural changes in an objective way that might be associated with vertigo rather than relying only on the subjective experience of the reader.” □

“We think adding 3D reconstructions might open the horizon for other studies addressing the subject of inner ear pathology in general, and the subject of vertigo in particular.”

Nagy N. Naguib, M.Sc.

More Than a Quarter of Emergency Radiological Services Uncompensated

Utilization of medical imaging nationwide may be in decline, but its use in the emergency department setting continues to grow—and much of that use is uncompensated, according to a study presented at RSNA 2013.

IN HIS STUDY OF A RESEARCH SAMPLE representing an estimated 8 percent of radiologists nationwide, Richard Duszak Jr., M.D., found radiologists received no compensation at all for 28.4 percent of radiological services rendered to emergency department (ED) patients.

“Given the ‘safety net’ role of EDs for uninsured patients, uncompensated services are increasingly a challenge to all specialists and appear to be a particularly common problem for radiologists,” said Dr. Duszak, chief medical officer of the Harvey L. Neiman Health Policy Institute (HPI) of the American College of Radiology.

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The shortfall represents a mean \$2,584 per month per physician in Medicare dollars for professional services alone, said Dr. Duszak, incoming vice-chair for Health Policy and Practice in the Department of Radiology and Imaging Services at the Emory University School of Medicine in Atlanta. “As physician reimbursement declines, this volume of uncompensated care could threaten

patient access,” he said.

Data from 2009 to 2012 were captured by Zotec Partners, a nationwide radiology billing company. Most commonly rendered services were: one-view and two-view chest radiography (20.8 and

28.3 percent uncompensated, respectively); non-contrast brain CT (26.5 percent uncompensated); and contrast and non-contrast abdomen/pelvis CT (28.8 and 27.6 percent uncompensated, respectively).

Most frequent modalities were radiography (27.4 percent uncompensated); CT (29.1 percent uncompensated) and ultrasound (33.5 percent uncompensated). Although CT represented just a third of ED services, it accounted for nearly two-thirds of uncompensated dollars. Of all uncompensated services, 52.3 percent were rendered to uninsured patients.

“Our findings help to increase the awareness of policymakers and regulators so that ED patient access to needed radiological services is ensured,” Dr. Duszak said.

Order Entry System for Trauma CT Increases Reimbursement Success

In another RSNA 2013 study, researchers measured the impact of a structured physician order entry system for trauma CT imaging on the clinical information provided to the radiologist and on associated coding practices and reimbursement success.

The study was conducted between at a quaternary care institution with a Level 1 Trauma Center and 58,000 ED visits annually and comprised 457 patients who received CT pan-scans, includ-

Multiparametric MR Aids Earlier Detection of Prostate Cancer Recurrence

Multiparametric MR (mp-MR) can enable earlier detection of cancer recurrence and improve treatment planning in patients who experience an increase in prostate specific antigen (PSA) after undergoing treatment for prostate cancer, according to the author of an RSNA 2013 education exhibit.

PROSTATE CANCER is treated most often with surgery and radiation therapy as first-line therapy. Although many patients experience elevated levels of PSA after treatment, the elevated levels are not always indicative of local recurrence or extensive metastatic disease, said Varaha Tammiseti, M.D., of the University of Texas Health Science Center at Houston.

“Elevated PSA levels don’t tell if there is a recurrence, and if there is recurrence, they don’t tell you if the cancer has spread outside of the prostate,” Dr. Tammiseti said. “Some patients get blind therapy without evidence of a recurrence.”

The education exhibit demonstrated how mp-MR combines different MR imaging techniques to provide more accurate information about both anatomy and function in patients with PSA relapse.



Tammiseti

“Given the ‘safety net’ role of EDs for uninsured patients, uncompensated services are increasingly a challenge to all specialists and appear to be a particularly common problem for radiologists.”

Richard Duszak Jr., M.D.



Duszak

ing 2,734 distinct exam accessions. After the intervention, there was a 62 percent increase in requisitions containing clinical signs, symptoms or physical examination findings and a 99 percent increase in provided mechanism of injury.

There was a 19 percent increase in primary ICD-9-CM codes representing clinical signs or symptoms (from 3 percent to 22 percent, $p < .0001$), and a modest 4 percent increase in reimbursement success for examinations submitted to insurance car-

riers (from 91 percent to 95 percent, $p = .003$). Rate of initial reimbursement denials dropped 7 percent (from 24 percent to 17 percent, $p = .04$).

Results showed that implementation of structured physician order entry for trauma CT imaging was associated with a large increase in rate of clinical history provided to the radiologist and was associated with a decrease in initial reimbursement denials and a modest increase in reimbursement success. □

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“Conventional imaging such as bone scans and CT are helpful only when disease is significantly advanced or metastatic, at which time treatment options are palliative rather than curative,” Dr. Tammisetti said. “We combine the advantage of the high-contrast resolution of MR with functional parameters like information on how tightly cells are packed, how blood flows in tissue and the chemical makeup of tissue. With MRI we can detect recurrence at an earlier point than other modalities, speeding the onset of appropriate treatments.”

Dr. Tammisetti also noted the role of mp-MR in imaging strategies for different types of recurrences. For instance, dynamic contrast-enhanced (DCE) MR is effective in helping detect small-sized prostate cancer recurrence after radical prostatectomy, while a combination of DCE-MR and diffusion-weighted imaging (DWI) is highly efficient after external-beam radiation therapy. Some research points to a complementary role for the two approaches. “The key challenge with a PSA rise is distinguishing a local recurrence from metastatic disease,” Dr. Tammisetti said.

In addition to aiding in the identification of local recurrence, prostate mp-MR provides more accurate information on the extent of the tumor, which is useful when choosing a second-line treatment such as cryoablation or androgen deprivation therapy. After radiation therapy, mp-MR helps with accurate tumor localization, important in image-guided minimally invasive therapy or image-guided biopsy. It is also effective for guiding biopsies.

“With MRI we can detect recurrence at an earlier point than other modalities, speeding the onset of appropriate treatments.”

Varaha Tammisetti, M.D.

Dr. Tammisetti suggested that the most optimal use of mp-MR in patients with PSA relapse would be as a complement to PET with choline or other newer agents to measure specific changes in metabolic activity associated with cancer. While literature on choline PET is still evolving, it has already shown effectiveness at helping identify systemic disease, but it may not have as much spatial resolution as MR to detect smaller-sized local recurrence.

“In the future, we may see multiparametric MR integrated into the workup of recurrent cancer along with choline PET and other newer PET agents,” Dr. Tammisetti said. □

Digital Breast Tomosynthesis Offers Superior Pre-surgical Staging

Digital breast tomosynthesis has the potential to replace full-field digital mammography (FFDM) for assessing invasive breast cancer, according to an RSNA 2013 presenter.

