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FEATURES



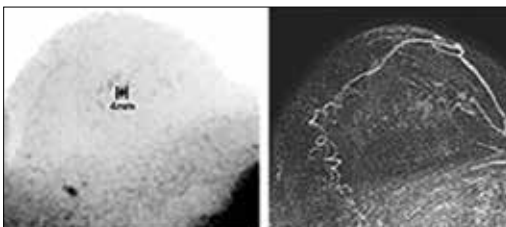
5 | International Panel Spotlights Education



7 | Radiology Leaders Share Secrets of Success



9 | The Promise of PET/MR Imaging



11 | MRI Technique Helps Clarify Breast Lesions



13 | Rendering DICOM Images as 3-D Printed Models

UP FRONT

- 1** First Impression
- 1** Numbers in the News

RADIOLOGY'S FUTURE

- 15** R&E Foundation Donors

NEWS YOU CAN USE

- 19** Journal Highlights
- 20** Value of Membership
- 21** *Radiology* in Public Focus
- 23** Education and Funding Opportunities
- 23** Annual Meeting Watch
- 24** *RSNA.org*

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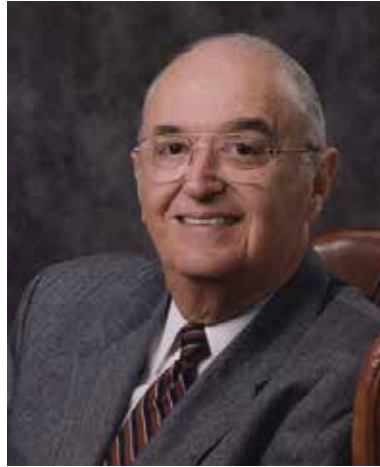
ARR Honors Baum with Gold Medal

The Academy of Radiology Research (ARR) honored **Stanley Baum, M.D.**, with its 2015 Gold Medal. Dr. Baum was presented with the award during a ceremony at RSNA 2015.

Dr. Baum helped found ARR in 1995 and served as its president from 1997 to 1999. He has since served as an indispensable advisor and champion for advancing ARR's mission and goals. For more than 20 years, Dr. Baum was professor and chairman of the Department of Radiology at the University of Pennsylvania in Philadelphia.

Among his many contributions to RSNA, Dr. Baum served as a member at-large of the RSNA Research & Education (R&E) Honors Council. He served on the *Radiology* Editorial Board as an advisory editor from 1975 to 1985 and as consultant to the editor from 1985 to 1989.

Dr. Baum was awarded the RSNA Gold Medal in 2003. He is an RSNA Research & Education (R&E) Foundation Bronze Visionary Donor.



APPLY NOW FOR RSNA EDITORIAL FELLOWSHIPS

Applications are being accepted for the RSNA William R. Eyler Editorial Fellowship and the RSNA William W. Olmsted Editorial Fellowship for Trainees.

Both fellowships offer the opportunity to work with *Radiology* Editor Herbert Y. Kressel, M.D., in Boston and *RadioGraphics* Editor Jeffrey S.

Klein, M.D., in Burlington, Vt. The Eyler fellowship lasts one month and the Olmsted fellowship lasts one week.

Each fellow will also visit the RSNA Publications Department at RSNA Headquarters in Oak Brook, Ill. The Eyler Fellow will work with the *RadioGraphics* editorial team at RSNA 2016.

Apply by May 1 to be considered for the William R. Eyler Editorial Fellowship and April 1 to be considered for the William W. Olmsted Editorial Fellowship for Trainees.

To learn more and to apply, go to:

RSNA.org/RSNA_Editorial_Fellowships.aspx.

Numbers in the News

5.8

Number, in millions, of times content from RSNA 2015 was seen across four platforms — Facebook, Twitter, LinkedIn and Instagram— during the annual meeting. Read more on [Page 24](#).

51,922

The official registration numbers for RSNA 2015. The meeting featured 1,728 scientific presentations, 444 education courses, six plenary sessions, 1,762 education exhibits, 921 scientific posters and special RSNA Centennial attractions. The RSNA Virtual Meeting attracted 4,141 attendees from 99 countries.

10,000

Number of patients who underwent coronary artery calcification (CAC) CT imaging as part of an outreach screening program. Researchers analyzing the data determined that CAC CT imaging may help predict patients at risk for early death as long as 15 years from the time of the scan. Read more on [Page 12](#).

1

Medical imaging should be incorporated into teaching medical students anatomy on Day One, according to a presenter at RSNA's International Trends Session focusing on educating the next generation of radiology professionals. Read more on [Page 5](#).



Roentgen Nominations Open

Nominations are being accepted now for the RSNA Roentgen

Resident/Fellow Research Award, recognizing residents and fellows who have made significant contributions to their departments' research efforts as evidenced by presentations and publications of scientific papers, receipt of research grants or other contributions.

Nominations are limited to one resident or fellow per program in radiology, radiation oncology or nuclear medicine per year. The program director or department chair selects the nominee for each program.

The RSNA Research & Education (R&E) Foundation provides an award plaque for the department to display and a personalized award to present to the selected resident or fellow. The deadline for nomination is April 1. Learn about the nomination process and see a list of past recipients at:

RSNA.org/Roentgen_Research_Award.aspx.



IN MEMORIAM

Robert W. Edland, M.D.



Robert W. Edland, M.D., former president of the American Society for Radiation Oncology (ASTRO) and renowned educator, died Aug. 30, 2015, at 83.

A native of Madison, Wisconsin, Dr. Edland earned his undergraduate degree at the University of Wisconsin (UW) at Madison before graduating from the UW Medical School.

He was commissioned in the U.S. Army Medical Corps and completed a general rotating internship in 1957 at Fitzsimons

General Hospital in Denver. After a six-month course in Army field medicine, he completed a three-year residency in general radiology at Brooke General Hospital in 1960, in San Antonio, Texas, serving the last year as chief resident.

After 11 years of military service, he accepted an appointment as assistant professor of radiology at the UW Medical School. In 1969, he was promoted to associate professor with tenure, chairman of the Division of Radiation Oncology within the Department of Radiology, and director of the radiotherapy center at the UW Hospitals and Clinics.

In 1970, he left the UW Medical School to found the Department of Radiation Oncology and the Western Wisconsin Radiotherapy Center at the Gundersen Clinic in La Crosse, where he served as chairman until 1995. He retired from the clinic in 1997.

Dr. Edland was elected secretary of ASTRO in 1974 and later served as the organization's councilor to the American College of Radiology (ACR) for seven years. In 1987, he was elected president of ASTRO, followed by a term as chairman of the board of directors.

In 1977, he was elected to fellowship in the ACR and the Royal Society of Health (England) and in 1988 as a distinguished fellow of the American College of Nuclear Medicine. In 2006, he was elected an Inaugural Charter Class Fellow of ASTRO.

In addition, for three decades he served as an adviser and cancer consultant to St. Francis Hospital and its affiliated clinics and tumor board with operating room privileges for radium and cesium brachytherapy of gynecological malignancies. During his career, Dr. Edland treated over 10,000 patients with cancer.

Norbash Named Radiology Chair at UCSD

Alexander M. Norbash, M.D., M.S., was recently named chair of the Department of Radiology at UCSD School of Medicine. Dr. Norbash will serve as professor of radiology and interventional neuroradiologist at UCSD Health.