ALTHOUGH FFDM AND ULTRASOUND are the proven imaging modalities for detecting breast cancer, presenter Asif Iqbal, M.D., said digital breast tomosynthesis is an emerging technology which is showing better accuracy in measuring the tumor sizes.

Two main problems are associated with FFDM, according to Dr. Iqbal, of the Breast Radiology Department of the National Breast Screening Centre at King's College Hospital in London, and colleagues. Anatomical noise from breast parenchyma can obscure tumors and certain growth patterns, such as diffusely infiltrating invasive lobular carcinoma, have relatively little fibrous or connective tissue growth around the tumor. "The characterization of the lesion—the extent of the tumor margins and the boundary of the lesion—are not as easily visible on FFDM," Dr. Iqbal said.

Digital breast tomosynthesis overcame these problems. "In particular, on the spiculated masses, which appear as a star shape, the spicules coming out from the nucleus of the tumor are easily visible, but they aren't as easily visible on FFDM," Dr. Iqbal said.

Researchers also found that digital breast tomosynthesis had a tendency to "over-measure" the size of tumors whereas ultrasound had a tendency to "under-measure." The team also reported changes in mammographic signs between the two modalities.

"Comparing FFDM with tomosynthesis, sometimes we found that a lesion with asymmetric density or parenchymal distortion would change into a spiculated mass on digital breast tomosynthesis," Dr. Iqbal said. "Mammographic sign change is one of the most significant benefits."

"Because of the glandular appearance of the tissue on the 2D, especially in dense breasts, it may not be easy to find the foci of



Iqbal

the tumor and the reader may classify it as normal or BI-RADS 1," Dr. Iqbal said. "But on the FFDM, because of the 3D information within the slices, we have noticed that it sometimes changes into a circumscribed or a spiculated mass."

Researchers studied 139 breast lesions in 137 patients, who averaged 58 years. The team found that 77.7 percent of the cancers were invasive ductal carcinoma, 15.8 percent were invasive lobular carcinoma, 2.2 percent were mucinous carcinoma and 2.8 percent were tubular carcinoma. There was one case each of medullary, lymphovascular and papillary carcinoma. Of the three tested modalities—FFDM, digital breast tomosynthesis and ultrasound—tomo-

synthesis offered the highest degree of accuracy in determining maximum tumor dimension, with a greater ability to determine tumor margins.

Dr. Iqbal said he believes that digital breast tomosynthesis has the potential to provide the best tumor staging for preoperative management. "Digital breast tomosynthesis will help in accurate tumor size measurement, which will in turn be important especially in conservative breast surgery. It will help us choose the surgical option that is best for the patient."

The superior measurement of digital breast tomosynthesis compared to FFDM and ultrasound is mainly due to the additional information in the 3D series of thin slices.

Dr. Iqbal and his team are further exploring the use of "synthetic 2D" generated with tomosynthesis. Dr. Iqbal's research earned a 2013 RSNA Trainee Research Prize honoring an outstanding scientific presentation in each subspecialty presented by a resident/physics trainee, fellow or medical student. □

Tomosynthesis Superior to Mammography in Breast Cancer Detection

Tomosynthesis is significantly better than conventional mammography at detecting breast cancers and characterizing morphology, according to research presented at RSNA 2013.

"THERE HAVE BEEN JUST A FEW CLINICAL STUDIES focusing on the advantages of tomosynthesis over conventional mammography," said Pragya A. Dang, M.D., of Massachusetts General Hospital, Boston. Those studies include findings that the use of tomosynthesis reduces recall rates, improves diagnostic accuracy and increases cancer detection.

"We wanted to delve further into our own experience and use the data we've collected over the last couple of years since we've been using tomosynthesis in clinical practice in order to access the maximum performance of these two technologies," Dr. Dang said.

Dr. Dang and colleagues retrospectively reviewed 172 biopsy-proven invasive breast cancers (142 invasive ductal carcinoma [IDC], 25 invasive lobular carcinoma [ILC] and 5 invasive mammary carcinoma) that were consecutively accrued prior to

biopsy between March 2011 and October 2012. The cancers were imaged with tomosynthesis and conventional digital mammography.

Two radiologists rated the visibility and morphology of these cancers with both tomosynthesis and conventional mammography without the presence of prior imaging. "Tomosynthesis demonstrated a significantly improved degree of visibility compared to digital mammography," Dr. Dang said.

Readers asked to determine whether tomosynthesis performed better, the same or worse than mammography rated tomosynthesis as superior to mammography in visualizing cancers in 70 percent of the cases, Dr. Dang said.

Lesion visibility was rated on a 5-point scale, from 1 (not visible) to 5 (obvious). Visibility scores for IDC were 3.4 for

System Aids Breast Cancer Detection in Women with Dense Breasts

A unique risk-assessment imaging system and model presented at RSNA 2013 accurately assesses the likelihood of breast cancer, especially in women with dense breasts, researchers say. The metabolic imaging and risk assessment (MIRA) model works as an adjunct to mammography in enabling early detection of breast cancer.



Izhaky

“ONE OF THE MAIN ISSUES WITH mammography is that it is very difficult to get an accurate reading for women with dense breasts,” said presenter David Izhaky, Ph.D., vice-president of research and development at Real Imaging, Ltd., a medical imaging company based in Israel’s Airport City. “You cannot replace mammography, but you can add an additional modality to aid the physician, particularly for women with dense breasts,” he said.

Dense breast tissue appears as a solid white area on mammograms, while the non-dense (fatty) tissue appears as dark areas. Tumors are also dense tissues. Because X-rays don’t penetrate dense tissue as effectively as they do fatty tissue, relying on mammograms alone to help detect tumors can become troublesome.

“What you get in the mammogram of a woman with dense breast tissue is the same contrast you would get for the tumor,” Dr. Izhaky said. “It’s very difficult for the physician to see the difference in the contrast in the image between the tumor and the healthy tissue.”

Another drawback of mammography is that results are based on human interpretation, which can lead to error such as missed diagnoses of breast cancer. And the current risk assessment models for breast cancer rely on genetic susceptibility and family history in addition to mammographic breast density.

Dr. Izhaky and his team targeted those issues in developing the computerized, noninvasive imaging modality used in the study, which comprised 3D breast vascular maps of 339 women. Of those women, 209 were healthy, 36 had benign lesions and 94 had biopsy-proven breast cancer. Researchers used receiver-operating characteristic (ROC) analysis and bootstrapping to assess the diagnostic accuracy of the breast cancer likelihood. They found an overall 84.1 percent area under the ROC curve, which increased to 86.5 percent when looking at dense-breast examples.

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“We believe we have the first risk-assessment tool purely based on imaging biomarkers,” Dr. Izhaky said.

The tool would be essential in early detection and prevention strategies, which depend on the ability to accurately identify individuals with significantly increased breast cancer risk. “Our technology attempts to provide a dynamic assessment analyzing the chances that a woman harbors a breast cancer at a specific time, based on objective metabolic signatures,” Dr. Izhaky said. “If assessed as high risk, such a woman would need immediate further workup to detect and localize the cancer.”

“In 10 years, most imaging modalities will provide risk assessment for the presence of pathology,” he said. “Providing the risk is by no means intended to exclude physicians from the clinical decision process, rather to provide them with a non-biased objective assessment in order for the physician to decide on the most appropriate workup for the patient, adopting a personalized, tailored approach.” □



Dang

tomosynthesis and 2.8 for mammography; ILC scores were 3.2 for tomosynthesis and 2.3 for mammography. “For both of these readers there was basically a one point improvement with tomosynthesis on the visibility score, which is statistically significant,” Dr. Dang said.

Of the 172 cancers, 28 (16 percent) were occult on mammography, whereas just 5 (3 percent) were occult on tomosynthesis.

Characterization of tumor morphology also improved with tomosynthesis, Dr. Dang said.

“Along with the improved visibility a much higher percentage of the cancers were more definitively characterized as masses compared to asymmetries, which were only available on one view,” she said.

For example, she pointed out that the first reader was only able to characterize 42 percent of cancers as masses with conventional mammography, compared to 78 percent with tomosynthesis.

Results were similar with the second reader, who was able to characterize 84 percent of the cancers as masses with tomosynthesis, compared to 36 percent with conventional mammography. But readers characterized 19 percent of the cancers as asymmetries on conventional mammography, compared to just 2 percent with tomosynthesis.

“This better characterization of tumor morphology does help translate into improved detection of cancers,” she said.

“Results show that tomosynthesis is significantly better than conventional mammography in visualizing cancers that we believe would translate to increased cancer detectability upon screening,” she said. “It also provides more accurate morphology of cancers that allow for a better assessment of a lesion in initial imaging.” □

Radiologists Are the Key to Efficient Imaging Utilization

Contrary to the fears of some, efforts to reduce unnecessary medical imaging could actually strengthen radiology by giving radiologists a more prominent role to play in patient management. For that to happen, radiologists must go beyond being service providers and become resource managers, some experts say.

PRESSURE TO REDUCE IMAGING OVERUTILIZATION has increased in recent years amid rising healthcare costs and radiation exposure concerns. Implementation of the Affordable Care Act and a philosophical shift in Washington away from volume-based toward value-based medicine have intensified the pressure.

In response, the radiology community has developed a number of programs to raise awareness of appropriate imaging. At the national level, the Image Wisely™ campaign that is supported by radiology organizations including the RSNA, the American College of Radiology (ACR), the American Association of Physicists in Medicine (AAPM) and the American Society of Radiologic Technologists (ASRT) strives to lower the amount of radiation used in medically necessary imaging studies and eliminate unnecessary procedures.

The Image Gently™ campaign launched by the Alliance for Radiation Safety in Pediatric Imaging focuses its efforts on children. (See sidebar.) The Choosing Wisely® initiative of the American Board of Internal Medicine (ABIM) Foundation promotes discussion among physicians and patients about appropriate use of healthcare resources including imaging tests.

On the local and statewide level, radiologists like Robert M. Milman, M.D., of the Austin Radiological Association in Austin, Texas, have been working to spread the message of optimal utilization to other healthcare providers. “When used appropriately, imaging has enormous benefit,” he said. “What we want to cut back on is inappropriate imaging.”

Dr. Milman provides programs for primary care physicians and nurse practitioners as well as lectures to medical students and advanced practice nursing students. His “What to Order When” presentations cover appropriateness guidelines for evidence-based utilization of diagnostic imaging services.

“The ACR has appropriateness criteria for imaging tests available on its website, but very few primary care physicians are aware of that,” he said. “I try to make everyone aware of the benefits of using imaging guidelines in the changing landscape of medicine as we move from a volume-based to value-driven model.”



Milman



Jha

During his presentations, Dr. Milman discusses evidence-based imaging practices for a variety of scenarios, such as low back pain, headaches and abdominal pain as well as follow-up strategies for ovarian cysts and pulmonary nodules. “Order the right test at the right time for the right reason,” he said. “For instance, most people with lower back pain get better without imaging, so holding off on ordering an MR scan may give you the same outcome and save the system money.”

Attendees of Dr. Milman’s workshops attest to its usefulness for clinical decision-making.

“It’s very, very difficult to control utilization in the U.S. because of the unconstrained nature of the market. It’s like trying to go on a diet while having a fridge full of chocolate, cheese and bacon.”

Saurabh Jha, M.B.B.S.

“Dr. Milman discusses the value of advanced imaging techniques in different clinical settings,” said Norman H. Chenven, M.D., founder of the Austin Regional Clinic, a 240-physician multispecialty care group, who attended a workshop last year. “He helped us simplify complex issues and organize the material in a way that makes sense to clinicians.”

Obstacles Exist to Optimal Imaging Utilization

These efforts appear to be paying off. A 2013 study by the Harvey L. Neiman Health Policy Institute found that the number of physician visits by patients age 65 or older resulting in an imaging exam dropped from 12.8 percent in 2003 to 10.6 percent in 2011. Medicare spending per enrollee for imaging also declined, from \$418 in 2006 to \$390 in 2011.

However, significant obstacles to optimal imaging utilization still exist within the U.S. healthcare system, according to Saurabh Jha, M.B.B.S., of the



IMAGE WISELY™
Radiation Safety in
Adult Medical Imaging

Department of Radiology at the University of Pennsylvania in Philadelphia. “It’s very, very difficult to control utilization in the U.S. because of the unconstrained nature of the market,” he said. “It’s like trying to go on a diet while having a fridge full of chocolate, cheese and bacon.”

Dr. Jha is the recipient of the 2012-2014 GE Healthcare/RSNA Education Scholar grant, “Technology Assessment for Radiology Residents—a Curriculum to Understand the Economics of Imaging and How to Value a Diagnostic Test.”

As he described in a July 2013 article in the *New England Journal of Medicine*, Dr. Jha trained as a surgeon in England, where imaging was scarce and radiologists also served as gatekeepers. When he moved to the U.S. and switched to radiology, he discovered an entirely different landscape.

“The basic difference is that the U.K. is constrained by budget, while the healthcare expansion in the U.S. has been unconstrained,” he said. “As long as the costs are not wholly borne by the consumer, there is an incentive to always expand imaging services.”

Dr. Milman agreed. “At the moment, the philosophy with respect to imaging is, the more, the merrier,” he said.

Besides educational programs, other solutions to reduce unnecessary utilization have been proposed, including the use of electronic health records (EHRs) to track physician performance. “EHRs will make it easier for payers to track who is ordering more imaging studies than their peers yet not improving outcomes,” Dr. Milman said.