An internationally recognized innovator and collaborator, Dr. Norbash served as chair and professor of radiology at Boston University from 2004 to 2015. Prior to joining Boston Medical Center, he was associate professor of radiology at Harvard Medical School where he directed the Diagnostic and Interventional Neuroradiology Service at Brigham and Women's Hospital from 2000 to 2004, and founded the interventional neuroradiology and endovascular neurosurgical practices.

A pioneer in endovascular neurologic therapies, Dr. Norbash has helped develop novel materials and devices including ultrathin stents for the endovascular treatment of aneurysms, laser-assisted stroke thrombolysis, resorbable-polymer stents, injectable polymer and hydrogel vascular embolic and occlusive compounds, and operator controllable remote-motion microcatheters.

Dr. Norbash has served on the education course faculty at multiple RSNA annual meetings and as a member of the Neuroradiology/Head and Neck Subcommittee of the RSNA Scientific Program Committee from 2001 to 2004.

The position was previously held by William G. Bradley Jr., M.D., Ph.D., who retired in September.



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RANZCR Honors Hennessy, Lisle

Oliver F. Hennessy, M.D., and **David A. Lisle, M.B.B.S.**, were recently honored by the Royal Australian and New Zealand College of Radiologists (RANZCR) at its annual meeting in Adelaide, Australia.

Dr. Hennessy received the Roentgen Medal, awarded to RANZCR fellows who have made valuable contributions to the college over a significant period of time. Dr. Hennessy, of the University of Melbourne, Department of Radiology at Royal Melbourne Hospital, Victoria, is involved in registrar education for those preparing for Part 2 RANZCR examinations. Dr. Lisle, a consultant radiologist at the Royal Brisbane and Brisbane Private Hospitals and an associate professor in medical imaging at the University of Queensland Medical School, received the Educational Service Award. The honor acknowledges an outstanding level of commitment, participation and leadership in training and education in clinical radiology over an extended period of time.

The international society speakers and guest faculty included RSNA immediate past-president **Ronald L. Arenson, M.D.**



Hennessy



Lisle

THIS MONTH IN THE RSNA NEWS ONLINE VERSION

Get more of this month's news at RSNA.org/News. Enjoy interactive features including video, audio, slide presentations and more. Go online to leave us a comment and easily share stories via social media as well.

As part of this month's cover story on advances in 3-D printing, we invite readers to explore a video of researcher Frank Rybicki, M.D., Ph.D., discussing his RSNA 2015 presentation on the need to render DICOM images as 3-D printed models.



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rsnanews@rsna.org
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Technology Forum

Pilot Testing Planned for the RSNA Image Share Validation Program

PILOT TESTING is scheduled to begin in 2016 on the Image Share Validation Program—a collaboration between RSNA and The Sequoia Project—designed to improve patient care through encouraging imaging vendors and radiology sites to improve access to medical images and reports.

Announced at RSNA 2015, the project will test compliance of vendors' systems using quality standards determined most effective for accurate and efficient exchange of medical images.

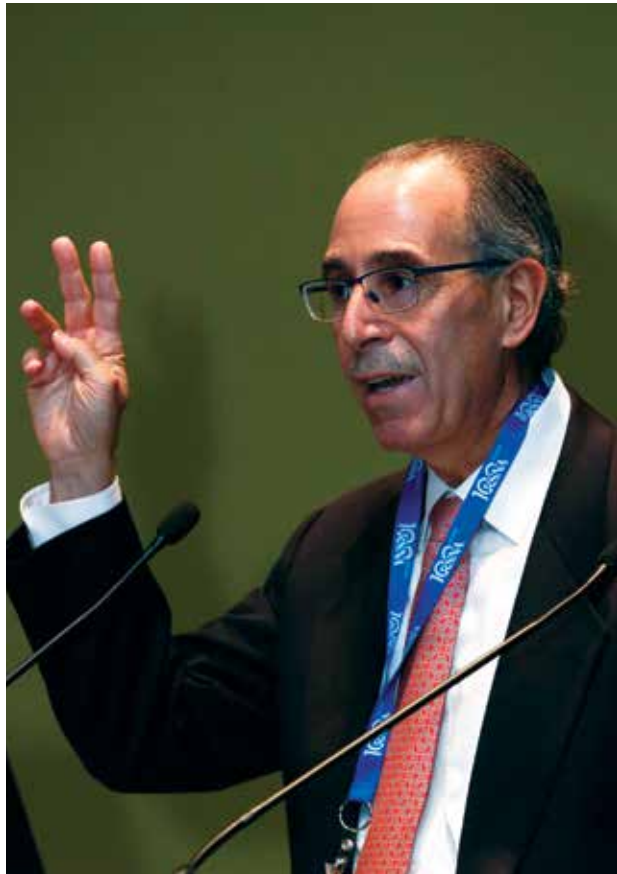
During pilot testing, RSNA will work closely with both the nonprofit The Sequoia Project and the Mallinckrodt Institute of Radiology at Washington University in St. Louis.

RSNA will offer validation of four bundles of functionality, based on Integrating the Healthcare Enterprise (IHE) profiles and actors:

- XDS-I Document Source and Consumer
- XDS-I Registry and Repository
- XCA-I Gateway
- Patient-focused Image Sharing through a personal health record (PHR) System

Vendors who successfully pass the testing program will be awarded the right to use the RSNA Image Share Validation mark to convey to purchasers that their products have achieved compliance with the capabilities tested in the program.

Image sharing provides physicians the benefit of historical exams, counteracts the growing cost of healthcare, reduces radiation exposure, and expedites clinical care, according to David Mendelson, M.D., representative of the RSNA Integrating the Healthcare Enterprise (IHE®) Board and member of the IHE USA Board. He likened image sharing to financial institu-



Mendelson

tions during an RSNA 2015 session. "It's like a banking model for moving images instead of money," Dr. Mendelson said. "You use tokens, a card, a password—and money moves in a matter of seconds."

An effective image sharing network should operate in much the same way, acting as a clearinghouse using IHE standards that move images over the Web, accessible with a token or password, he said.

RSNA Spotlights Centennial Image Contest Winners



In its second year, the RSNA Centennial Image Contest drew an impressive array of more than 600 submissions from the radiology community throughout the world.

Entries were submitted in four categories: Radiology Art, Most Unusual Case, Best Medical Image and Best Photo. Winning images were determined by vote and an expert RSNA panel and were featured in a gallery in the Centennial Showcase at RSNA 2015.

Next month, we invite readers to explore the *RSNA News* feature story spotlighting the 2015 contest and the winning artists, including Katia Kaplan-List, M.D., of Rochester General Hospital, New York, whose image, "Eyes Like Stars" (left), a rendering of Vincent Van Gogh's masterpiece, "Starry Night," won the Radiology Art category.

Radiology Imaging Education Focus of International Panel

BY FELICIA DECHTER

While each brought a different set of experiences to the table, a panel of experts from around the globe also found a lot of common ground in their approach to educating the next generation of radiologists during the International Trends Session held at RSNA 2015.

RADIOLOGY EDUCATION should be interesting and interactive, incorporate technology and e-learning, be simple when possible, and above all, be patient-centered, according to presenters gathered to discuss “International Medical Student Imaging Education.”

Each year the International Trends meeting is held to bring radiology organizations together to share ideas and best practices on a topic of global importance to the profession.

In discussing the basics of teaching medical students about radiologic equipment and radiology protection in the U.K., Christiane Nyhsen, M.D., consultant radiologist at City Hospitals Sunderland NHS Foundation Trust and senior lecturer at Newcastle University, stressed the importance of keeping students’ attention.