Efforts are also underway to develop and install decision support systems linked to order entry. Quality metrics, such as benchmarks for the acceptable proportion of negative imaging studies, are another promising pathway to utilization management. Bundled payments for accountable care organizations will offer an opportunity to institute these measures, according to Dr. Jha.

“We need some changes to identify patterns of overuse,” he said. “For instance, having benchmarks that establish norms, such as an acceptable rate of negative MRIs.”

Other ideas include increasing imaging appropriateness education in medical school and developing programs in which radiology residents participate in rounds with clinical teams.

Radiologists as Utilization Managers

The key to effective imaging optimization, however, lies with radiologists and their role as imaging utilization managers, experts said. “Radiologists should not simply advise on the best imaging method, but also provide input as to which diagnoses should be considered in the first place,” Dr. Jha said. “We need to be clinically engaged, know the patient’s history, the clinical context and the pretest probability of disease, and discuss these things with the referring physician.”

The management role will prove challenging in a business model that depends largely on referrals. Nevertheless, Dr. Milman, who has been in private practice in Austin more than 20 years, said he believes that referring physicians generally appreciate opportunities to discuss the best imaging approach for each patient.



“Probably 99 percent of the time, the referring physician is happy that the radiologist is picking up the phone and contacting him or her to make sure the right test is performed,” he said. “That

builds a relationship and prevents you from becoming a commodity.”

This last point is critical, as the threat of commoditization is the biggest challenge facing radiology today, Dr. Jha said. “We have to realize that the world is not like it was before the financial meltdown of 2008,” he said. “At that time, we feared self-referral—now we need to fear commoditization.”

Avoiding commoditization will prove to be especially challenging for radiologists amid continuing development of technology like teleradiology and PACs. “In today’s high-volume world, there is less time for interaction between radiologists and other doctors,” Dr. Milman said. “Many doctors have access to images on PACs so they don’t come by as often to discuss a case.”

Clinical imaging conferences and imaging rounds can weave the radiologist back into the fabric of patient management, Dr. Jha said. Initiatives to promote more “face time” between radiologists and patients, such as those offered by RSNA’s Radiology Cares® campaign, show promise, Dr. Milman said.

“As this process of optimizing utilization moves forward, we have an opportunity to show the value of radiologists,” Dr. Jha said. “A CT scan can be valuable, but radiologists can add value beyond that scan, for instance by showing that judicious use of CT can prevent overuse of far more expensive modalities like catheter angiograms.”

Neither Dr. Jha nor Dr. Milman expects the shift to more efficient utilization to be seamless, but they agree that the radiologist must play a central role in the process. “By being a team player and interacting with other physicians, radiologists will strengthen our profession and ultimately improve outcomes for our patients,” Dr. Milman said. □

WEB EXTRAS

📄 Access the article, “From Imaging Gatekeeper to Service Provider — A Transatlantic Journey,” in the *New England Journal of Medicine* at nejm.org/doi/full/10.1056/NEJMp1305679

📄 For more information on the Image Wisely campaign founded by RSNA, ACR, ASRT and AAPM, go to imagewisely.org.

📄 For more information on the Image Gently campaign supported by more than 40 organizations including RSNA, go to imagegently.dnnstaging.com/Home.aspx.

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Image-guided Robot Detects, Removes Brain Tumors

Using maggots to eat away dead human tissue may not seem to have much in common with neurosurgery, but the age-old idea was the inspiration for a trio of researchers to combine robotics and real-time MR brain imaging to treat brain tumors.

SEVERAL YEARS AGO, J. MARC SIMARD, M.D., a professor and neurosurgeon at the University of Maryland School of Medicine, Baltimore, happened to be watching a television program on the medical use of sterile maggots. Finding it “fascinating,” Dr. Simard thought the idea could work with brain tumors—minus the maggots.

“The idea was to develop a very tiny robot that could remove diseased areas while leaving healthy tissue untouched, which of course is one of the major challenges with removing brain tumors,” Dr. Simard said.

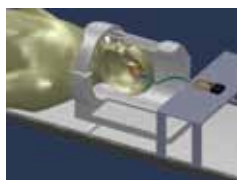
Dr. Simard joined with other experts—Rao Gullapalli, Ph.D., associate professor of diagnostic radiology at the University of Maryland, and Jaydev Desai, Ph.D., an associate professor of mechanical engineering at the University of Maryland, College Park—to develop the prototype for a minimally invasive neurosurgical intracranial robot (MINIR) they hoped could one day be a huge aid to neurosurgeons in removing difficult-to-reach brain tumors.

Initially funded in part by a 2006 National Institutes of Health (NIH) grant, the team developed MINIR over a number of years and determined its feasibility. In 2012, the team secured a \$2 million National Institute of Biomedical Imaging and Bioengineering (NIBIB) grant to continue developing MINIR-II, a fully MR imaging-compatible robot designed to enable neurosurgeons to reach and remove brain tumors, with the goal of greatly improving outcomes for these patients.

“The clinical issue is quite simple,” Dr. Gullapalli said. “Current neurosurgery practices—especially those involving resection of deep-seated tumors—are in some sense blinded.”

Dr. Gullapalli received a \$25,000 Research & Education (R&E) Research Seed Grant in 1999 at the University of Maryland for the project, “Regional Cerebral Blood Flow at Rest & Task Dependent Activation in the Supplementary Motor Cortex: Correlating Baseline Perfusion MRI with Functional MRI.”

ON THE COVER
Guided by MR imaging, a Minimally Invasive Neurosurgical Intracranial Robot (MINIR), shown here as a prototype, would help target brain tumors.



Simard



Gullapalli

Based on imaging performed before the surgery, surgeons open the skull and make a large incision in the brain to create a line of sight that allows them to extract the tumor. “The problem is that you can never be quite sure you’ve removed enough of the tumor,” Dr. Gullapalli explained. “And because new tissue moves in to replace the tissue that’s been removed, there is a risk of removing some of the healthy tissue.”

The procedure may have to be repeated if the tumor isn’t completely removed, making it potentially very cumbersome and drawn out—not a “high-confidence surgery,” Dr. Gullapalli said. But by dropping the tiny robot down into the tumor area and using MR imaging guidance, surgeons are able to remove the tumor without injuring nearby healthy tissue.