“Radiology protection needs to be presented to students in an interesting way,” Dr. Nyhsen said. “Share the challenges of what low-dose radiation risks may or may not be. Tell them about studies in geographic areas of high background radiation. Mention radiation spas, emerging evidence of how the human body responds to low levels of radiation. It is quite fascinating in my opinion.”

Radiological equipment is best taught alongside real cases, Dr. Nyhsen said. Interactive discussions help keep students interested. For example, learning points on MRI safety can be nicely integrated between case discussions, she said.

“Teach medical students well and future doctors will have a much better understanding of how to make the best use of imaging modalities available,” she added.

And make sure to put patients first.

“Put the patient in the center of teaching,”



Leaders from around the world gathered at the RSNA 2015 International Trends session to discuss the state of medical student imaging education.



Education should be interesting, interactive and patient-centered, presenters stressed.

"Teach medical students well and future doctors will have a much better understanding of how to make the best use of imaging modalities available."

CHRISTIANE NYHSEN, M.D.



Experts from Germany, the U.K., Japan, Italy and the U.S. joined a discussion on international, education-related topics including how and when to introduce medical imaging into the curriculum and how to teach medical students about radiologic equipment and radiology protection.

Dr. Nyhsen said. "Imaging should help the patient—the patient should be considered, advised, have tests appropriately explained and their fears reduced."

Medical Imaging Should be Taught on Day One

Petra Lewis, M.B.B.S., discussed the introduction of medical imaging into anatomy and more specifically, offered her opinion on when it should be introduced, why it should be incorporated, who should teach it, and how it should be taught.

"The 'when' is easy," said Dr. Lewis, of the Geisel School of Medicine at Dartmouth, in Hanover, New Hampshire. "It should start on Day One of the anatomy course and preferably Day One of medical school."

Medical imaging should be incorporated early into preclinical curriculum since all medical students will use it either directly or indirectly their entire careers. Radiologists should be teaching anatomy as well as medical imaging, Dr. Lewis said.

"We know the anatomy, the imaging

and the clinical impact of these findings," Dr. Lewis said. "Residents and fellows are fabulous at teaching anatomy and usually greatly enjoy the experience. Use the resources you have available to teach."

All modalities can be used to teach anatomy depending on the organ system, Dr. Lewis said. Online modules that already exist or are created within the institution can help, especially for pre-learning materials. Short videos are easy to make and are effective, she said.

Keep it Simple, Use E-learning

Simplification is the key to introducing the basics of medical imaging technology, dose and safety, said Francesco Sardanelli, M.D., a professor of radiology at the University of Milan, Italy.

"We should try to reduce complexity to simplicity," Dr. Sardanelli said. "We need to present the meaning of words we use, to explain to students the risk of the MR environment and translate the numbers to something easy to understand. One example is better than 20 lines of text."

In Japan, lecture-theatre style education is still dominant in radiology, said Kunihiko Fukuda, M.D., a professor of radiology at the Jikei University School of Medicine in Tokyo. However, "It is desirable to create more e-learning materials and use them effectively in the flipped education style," Dr. Fukuda said. "If the lecture style will be continued, radiology should be integrated with clinical medicine and pathology."

Medical education is six years in Japan, Dr. Fukuda said. Radiation physics and biology start at early stages in lecture style, he said, while imaging diagnosis and radiation oncology start usually from year four. "They are usually started with the lecture style and then progress to a tutorial and/or elective course," Dr. Fukuda said.

WEB EXTRAS

For more information on RSNA's international programs, fellowship and grants, go to RSNA.org/International.

Want to be a Successful Leader? Three of Radiology's Prominent Leaders Tell You How

BY FELICIA DECHTER

Successful leaders share a variety of traits including emotional intelligence, honesty, the ability to inspire confidence and an abundant optimism, according to a trio of radiology's foremost leaders during an RSNA 2015 session.

THE ROOT CHARACTERISTICS of successful leaders, how these values build on each other, how to consistently demonstrate these core values and behaviors that can lead to failure were some of the topics discussed by Jonathan Lewin, M.D., senior vice-president for Integrated Healthcare Delivery at Johns Hopkins Medicine.

Daily Bulletin coverage of RSNA 2015 is available at RSNA.org/Bulletin.

"Many of the most impactful opportunities are the informal leadership roles that we play in our organizations and these are available to everyone with dedication and a willingness to serve," Dr. Lewin said.

Other critical traits include the ability to create and communicate a compelling vision, the ability to inspire confidence, unfailing respect for others and generosity of time and ideas, Dr. Lewin said.

"The misconception is that leadership requires commanding the troops, when in fact it requires serving the troops," said Dr. Lewin.

James Brink, M.D., radiologist-in-chief at Massachusetts General Hospital and a professor of radiology at the Harvard Medical School in Boston, explained the pitfalls to avoid when dealing with confrontational issues and axioms to adopt to elevate respect in your organization.

Those tips include: Address others as you would like to be addressed; bring problems first to those responsible; look for the good in each other and relish it; do not put confrontational messages in writing; limit e-mail/text messages to the logistics of face-to-face meetings or phone calls (e-mail does not convey emotion, which can be confusing as many words have double meanings). And, "do not copy the world," he added.

"Emotional intelligence with an emphasis on empathy, respect and selflessness are all necessary," Dr. Brink said. Emotional intelligence,

he said, is the ability to identify, monitor and discriminate among different human emotions and to use emotional information to guide thinking and behavior.

It's time to change how our leaders are often selected, said presenter N. Reed Dunnick, M.D., professor and chairman of the Department of Radiology at the University of Michigan, in Ann Arbor.

"We do not prepare them for the next position and then we express surprise when they fail," said Dr. Dunnick, 2014 RSNA President. "That must change, and programs such as the RSNA Academy of Radiology Leadership Management (ARLM) provide one way to participate in that change."

Successful leaders put the organization ahead of themselves and possess a high degree of emotional intelligence.

Equally important however, said Dr. Dunnick, is communication.

"We don't do it well," he said. "Sometimes it is unclear, sometimes too late, sometimes it's not done at all."

A good leader must have an appreciation of culture when leading any organization, Dr. Dunnick said. Find good people and support them, he said. Create a clear vision and communicate it in a compelling way.

Attendees were left with some basic principles to take with them.

"Walk the talk," Dr. Dunnick said. "But be consistent and reward positive contributors."

"Look for ways to help each other," Dr. Brink said. "Do not swing the imaginary sword in the corner until you've thought through the ramifications of your actions."

Lastly, Dr. Brink added: "Trust is hard to come by and easy to lose. It can take a long time to overcome a negative reputation that develops because of a poorly thought out action."



Dunnick



Lewin



Brink

Simulation Effective in Gauging Residents' Communication Skills



BY FELICIA DECHTER

SIMULATION TRAINING is a promising method for teaching and assessing residents' communication abilities, according to the presenter of an RSNA 2015 session.

"Simulation is a great way to teach and evaluate residents' communications skills because prior studies have shown that training courses that allowed radiologists to practice delivering bad news not only improved performance, but also significantly altered attitudes and beliefs about importance of psychosocial issues and communication," said Carolynn DeBenedectis, M.D., an assistant professor of radiology at the University of Massachusetts Medical School (UMass) in Worcester.

In March, Dr. DeBenedectis conducted simulation training at the interprofessional Center for Experiential Learning and Simulation (iCELS) at UMass to develop

a curriculum to teach radiology residents communication aptitude through simulation.

Using the Gap-Kalamazoo Communication Skills (GKCS) assessment form, a validated instrument developed to assess communication skills, she was able to obtain an objective measurement of residents' communication skills and identify specific areas needing improvement.

Current first- and fourth-year radiology residents with no former communication skills training participated in six baseline scenarios with trained professional patient "actors." Plots included error and apology, delivering bad news, canceling examination/procedure, radiation risk counseling, delivering results in pediatric imaging, and interactions with an angry referring physician. The GKCS form was used as a benchmark of resident performance by attending radiologists with prior communication skills training and by the patient actors involved.

Activities were videotaped and residents were immediately debriefed with several teaching points identified. Following a two-week washout period and additional training, residents participated in a second similar simulation.

These results showed that the average GKCS score for all the residents improved to 79 percent in Part 2 compared to 74 percent in Part 1. Fourth-year residents performed better on both Part 1 and 2 when compared to first-year residents.

The findings initially surprised Dr. DeBenedectis. She thought that first-year residents would have better communication skills given their recently completed internships which involve considerable patient contact and more opportunity to communicate with patients directly.

"In retrospect, it does make sense that the fourth-year residents did better, as they have been practicing radiology-specific communication skills for the last four years of residency," Dr. DeBenedectis said. "In addition, the fourth-year residents may be more confident, given their increased experience in the field."



Fayad

"The conventional philosophy of medical teaching was 'see one, do one, teach one,' but our thinking has evolved with the availability of simulation tools."

LAURA FAYAD, M.D.

Evolving Beyond Conventional Methods

Simulation has great potential for training radiologists, said another session speaker, Laura Fayad, M.D., of the Johns Hopkins University School of Medicine in Baltimore.

She explained that while conventional teaching with the "case conference" in radiology residency is a form of simulation, there are now more formalized and sophisticated simulation techniques available for education. These include computer-based techniques, the integration of 3-D imaging models, physical models, mannequin or cadaver models and hybrid simulation systems.

"The conventional philosophy of medical teaching was 'see one, do one, teach one.' However, our thinking has evolved with the availability of simulation tools," Dr. Fayad said. "We can now give the trainee an opportunity to practice all aspects of a procedure, including the distracting aspects that are not directly related to the task at hand, such as interfacing with the nursing staff and equipment."



Carolynn DeBenedectis, M.D., watching and taking notes on the residents' performance during the communication skills simulation at the University of Massachusetts.

PET/MRI Faces Challenges on Road to Wider Use

BY PAUL LATOUR

Despite the far-reaching promise that PET/MR imaging holds for radiologists, researchers and healthcare overall, the combined technique has yet to achieve the utilization numbers realized by PET/CT, said presenters of a plenary session at RSNA 2015.

“CLEARLY, PET/MRI is not progressing at the same rate as PET/CT, but on the other hand, there is a tremendous amount of excitement about PET/MRI development,” said Paul E. Kinahan, Ph.D., vice-chair of radiology research and head of the Imaging Research Laboratory at the University of Washington. “However, a lot of effort is occurring in different directions.”

At RSNA 2015, Dr. Kinahan moderated the RSNA/American Association of Physicists in Medicine (AAPM) symposium, “PET/MR Imaging: Translation into Practice,” designed to increase understanding of PET/MRI and evaluate its path to utilization in clinical and research settings.

Challenges to widespread adoption of PET/MRI include

financial obstacles, acceptance of the hybrid technology and staff training issues, he said.

“Some of the remaining challenges—notably evaluating and improving quantitative accuracy and reproducibility, and MR-based attenuation correction—require expertise in both PET and MR imaging,” he said.

“There are very few people who are experts in both PET and MR, so training technologists is another issue,” said Jonathan McConathy, M.D., Ph.D., during his presentation exploring PET/MRI from a clinical perspective.

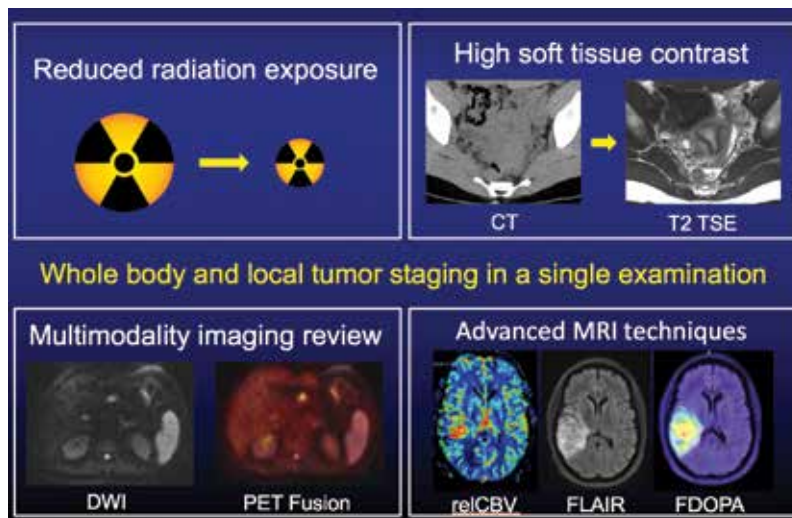
Researchers stressed that groups within RSNA and AAPM, as well as their partner societies, do hold this expertise. For example, RSNA’s Quantitative Imaging Biomarkers Alliance (QIBA) unites researchers, healthcare professionals and industry representatives to advance quantitative imaging and the use of imaging biomarkers in clinical trials and clinical practice.

Economic Issues Impede Growth of PET/MRI

Despite optimism for the expansion of PET/MRI, Dr. McConathy stressed that economic issues are currently a hindrance to clinical utilization. Along with the system’s overall cost, PET/MRI potentially slows down the patient throughput, which can decrease reimbursement.

“I don’t think this is unsolvable, but economic issues are one factor preventing PET/MRI from being widely used,” said Dr. McConathy, the director of the Division of Molecular Imaging and Therapeutics and an associate professor of radiology at the University of Alabama at Birmingham. “The systems are more expensive, so can we show clear-cut benefit that justifies its value versus the high cost?”

If PET/MRI is embraced on a larger scale, the advantages are significant. The technique offers reduced radiation exposure vs. PET/CT, high soft-tissue contrast, simultaneous multimodality imaging review, and advanced MRI techniques well-suited for neuroimaging, multiparametric tumor characterization, and

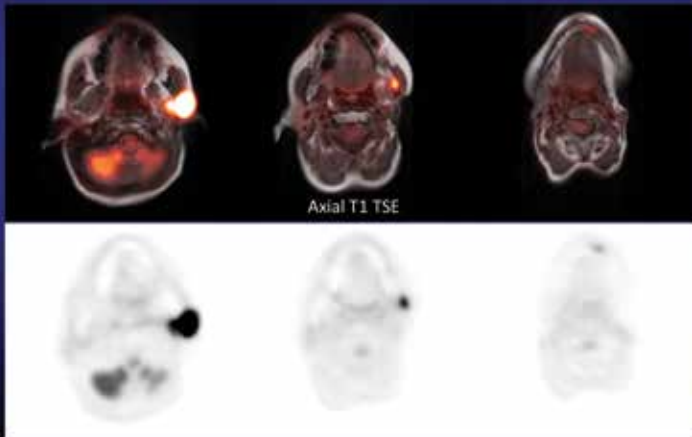


Examples of advantages of simultaneous PET/MRI vs. PET/CT. Images courtesy of Jonathan McConathy M.D., Ph.D, Katie Fowler M.D., Ryan Fields M.D., Keith Rich M.D., and Tammie Benzinger M.D., Ph.D.