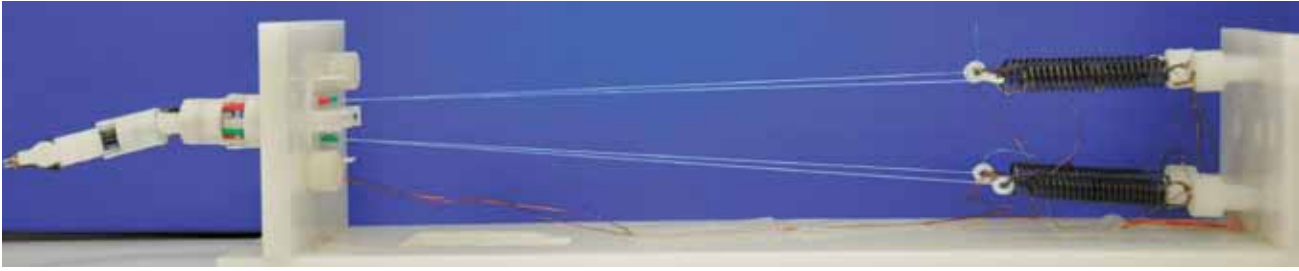
Robotics and MR Imaging Form Critical Union

Dr. Gullapalli, whose area of expertise is MR, and Dr. Desai embarked on the project based on their experience using robots to perform breast biopsies. “Moving from breast to neuro is a huge leap,” he said.

Moreover, marrying robotics and MR imaging to create this new device brought with it a huge challenge—developing a robot that could safely be used inside an MR imaging scanner. “It’s not just the type of material, but its shape that matters,” Dr. Gullapalli said. “The shape of any object will deflect the magnetic field somewhat and create image distortion, so we had to work out these details.”

“Real-time image guidance is critical, so we have to have sensors built into the robot to tell us its location.”

Rao Gullapalli, Ph.D.



The newest prototype of the MR imaging-compatible Minimally Invasive Neurosurgical Intracranial Robot (MINIR) (*above*) designed to enable neurosurgeons to reach and remove brain tumors and greatly improve patient outcomes; (*bottom right*) an earlier version of the MINIR; Jaydev Desai, Ph.D., (*bottom left*) is among the University of Maryland School of Medicine researchers who developed the MINIR prototype.

Images courtesy of University of Maryland, School of Medicine

Above all, the device had to be small, Dr. Desai said. “We needed something we could maneuver like a finger, but with more freedom,” he said. The actuator—the device that drives the robot—must also be compatible with MR imaging and create enough force to move the robot joint and perform tasks like electro-cauterizing tissue. The latest prototype contains a plastic robot body and shape memory alloy spring actuators that actually sit apart from the robot’s body.

Another challenge, Dr. Gullapalli said, is “that you actually have to drive this thing.” He compares it to driving a car—the operator wants to know what’s in front, behind and on his sides. And that’s where MR imaging comes into play.

“As this device moves and chisels out part of a tumor, the surgeon needs to make sure he’s not inadvertently going to hit normal tissue,” he said. “Real-time image guidance is critical, so we have to have sensors built into the robot to tell us its location.”

In that way, Dr. Gullapalli said, the scanner can provide the robot—or the surgeon operating the device—images letting it know what lies in front, behind and on its sides, “in real time and on demand.”

Researchers working to further develop the device by reducing image distortion and testing its safety and efficacy say bringing the device to clinical trial is probably five-to-10 years away. “This is a long-term project,” Dr. Gullapalli said. □

NIH BRAIN PROJECT ALLOCATES \$4 MILLION FOR IMAGING RESEARCH

Application Deadline is March 13

Grant applicants are being sought for the \$4 million in funding allocated by the National Institutes of Health (NIH) for human brain imaging research as part of its Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative.

NIH plans to invest \$40 million in Fiscal Year 2014 in six areas (including imaging) contingent on the submission of a sufficient number of applications. The application deadline for the imaging initiative, “Planning for Next Generation Human Brain Imaging,” is March 13.

The initiative is designed to support planning activities and the initial stages of development of entirely new or next generation brain imaging technologies and methods that will lead to transformative advances in understanding the human brain.

Application budgets are limited to \$300,000 in direct costs in any project year and must reflect the needs of the proposed project. Funds will provide imaging researchers, societies, industry partners and other stakeholders the time and resources to prepare a proposal by the end of three years. The planning grants will support collaborative meetings, early data gathering, prototype modeling, proof of concept and other planning stages.

Applicants must propose development of new techniques with capabilities exceeding the most current imaging techniques. Incremental approaches will not be accepted. The grants are meant to encourage highly innovative teams including radiologists, physicists, chemists, computational scientists, neuroscientists and industry partners.

Introduced in 2013, President Barack Obama’s 10-year BRAIN initiative focuses on building a new arsenal of tools and technologies for helping scientists unlock the mysteries of the brain.

To apply for funding and to review the Funding Opportunity Announcement (FOA) (RFA-MH-14-217) describing the goals for this new program, go to Grants.nih.gov/grants/guide/rfa-files/RFA-MH-14-217.html.

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YOUR DONATIONS IN ACTION – MULTI-PARAMETRIC RESPONSE MAP AIDS BRAIN TUMOR TREATMENT

Glioblastoma Multiforme (GBM) is the most common and lethal primary brain tumor; however, the current standard of care does not account for the multifaceted nature of tumor pathophysiology.

With a Canon U.S.A./RSNA Research Medical Student Grant, **Pablo A. Valdes, Ph.D.**, of the Geisel School of Medicine at Dartmouth, and Clifford J. Belden, M.D., chair and associate professor of radiology, Dartmouth-Hitchcock Medical Center, set out to create a Multi-Parametric Response Map (mPRM) biomarker that will more accurately predict progression-free survival and median overall survival in recurrent GBM than standard radiographic criteria.

Dr. Valdes is enthusiastic about the clinical implications of this research. “Successful completion of the project may demonstrate an mPRM for improved clinical radiographic assessment of treatment response to help guide therapy decisions and improve patient survival rates.”



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Education and Funding Opportunities

New Education Product Alert: RSNA Scan: 2012 Year in Review

RSNA IS OFFERING an exciting new product—RSNA Scan: 2012 Year in Review, a collection of not-to-be missed RSNA educational content from 2012 available on a USB drive. RSNA developed the scan based on the most viewed, watched, misdiagnosed cases and talked about education content from 2012.

Browse some of the most innovative and popular articles published in RSNA's peer-reviewed journals *Radiology* and *RadioGraphics* and re-experience the excitement of scientific advancement with the Alexander R. Margulis Award in Scientific Excellence, presented to the best original scientific article published in *Radiology*. The RSNA Scan includes the award-winning article, as well as the accompanying video award presentation.

The RSNA Scan also features the most-viewed scientific abstracts from RSNA 2012, including recipients of the Science Trainee Research Prize as well as the most viewed and talked about educational exhibits from RSNA 2012, including recipients of the Magna Cum Laude Award. The RSNA Scan is also a perfect teaching tool for residents and fellows by gathering together some of the most important topics in radiology education.



Keep diagnosis skills sharp by investigating some of the most challenging and unique Cases of the Day covering a wide range of subspecialties. The RSNA Scan includes the most misdiagnosed cases by attendees as well as an in-depth review of imaging findings and detailed discussion on how each correct diagnosis can be reached.

Watch RSNA 2012 plenary sessions including the ever-popular Image Interpretation Session, along with the New Horizons Lecture and Annual Oration in Radiation Oncology, the Friday Imaging Symposium, RSNA/AAPM Symposium and RSNA 2012 President's Address.

The cost is \$100 for members and \$250 for non-members. Visit RSNA.org/RSNA_SCAN to add this education collection to your library. Watch for the RSNA Scan: 2013 Year in Review.

Nominate Your Academic Superstar — RSNA Introduction to Research Program

Deadline for nominations
April 15, 2014

THE RSNA COMMITTEE ON INTERNATIONAL RADIOLOGY EDUCATION (CIRE) seeks nominations for the RSNA Introduction to Research for International Young Academics (IRIYA) program that encourages young radiologists from countries outside North America to pursue careers in academic radiology by:

- Introducing residents and fellows to research early in their training
- Demonstrating the importance of research to the practice and future of radiology
- Sharing the excitement and satisfaction of research careers in radiology
- Introducing residents to successful radiology researchers, future colleagues and potential mentors

This special four-day seminar will be held during the 2014 RSNA Annual Meeting and Scientific Assembly. The CIRE recommends 15 young academics for consideration by the RSNA Board of Directors each year.

Eligible candidates are residents and fellows currently in radiology training programs or radiologists not more than two years out of training from outside North America, who are beginning or considering an academic career. Nominations must be made by the candidate's department chairperson or training director. Fluency in English is required. Nomination forms are available at RSNA.org/IRIYA.

Medical Meetings

March-April 2014

MARCH 22-27

Society of Interventional Radiology (SIR), 39th Annual Scientific Meeting, San Diego

- www.sirweb.org
- Visit RSNA at Booth 301

MARCH 23-28

Society of Abdominal Radiology (SAR) and the European Society of Urogenital Radiology (ESUR), joint Annual Scientific Meeting and Educational Course, Boca Raton Resort and Club, Fla.

- www.abdominalradiology.org

MARCH 29-APRIL 2

American Institute of Ultrasound in Medicine (AIUM), Annual Convention, Caesars Palace, Las Vegas

- www.aium.org

MARCH 30-APRIL 4

International Diagnostic Course Davos (IDKD), 46th IDKD, Diseases of the Abdomen and Pelvis, Convention Center Davos, Switzerland

- www.idkd.org

APRIL 1-4

RSNA and Association of University Radiologists (AUR), Joint Sponsored 62nd Annual Meeting, in conjunction with SCARD, APDR, A3CR2, ACER, AMSER, RAHSR, RRA, APCR and SNMMI, Baltimore Marriott Waterfront

- www.aur.org

APRIL 3-5

American Brachytherapy Society (ABS), Annual Meeting, Manchester Grand Hyatt, San Diego

- www.americanbrachytherapy.org

APRIL 4-8

European Society for Radiotherapy & Oncology (ESTRO), ESTRO 33, Reed Messe Congress Center, Vienna

- www.estro.org

APRIL 5-8

American Physical Society (APS), April Meeting 2014, Savannah, Ga.

- www.aps.org

APRIL 10-13

Japan Radiological Society (JRS), 73rd Annual Meeting, Pacifico Yokohama, Japan

- www2.convention.co.jp/jrs73/en

APRIL 24-27

Canadian Association of Radiologists (CAR), 77th Annual Scientific Meeting, Le Centre Sheraton, Montreal

- www.car.ca/en.aspx

FIND MORE EVENTS AT
RSNA.org/calendar.aspx

Journal Highlights

The following are highlights from current issues of RSNA's two peer-reviewed journals.

State of the Art: Imaging of Occupational Lung Disease

Imaging of occupational lung disease, often perceived as a static discipline, continues to evolve with changes in industry and imaging technology. The challenge of accurately identifying an occupational exposure as the cause of lung disease demands a team approach, requiring integration of imaging features with exposure type, time course and severity.

In a State-of-the-Art article in the March issue of *Radiology* (RSNA.org/Radiology), Christian W. Cox, M.D., of National Jewish Health in Denver, and colleagues demonstrate the importance of a multidisciplinary approach to diagnosing occupational lung disease, with particular emphasis on a radiologic pattern-based approach. In addition, the authors illustrate the spectrum of lung injury related to occupational exposures and discuss the imaging features of several newly described occupational diseases.

Increasing use of CT has demonstrated that specific occupational exposures can result in a variety of patterns of lung injury. The radiologist is often ideally placed to recognize potential occupational lung disease and question the clinician about possible exposures that, if causally relevant, may lead to more targeted medical management and prevention, according to the authors.

"The radiologist must understand the spectrum of expected imaging patterns related to known occupational exposures and must also recognize newly described occupational exposure risks, often related to recent changes in industrial practices," the authors write.



Thin-section CT image at the level of the right middle lobar bronchus in a patient with concentrated concrete dust exposure resulting in acute silicosis that manifested as posterior predominant patchy consolidation. Note some areas of ground-glass opacity and septal thickening consistent with a crazy-paving pattern (between arrows).

(*Radiology* 2014;270;3:681-696) ©RSNA, 2014. All rights reserved. Printed with permission.

This article meets the criteria for AMA PRA Category 1 Credit™. SA-CME is available online only.

The Thyroid: Review of Imaging Features and Biopsy Techniques with Radiologic-Pathologic Correlation

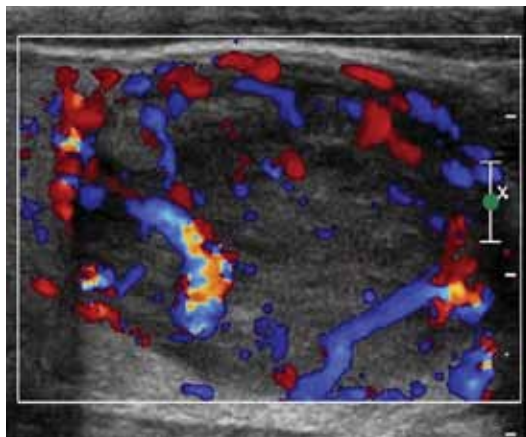
Imaging has long been established as an essential element in the workup of clinically suspected lesions of the thyroid gland. While thyroid nodules are often detected incidentally at CT, MR imaging and PET, ultrasonography is the most commonly used imaging modality for characterizing the nodules.

Knowledge of the normal and abnormal imaging appearances of the thyroid gland is essential for appropriate identification and diagnosis of thyroid lesions, according to Arun C. Nachiappan, M.D., of Baylor College of Medicine, Houston, and colleagues, authors of an article in the March-April issue of *RadioGraphics* (RSNA.org/RadioGraphics).