“PET/MRI is not progressing at the same rate as PET/CT, but on the other hand there is a tremendous amount of excitement about PET/MRI development.”

PAUL E. KINAHAN, PH.D.

Case: Head and neck cancer



Selected F-18 fluorodeoxyglucose (FDG)-PET/MRI images from a clinical study in a patient with a recurrent adenocarcinoma of the left parotid gland demonstrate markedly increased FDG uptake in the recurrent parotid tumor as well as perineural spread with foci of increased FDG uptake in the left mandibular and left mental foramina. The combined FDG-PET and T1 TSE MR images facilitate simultaneous review and increase confidence in the diagnosis.

cardiovascular imaging that are not available with CT. In addition, PET/MR systems can reduce overall imaging time, provide more accurate co-registration, perform motion correction of PET data, and cross-validate PET and MRI techniques.

PET/MR's clinical applications include the areas of oncology, neuroimaging and cardiovascular imaging. In oncology, Dr. McConathy considers PET/MRI valuable for a variety of indications such as brain tumors, head and neck cancer, liver metastases, cervical cancer, prostate cancer, rectal cancer, multiple myeloma and lymphoma.

"Initially, most clinical PET/MRI studies will be performed in patients with indications for standard of care PET and MRI exams, the one exception being radiation reduction," Dr. McConathy said. "Some of our pediatric lymphoma cases are moving over to PET/MRI purely for dose reduction."

PET/MRI Holds Promise in Brain Research

Presenting a researcher's perspective on PET/MRI during the symposium, Bruce Rosen, M.D., Ph.D., said that PET and MR perfectly complement each other. MRI has high spatial resolution, a strong ability to image physiology and is non-invasive, while PET has "exquisite sensitivity," and is readily quantifiable.

PET/MRI offers opportunities for researchers in terms of improved data collection and as a tool that could lead to better understanding of how the brain works, Dr. Rosen said.

"As researchers we're extremely interested in continuing to push the envelope on data collection," said Dr. Rosen, director of the Athinoula A. Martinos Center for Biomedical Imaging and a professor of radiology at Harvard Medical School. "This includes hardware issues, but more importantly, clever ways to use the simultaneously collected data to improve our data analytic flow."

As with clinical implementation, PET/MRI poses methodological challenges for researchers, including attenuation and motion corrections. Attenuation correction is difficult to do with MRI only, but it can be done dynamically with PET measurements, unlike CT, Dr. Rosen said.

"That means, in principle, we should actually be able to do a better job of attenuation correction if we can find a way to get



McConathy



Rosen

the equivalent attenuation information from the MR," Dr. Rosen said.

Regarding biology, Dr. Rosen said the real question is what PET/MRI can tell researchers about a tumor, both in its native state and in its response to therapy.

"There's information there; we have to be clever enough to think through exactly what that means biologically," he said.

Although radiology research has had little clinical impact in the area of neuropsychiatric diseases, PET/MRI could change that in the future, Dr. Rosen said.

The combination of PET tracers targeting early molecular changes with an MR marker such as nerve degeneration could have clinical significance in determining what patients are susceptible to certain neuropsychiatric diseases such as Alzheimer's disease and dementia.

"We're beginning to understand circuit-based diagnosis of different psychiatric diseases," Dr. Rosen said. "Can we bring the neurochemical side into this? One of the great opportunities PET/MRI offers is allowing us to understand what's happening on a neurochemical level."

MRI Technique Helps Clarify Breast Lesions Without Contrast

BY RICHARD DARGAN

A new breast MRI technique is highly effective at ruling out malignancy, and thus has the potential to reduce unnecessary biopsies and emotional distress, for breast cancer screening participants when used as a complement after regular screening, new research shows.

GERMAN RESEARCHERS determined that the technique—diffusion weighted imaging with background suppression MR mammography (DWIBS-MRM), which requires no contrast—may provide a safe, noninvasive method for resolving suspicious mammography findings without biopsy.

“If the preliminary findings are confirmed, this approach could have a high potential to be used as an adjunct in the clarification process of unclear lesions

on X-ray mammography in breast cancer screening,” said author Sebastian Bickelhaupt, M.D., a radiologist at the German Cancer Research Center in Heidelberg. “This might help to reduce the number of invasive biopsies and alleviate the anxiety of breast cancer screening participants with unclear breast lesions found in mammograms.”

DWIBS-MRM adds background suppression to DWI, addressing some of DWI’s limitations while enabling volumetric 3-D image processing. First shown feasible in 2004, DWIBS is commonly used as an adjunct to regular MRI examinations for abdominal and prostate imaging, but less is known about its utility in breast imaging.

For the study published online in September 2015 in *Radiology*, researchers optimized DWIBS for breast imaging by adjusting the b-values—variables that affect the MR image contrast—and using fat suppression to improve image quality.

“Further, we developed and implemented a quality-assurance system with periodic quality testing in order to assure a high, comparable and standardized quality of our images,” Dr. Bickelhaupt said.

Researchers compared DWIBS-MRM to an abbreviated contrast-enhanced MRI and a full diagnostic breast MRI protocol in 50 women ranging in age from 50 to 69 years who had suspicious screening mammograms and indication for biopsy from September 2014 to January 2015.

Twenty-four of the 50 participants had a breast carcinoma. Comparing the different approaches, researchers determined that DWIBS-MRM showed comparable accuracy to that of the full diagnostic and the abbreviated contrast-enhanced MRI protocols. In addition, DWIBS-MRM yielded a negative predictive value of 92 percent.

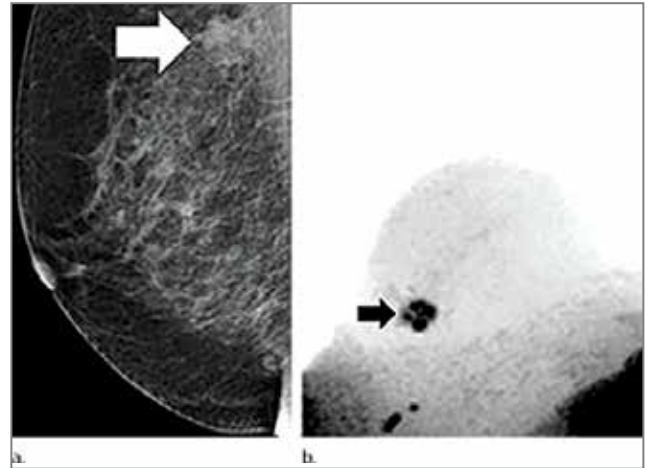
Among its advantages over other MRI approaches, DWIBS-MRM results can be obtained in less than seven minutes, compared with more than 30 minutes for a full breast MRI exam, while mean reading time using unenhanced DWIBS-MRM is less than 30 seconds. The faster times would make it easier to integrate the protocol into a high-volume screening environment.



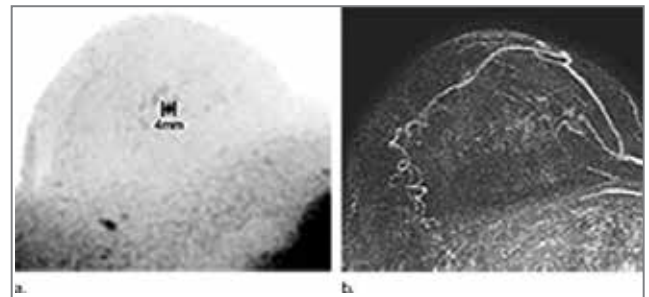
Bickelhaupt

“We also took care that the time demand on the radiologist is as short as possible to allow for the case load expected within the screening setting,” Dr. Bickelhaupt said.