The authors discuss: imaging appearance of thyroid lesions with special emphasis on clinical background and radiologic-pathologic correlation; current indications for thyroid fine-needle aspiration biopsy (FNAB); proper ultrasound-guided FNAB technique; and cytologic analysis of the acquired specimen.

The critical roles of the radiologist in the management of thyroid disease are to decide whether to biopsy a nodule on the basis of ultrasound criteria and to use proper FNAB technique for thyroid biopsy, according to the authors.

"It is also important for the radiologist to have a basic knowledge of thyroid disease, be familiar with specimen processing, and recognize the cytologic appearances of thyroid lesions, all of which will facilitate a multifaceted understanding of the management of thyroid nodules," the authors write.



Metastatic lung carcinoma in a 63-year-old man with known lung carcinoma in whom a new thyroid nodule was discovered at staging CT. Longitudinal duplex ultrasound image shows a mildly heterogeneous, hypoechoic 3-cm solid nodule with increased peripheral and central vascularity. Increased central vascularity is a suspicious ultrasound feature.

(*RadioGraphics* 2014;34:276-293) ©RSNA, 2014. All rights reserved. Printed with permission.

This article meets the criteria for AMA PRA Category 1 Credit™. SA-CME is available in print.

Radiology in Public Focus

A press release was sent to the medical news media for the following article appearing in a recent issue of *Radiology*.

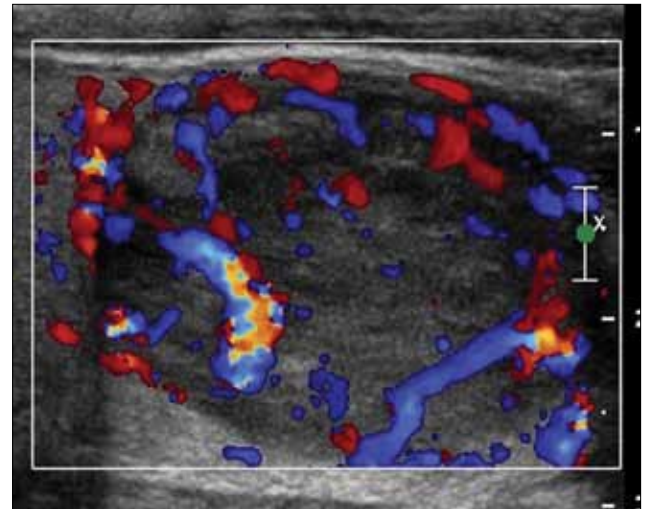
Mapping the Effect of the Apolipoprotein E Genotype on 4-Year Atrophy Rates in an Alzheimer Disease-related Brain Network

THE APOLIPOPROTEIN E (APOE) genotype ($\epsilon 4$) allele is associated with accelerated rates of atrophy in a specific gray matter network of vulnerable brain regions among subjects at risk for Alzheimer disease (AD), new research shows.

Christopher A. Hostage, M.D., of the Duke University School of Medicine and the Alzheimer's Disease Neuroimaging Initiative (ADNI), and colleagues analyzed data from 237 subjects (mean age, 79.9 years; 40 percent female) with mild cognitive impairment (MCI) in the ADNI database and assessed the effect of the APOE genotypes $\epsilon 4$ and $\epsilon 2$ alleles on regional brain atrophy rates over a 12-48-month period. Regional atrophy rates were derived by using a fully automated algorithm applied to T1-weighted MR imaging data.

According to results, 13 of 15 experimental regions showed a significant effect of $\epsilon 4$ or higher atrophy rates ($P < .001$ for all). Cohen d values ranged from 0.26 to 0.42, with the largest effects seen in the amygdalae and hippocampi. The transverse temporal cortex showed a trend ($P = .02$, but did not survive Bonferroni correction) for a protective effect (Cohen d value = 0.15) of $\epsilon 2$. No control region showed an APOE effect.

"The additional rate of atrophy in vulnerable brain regions—regions that typically display marked degeneration in AD—that is directly attributable to APOE $\epsilon 4$ is comparable in magnitude to the underlying age-related, baseline rate of atrophy observed for these areas in $\epsilon 4$ noncarriers," the authors write.



Medial, inferior, superior and lateral images of a 3D FreeSurfer reference brain model show regions of accelerated atrophy in the presence of APOE $\epsilon 4$ in subjects with mild cognitive impairment. Effect size of the APOE $\epsilon 4$ acceleration of cortical atrophy is depicted by color: Blue signifies a magnitude of Cohen d value of less than 0.25; yellow, 0.25–0.35; and red, more than 0.35. Gray areas were not examined. (*Radiology* 2014;270:2:InPress) ©RSNA, 2014. All rights reserved. Printed with permission.

Media Coverage of RSNA

In December, media outlets carried 5,914 RSNA-related news stories. These stories reached an estimated 2.6 billion people.

Print and online coverage included *The Huffington Post*, *U.S. News & World Report*, *The Wall Street Journal*, *Yahoo! News*, *Los Angeles Times*, *BBC News*, *The Atlanta Journal-Constitution*, *Examiner.com*, *WebMD*, *FOXNews.com*, *Toronto Telegraph*, *Newsday*, *New York Post*, *Glamour*, *Self*, *Prevention* and *Shape*.

Broadcast coverage included Doctor Radio, Fox News Channel, Al Jazeera America, WGN America, WABC-TV (New York), WNBC-TV (New York), KABC-TV (Los Angeles), WMAQ-TV (Chicago), WLS-TV (Chicago) and WBBM-TV (Chicago).

Media coverage of RSNA 2013 will be highlighted in a future issue of *RSNA News*.



MARCH PUBLIC INFORMATION OUTREACH ACTIVITIES FOCUS ON COLORECTAL CANCER

To highlight National Colorectal Cancer Awareness Month in March, RSNA is distributing radio public service announcements (PSAs) encouraging listeners to be screened for colorectal cancer.

In addition, RSNA is distributing the "60-Second Checkup" audio program to nearly 100 radio stations across the U.S. The segments focus on colorectal cancer screening and the types of exams available.

New on *RadiologyInfo.org*

Visit *RadiologyInfo.org*, the RSNA and ACR's jointly-sponsored public information website, to read the latest disease/condition topics, including:

- Benign Prostatic Hypertrophy (BPH)
Radiologyinfo.org/en/info.cfm?pg=bph
- Cystic Fibrosis

Technology Forum

IHE® Connectathon Grows as Hub for Health IT Interoperability Testing

The 16th annual IHE North American Connectathon, health information technology's (HIT) largest interoperability testing event, was held Jan. 27-Jan. 31, in Chicago. The event allows vendors from across healthcare to test implementations of IHE Profiles and their ability to connect effectively with industry peers. One hundred-forty systems from 97 companies were tested at this year's event.