Researchers developed a standardized quality assurance program for DWIBS-MRM implementation that could be incorporated into existing programs like the Mammography Quality Standards Act (MQSA) program in the U.S.



Images in 65-year-old breast cancer screening participant with a suspicious lesion (arrow) at screening mammography. (a) Mediolateral oblique screening mammogram. (b) Diffusion-weighted imaging with background suppression ($b = 1500 \text{ sec/mm}^2$) maximum intensity projection, displayed with black-white inversion, shows the lesion as an area of focal diffusion restriction. (*Radiology* 2016;OnlineAheadof Print) © RSNA 2016 All Rights Reserved. Reprinted with permission



Images of a screening-detected lesion in a 67-year-old breast cancer screening patient. (a) Diffusion-weighted imaging with background suppression ($b = 1500 \text{ sec/mm}^2$) maximum intensity projection (MIP), displayed with black-white inversion, clearly depicts the focal lesion as an area of focal diffusion restriction. (b) First postcontrast subtraction MIP shows an area of subtle enhancement that is partially obscured by generally increased background enhancement. (*Radiology* 2016;OnlineAheadof Print) © RSNA 2016 All Rights Reserved. Reprinted with permission

Potential Exists for Wider Use

DWIBS-MRM has the potential for widespread use, especially if study results can be reproduced at different centers, said Savannah Partridge, Ph.D., a research associate professor in breast imaging at the University of Washington in Seattle who has investigated the role of DWI in differentiating high-risk breast lesions requiring additional workup from other non-malignant subtypes.

“The results of this study are promising for reducing false positives and unnecessary biopsies in breast cancer screening,” Dr. Partridge said. “Breast diffusion MRI approaches and image quality vary widely across centers, and advantages of the vendor-specific DWIBS technique for breast tumor characterization over more conventional diffusion MRI techniques were not tested in this study, warranting further investigation.”

Dr. Bickelhaupt says DWIBS-MRM is not intended as a stand-alone screening modality, but as an adjunct to X-ray mammography and tomosynthesis. “While the results so far are promising, the degree of evidence is currently not sufficient to recommend the method be implemented into screening in a general setting,” Dr. Bickelhaupt said.

Researchers also plan to extend their DWIBS-MRM research to women with dense breasts and women who are undergoing diagnostic X-ray mammograms with unclear findings.

DWIBS-MRM has potential value in other breast imaging applications as well, including assessment of treatment response in women undergoing preoperative chemotherapy, Dr. Partridge said.

WEB EXTRAS

📄 Access the full *Radiology* study at RSNA.org/Radiology.

Coronary Calcium CT Scan May Predict Premature Death Risk

BY ED BANNON

A CORONARY ARTERY calcification (CAC) CT scan may be useful in identifying patients at risk for early death as long as 15 years from the time of the scan, according to recent research.

Although CAC scores are primarily used to estimate cardiovascular prognosis and all-cause mortality in the short term, authors of a recent study published in the *Annals of Internal Medicine* determined that CAC scores are highly predictive of long-term mortality in patients without symptoms of coronary artery disease.

“CAC scores markedly improve prediction of all cardiac and cerebrovascular events and all-cause mortality endpoints by as much as 65 percent over other risk factors including age and other biomarkers,” said Leslee Shaw, Ph.D., lead author and a professor of cardiology at Emory University School of Medicine, Atlanta. “These findings give us a better understanding of the importance of coronary calcium scans to predict mortality.”

Researchers conducted a statistical analysis of nearly 10,000 patients who underwent CAC imaging as part of an outreach screening program in the Nashville area. Physicians collected data on 9,715 patients from 1996 to 1999 at an outpatient clinic. All patients received CAC imaging using multislice CT or electron beam tomography.

Although these patients did not have symptoms of coronary artery disease, a detailed history of cardiac risk factors was collected at the time of screening. Out of the

sample, deaths of 936 patients were confirmed through the National Death Index.

The study’s 15-year outlook is important because it determined that health risks accelerate disproportionately for patients with CAC. The incident mortality curves revealed very low mortality rates through five years, but mortality increased substantially between 5 and 15 years for the same patients.

Previous studies have determined that patients with CAC scores between 300 and 400 have a 4 percent to 9 percent mortality rate after five years. Looking at patients with a similar CAC score, however, Dr. Shaw and colleagues determined a 15-year all-cause mortality rate of more than 20 percent. Figures such as these, according to the study, reflect a “progressive disease and perhaps nonlinear risk that may only be found through lengthier follow-up.”

“Long-term estimates of mortality provide a unique opportunity to examine the value of novel biomarkers, such as CAC, in estimating important patient outcomes,” Dr. Shaw said. “The current findings support effective long-term—that is, approximately 15-years—mortality stratification and risk reclassification based on CAC measurements.”

Dr. Shaw thinks calcium scans ultimately could become part of a person’s regular physical exam, as common as blood cholesterol tests.

“I think it’s headed that way,” she said. “We’re kind of on the edge of this becoming more accepted.”



Shaw

“CAC scores markedly improve prediction of all cardiac and cerebrovascular events and all-cause mortality endpoints by as much as 65 percent over other risk factors including age and other biomarkers.”

LESLEE SHAW, PH.D.

Converting DICOM Images to 3-D Printed Models Critical to Progress

BY FELICIA DECHTER

The impact of 3-D printing is so significant that it may become the standard way that doctors “talk to their patients.” However, certain challenges must be overcome before the modality realizes its full potential in radiology and healthcare overall, said a presenter of an RSNA 2015 session.

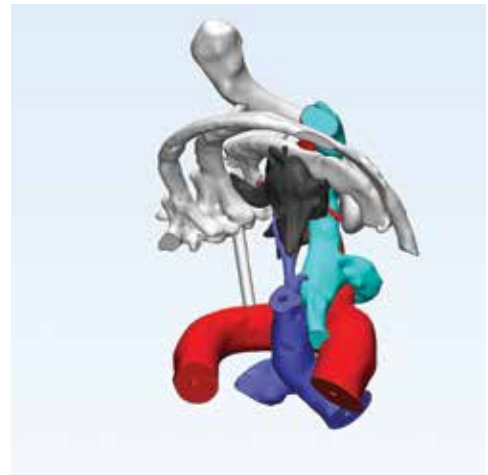


3-D printed models are being used with increasing frequency to plan complex orthopedic interventions; top, right: Paul Beule, M.D., Division Head of Orthopedic Surgery, and right, Kawan Rakhra, M.D., Division Head of Musculoskeletal Imaging, both from the University of Ottawa, discuss and plan a procedure for a patient with a knee derangement.

(Images courtesy Dimitris Mitsouras, Ph.D., Andetta Hunsaker, M.D., and Frank J. Rybicki, M.D., Ph.D.)

ON THE COVER

Images of a patient with an adenocarcinoma of the lung. Right: an image of the Standard Tessellation Language (STL) model; far right, the tumor is depicted in black on the photograph of the 3-D printed model. The model shows invasion of ribs and the relationship with the subclavian artery. The patient subsequently underwent thoracotomy for complete resection with vascular surgery assistance for resection.



“Thus far, we don't have evidence that 3-D printing changes diagnoses. We hope that the ability to diagnose from 3-D printing will be realized in the future.”

FRANK RYBICKI, M.D., PH.D.



A 3-D printed cardiac model from a baby with congenital heart disease.