Connectathon testing helps the HIT industry achieve the level of interoperability needed to meet the demands of healthcare providers and patients for convenient, secure access to electronic health records (EHRs). The event has also become an important milestone for HIT standards bodies, emerging health information organizations (HIOs) and government agencies, whose success relies on achieving effective interoperability of HIT systems.

This was apparent as users and developers of these systems gathered at the Con-

nectathon Conference on Jan. 29. The educational and networking event featured success stories and best practice examples of agencies and organizations achieving information exchange and improving patient outcomes while realizing the value of health IT.

Doug Fridsma, M.D., Ph.D., director of Science and Technology in the Office of the National Coordinator for Health Information Technology, delivered the keynote address, "Strategy and Principles to Accelerate Health Information Exchanges and Interoperability" while Eric Heflin, CTO at Healthway, a nationwide HIO,

described Connectathon testing as part of the foundation of his organization's plans for success.

RSNA and the Healthcare Information and Management Systems Society (HIMSS) have been sponsors of the Connectathon since its inception in 1999. The first several events were held at RSNA headquarters in Oak Brook, Ill. Next year, for the first time, the Connectathon will be held at the HIMSS Innovation Center in Cleveland, Ohio. Connectathons are also held annually in Europe, Japan and Korea.

For more information on IHE, go to RSNA.org/ihe.aspx.

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Post Your Resume for Free on RSNA Career Connect

RSNA's job website, Career Connect, puts job seekers in touch with the latest listings in the field.

Create a Search Agent to zero in on the positions that meet your requirements and receive e-mails when perfect jobs become available. Job seekers can post their resumes free of charge so employers can match skills to needs.

Check out Career Connect at careers.rsna.org.

RSNA CAREER CONNECT ONLINE MEDICAL JOBS APPLY NOW

RSNA Career Connect Find great radiology jobs of job seekers

Thursday, March 08, 2012

SEARCH RESULTS

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- Find New Jobs
- Search Results
- Company Accounts

JOB SEEKERS

- Submissions
- Find New Resumes
- Search Jobs
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Job Seekers

Employers

POST YOUR JOB and take advantage of these great rates:

30 Day Posting	60 Day Posting
\$225	\$325

For questions, contact Melissa at 1-630-577-7077 or meg@rsnaconnect.org

The Value of Membership

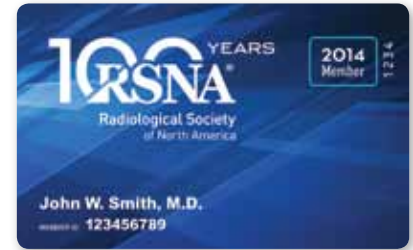
RSNA Offers Affordable Membership as Residents Transition into Practice

Residents and fellows transitioning into practice will likely find a strong incentive for maintaining their RSNA membership: reduced rates.

While members-in-training receive free RSNA membership, members transitioning from training qualify for greatly reduced rates during the first and second years of practice—just \$100 in year one and \$200 in year two. It is not until the third year of practice that transitioning members pay standard membership dues.

The RSNA benefit gives residents time to settle into the profession before paying the full membership fee. Under the program, transitioning members receive all the benefits of full membership, including subscriptions to *Radiology*, *RadioGraphics* and *RSNA News*, free admission (with advance registration) to the annual meeting and free access to online CME opportunities.

For more information about reduced rates, contact the Membership Department at 1-877-RSNA-MEM (1-877-776-2636) or membership@RSNA.org.



Annual Meeting Watch

RSNA 2014 Online Abstract Submission Now Open

The online system to submit abstracts for RSNA 2014 is now active. The submission deadline is 12 noon Central Time on Wednesday, April 9, 2014. Abstracts are required for scientific presentations, education exhibits, applied science, quality storyboards and quantitative imaging reading room showcase.

To submit an abstract online, go to RSNA.org/abstracts.

The easy-to-use online system helps the Scientific Program Committee and Education Exhibits Committee evaluate submissions more efficiently. For more information about the abstract submission process, contact the RSNA Program Services Department at 1-877-776-2227 within the U.S. or 1-630-590-7774 outside the U.S.

RSNA 2014 Registration

Registration Fees

BY NOV. 7 AFTER NOV. 7

\$ 0	\$ 100	
0	0	RSNA/AAPM Member
0	0	RSNA/AAPM Member Presenter
0	0	RSNA Member-in-Training, RSNA Student Member and Non-Member Student
0	0	Non-Member Presenter
180	280	Non-Member Resident/Trainee
180	280	Radiology Support Personnel
825	925	Non-Member Radiologist, Physicist or Physician
825	925	Hospital or Facility Executive, Commercial Research and Development Personnel, Healthcare Consultant and Industry Personnel
325	325	One-day registration to view only the Technical Exhibits

Other Important Dates for RSNA 2014

Deadlines

- April 9:** Call for Abstracts deadline
- May 1:** Member registration and housing opens
- June 4:** General registration and housing opens
- July 9:** Course enrollment opens
- October 24:** International deadline to have full conference badge mailed
- November 7:** Final housing and discounted registration deadline
- November 26:** Deadline to guarantee a seat for all ticketed courses
- Nov. 30–Dec. 5:** 100th Scientific Assembly & Annual Meeting



Register by Nov. 7 to receive the discounted registration fee and full conference materials mailed to you in advance. International visitors must register by Oct. 24 to receive these materials in advance. Registrations received after Nov. 7 will be processed at the increased fee and conference materials must be obtained at the McCormick Place Convention Center.

Newest *Radiology Select* Volume Available on *RSNA.org*

Visitors to *RSNA.org* can access the entire *Radiology Select* series including the newest edition, “*Radiology Select* Volume 5: Radiation Dose and Dose Reduction,” introduced in February 2014.

Radiology Select is a continuing series of selected *Radiology* articles that highlight developments in imaging science, techniques and clinical practice. Each volume focuses on a particular topic important in the field and is supplemented by commentaries, author interviews, podcasts and educational opportunities. Articles are personally selected by guest editor(s) for a comprehensive portfolio.

The *Radiology Select* homepage also features a video introduction from Series Editor Deborah Levine, M.D., who explains the process of creating the series collection as well as how to access the series in its online, tablet and print formats.

“*Radiology Select* Volume 5: Radiation Dose and Dose Reduction” covers the challenges associated with the safe use of ionizing radiation in medical imaging; examines the quantification of radiation exposure, patient dose and risk; and demonstrates how to optimize and manage dose in various patient populations and body systems.

Radiology Select



COMING NEXT MONTH

RSNA News reports on the results of research analyzing the effectiveness of patient portals that engage patients in their own healthcare and facilitate communication between patients and radiologists in a way that is helpful to both.

Radiology *Select*

Radiation Dose and Dose Reduction

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