“3-D printing is a completely disruptive technology in general and in medicine,” said Frank Rybicki, M.D., Ph.D., professor and chair of the Department of Radiology at the University of Ottawa Faculty of Medicine. “It will change the way that doctors do procedures. It will change the way we teach young physicians.”

3-D printing refers to the fabrication of graspable objects from digital models. 3-D printing itself depends on the advanced imaging modalities and protocols to generate source DICOM images amenable for printing. And while advanced visualization displays play a role in communicating information to referring clinicians, “there is an unmet need that radiologists need to fulfill to render DICOM images as 3-D printed models capable of providing both tactile feedback and tangible depth information of both anatomic and pathologic states,” Dr. Rybicki said.

“Radiologists are trained to make a diagnosis using ‘routine’ 2-D images such as CT and MRI,” Dr. Rybicki said. “Thus far, we don’t have evidence that 3-D printing changes diagnoses. We hope that the ability to diagnose from 3-D printing will be realized in the future.”

“The next natural step in the progression of technology is 3-D printing. That is, taking the same DICOM images we use



Rybicki

for 3-D visualization and generating 3-D printed models,” Dr. Rybicki said. “Until now, what radiologists have not been able to do is allow the referring physician—for example the surgeon—to plan the procedure ahead of time with a 3-D model that can be held in their hands,” Dr. Rybicki said. “Sometimes, the ‘referring’ physician is a radiologist doing an image-guided procedure. There is a large amount of evidence showing that this is now an essential part of patient care.”

Radiologists will need to learn the software to convert images to DICOM, Dr. Rybicki said.

It is essential that radiologists invest the time to learn the methods so that the printing of medical models from CT and MR images becomes integrated with radiology departments, he said.

Dr. Rybicki first began moderating didactic courses in 3-D printing at RSNA 2013. In 2014, participants were taught the software used to convert the image from a CT scan to a hand-held printed

model for the first time. At the RSNA 2015 session, they did the same.

Reimbursement, Cost Remain Hurdles

There are a number of obstacles to more mainstream adoption of 3-D printing, including cost, training, materials, equipment, guidelines and the need for a consensus in terminology.


“If we’re going to get reimbursement, we need a single reporting standard for 3-D printing,” Dr. Rybicki said.

And reimbursement, he said, will be a major hurdle.

“All payors know that we need 3-D printing, and that it will eventually be reimbursed as the demand continues to swell,” he said. “This will happen as we accumulate more data, and then develop guidelines regarding appropriate utilization. While there are many pressures to contain costs, data is beginning to show that the generation of 3-D models is cost-effective for several applications, particularly when the model saves time in the operating room.”

Many vendors at RSNA 2015 introduced new 3-D printing software, hardware and new collaborations, he said. “This will drive down the costs over time.”

WEB EXTRAS

 View a video of Dr. Rybicki discussing his RSNA 2015 session, “3D Printing for the Radiologist: A Primer and Introduction to Sessions,” at RSNA.org/News.

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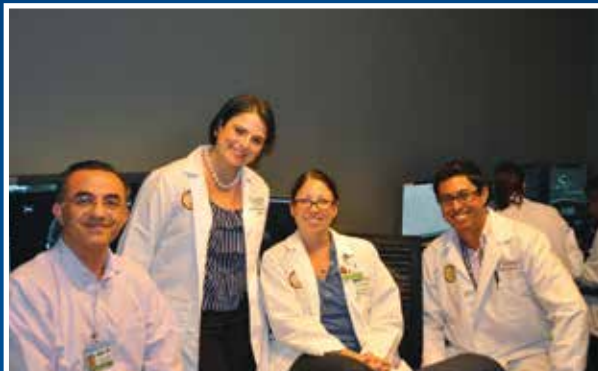
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Restriction Spectrum Imaging for Breast Cancer Imaging



Clinical breast team, pictured from left to right: Mohammed Eghtedari, M.D., Ph.D., Rebecca Rakow-Penner, M.D., Ph.D., Haydee Ojeda, M.D., Ajay Rao, M.D.

2015 RSNA Research Resident Grant recipient **Rebecca Rakow-Penner, M.D., Ph.D.**, will evaluate and further develop a diffusion MRI technique called restriction spectrum imaging (RSI) for breast cancer imaging.

“RSI provides a mathematical framework for separating small spherically isotropic diffusion (representing tumor nuclei), from less restricted unwanted signal, and also corrects for B0 field inhomogeneity artifacts” said Dr. Rakow-Penner. “The technique has the potential to improve errors due to distortion and non-invasively reflect tumor grade.”

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Journal Highlights

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

Portal Venous Interventions

Although portal venous interventions have had major impact on the outcomes of patients with liver cancer, portal hypertension and insulin-dependent diabetes mellitus, further improvements are needed in order to expand the availability of this treatment to patients.

In a State-of-the-Art review in the January issue of *Radiology*, (RSNA.org/Radiology) David C. Madoff, M.D., of Presbyterian Hospital/Weill Cornell Medical Center, New York, and colleagues provide an overview of the most recent data and strategies for utilization of portal venous interventions:

Preoperative portal vein embolization: This technique allows patients previously considered unresectable due to an inadequate anticipated future liver remnant to have safe major hepatic resection.

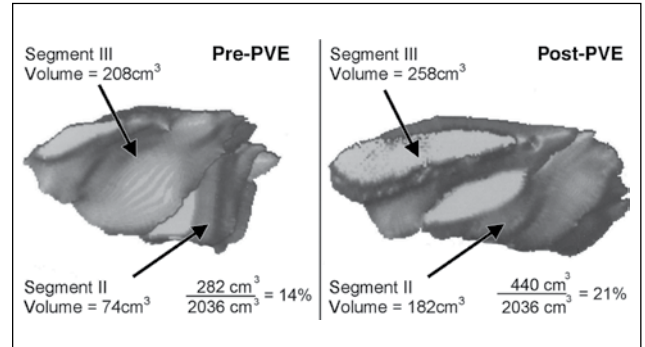
Transjugular intrahepatic portosystemic shunt (TIPS): Multiple clinical trials for various indications show TIPS to be an effective, durable therapy for treating sequelae of portal hypertension.

Balloon retrograde transvenous obliteration: Commonly practiced in Asia, the procedure is gaining acceptance in the U.S. as a potential alternative to TIPS in the management of variceal hemorrhage and hepatic encephalopathy.

Islet cell transplantation: A promising cellular-based therapy aimed at long-term stabilization of glycemic control in Type 1 diabetics and reduction of complications related to diabetes.

The techniques—although performed for very different intent—require a thorough understanding of portal venous anatomy, physiology and pathophysiology, according to the authors.

“Although considerable progress has been made in all of

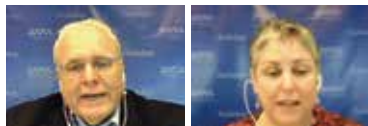


FLR hypertrophy after portal vein embolization (PVE) as determined by 3-D reconstruction of CT images. Before embolization (left), the volume of segments 2 and 3 was 282 cm³ (14 percent of total liver volume [2036 cm³]). After embolization (right), the volume of segments 2 and 3 was 440 cm³ (21 percent of total liver volume [2036 cm³]).

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the areas discussed herein, these approaches remain early in their utilization. Hopefully, further research will advance these fields and define how they fit into modern treatment paradigms,” the authors write.

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



Radiology
EXTRA
PODCASTS

Listen to *Radiology* Editor Herbert Y. Kressel, M.D., deputy editors and authors discuss the following articles in the December issue of *Radiology* at RSNA.org/Radiology-Podcasts.

- “Sex Differences in Gray Matter Changes and Brain-Behavior Relationships in Patients with Stimulant Dependence,” Michael F. Regner, M.D., and colleagues.
- “COPD: Do Imaging Measurements of Emphysema and Airway Disease Explain Symptoms and Exercise Capacity?” Miranda Kirby, Ph.D., and colleagues.
- A combined podcast on *Radiology*'s paired “Controversies” pieces:
 - “Controversies in Contrast Material–induced Acute Kidney Injury: Closing in on the Truth?” Robert J. McDonald, M.D., Ph.D., and colleagues.
 - “Controversies in Contrast Material–induced Acute Kidney Injury: Propensity Score Matching of Patients with Different Dose/Absolute Glomerular Filtration Rate Ratios,” Ulf R. Nyman, M.D., Ph.D., and colleagues.

Internal Hernias in the Era of Multidetector CT: Correlation of Imaging and Surgical Findings

The advent of multidetector CT (MDCT), with its thin-section axial images, high-quality multiplanar reformations and 3-D images, currently plays an essential role in preoperative diagnosis of internal hernias, with a correlated expansion of the roles expected of radiologists.

In an article in the January-February issue of *RadioGraphics* (RSNA.org/RadioGraphics), Satoshi Doishita, M.D., Osaka City University Graduate School of Medicine, Japan, and colleagues provide an overview of the diagnostic approach to internal hernias with MDCT, placing an emphasis on tracing key vessels; present various pathognomonic findings for the various types of internal hernias at MDCT; and discuss the usefulness of MDCT with correlation of imaging and intraoperative findings.

For definitive diagnosis of an internal hernia, analysis of displacement of anatomic landmarks around the hernia orifice is particularly important, and thin-section images provide the required information, according to the authors.

"A detailed knowledge of the anatomy, etiology and imaging landmarks of the various hernia types is also necessary," the authors write. "Familiarity with the appearances of internal hernias at MDCT allows accurate and specific preoperative diagnoses."

RadioGraphics



Transmesenteric hernia in a 59-year-old woman with right lower abdominal pain. Volume-rendered CT image shows a defect (→) in the mesentery of the terminal ileum (→) through which the converging mesenteric vessels pass. Approximately 190 cm of gangrenous small intestine was resected, and the defect was closed with sutures. (Images courtesy of Sakae Nagaoka, M.D., Japanese Red Cross Medical Center, Tokyo, and Chikara Shirata, M.D., Graduate School of Medicine, University of Tokyo).

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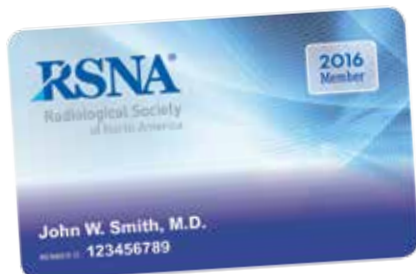
Access the CME tests at RSNA.org/eLearn.

Radiology
RadioGraphics

Value of Membership

RSNA membership includes many benefits, such as your subscription to *RSNA News* and:

- Subscriptions to *Radiology* and *RadioGraphics*
- Free tools to help with continuing medical education
- Free advance registration to the RSNA annual meeting



Renew online at RSNA.org/Renew or by mail with the invoice sent to you in early January. Members can also sign up for automatic renewal, a new, convenient feature that allows RSNA to charge a designated credit card for annual membership dues.

For more information, including how to apply for retired status, contact membership@rsna.org or 1-877-RSNA-MEM (1-877-776-2636) or 1-630-571-7873 outside the U.S. and Canada.

Radiology in Public Focus

Press releases were sent to the medical news media for the following articles appearing in recent issues of *Radiology*.

Breast MRI After Mammography May Identify Additional Aggressive Cancers

Multicentric cancer detected at breast MRI that is occult at mammography appears to represent a larger tumor burden in approximately one-quarter of patients and can upstage the diagnosis, resulting in potential changes in treatment, according to new research.

Chiara Iacconi, M.D., of the Breast Unit at USL1 Massa-Carrara in Carrara, Italy, and colleagues reviewed records from 2001 to 2011. The records included 2,021 patients with newly diagnosed breast cancer who underwent biopsy after preoperative MRI, 285 (14 percent) of whom had additional cancer detected at MRI that was occult at mammography.

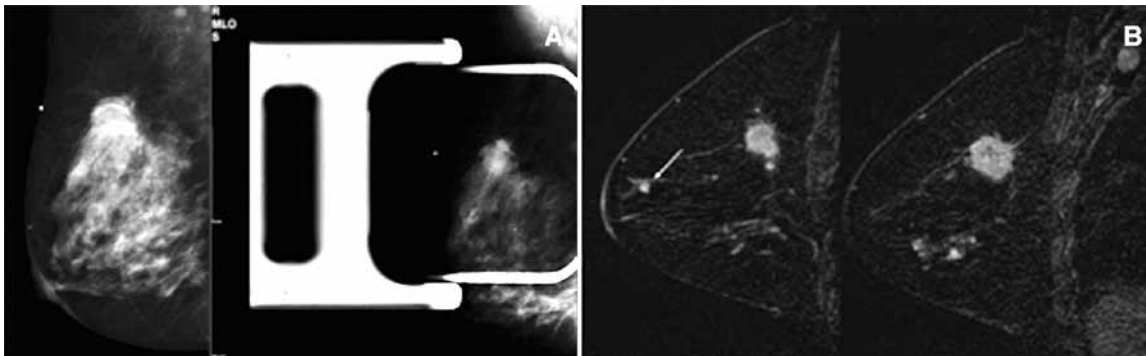
In 73 patients (3.6 percent), MRI identified 87 cancers in different quadrants than the known index cancer, constituting the basis of the study. In 62 of 73 patients (85 percent; 95 percent confidence interval [CI]: 75, 92), one additional cancer was found, and in 11 of 73 (15 percent; 95 percent CI: 8, 25), multiple additional cancers were found. A χ^2 test with adjustment for multiple lesions was used to examine whether MR imaging and pathologic features differ between the index lesion and additional multicentric lesions seen only at MR imaging.

The researchers found known index cancers were more likely to be invasive than MRI-detected multicentric can-

cers (88 percent vs. 76 percent, $P = .023$). Ductal carcinoma in situ (21 of 87 lesions [24 percent]; 95 percent CI: 15, 36) represented a minority of additional MRI detected multicentric cancers. Overall, the size of MRI detected multicentric invasive cancers (median, 0.6 cm; range, 0.1-6.3 cm) was smaller than that of the index cancer (median, 1.2 cm; range, 0.05-7.0 cm; $P = .023$), although 17 of 73 (23 percent) (95 percent CI: 14, 35) patients had larger MRI detected multicentric cancers than the known index lesion, and 18 of 73 (25 percent) (95 percent CI: 15, 36) had MRI detected multicentric cancers larger than 1 cm.

MRI detected multicentric cancers and index cancers differed in histologic characteristics, invasiveness, and grade in 27 of 73 (37 percent) patients (95 percent CI: 26, 49). In four of 73 (5 percent) patients (95 percent CI: 2, 13), MRI detected multicentric cancers were potentially more biologically relevant because of the presence of unsuspected invasion or a higher grade.

"Having a majority of patients undergo potential overtreatment versus a minority who may be undertreated is at the heart of the controversy surrounding the use of breast MRI. Patient decisions for diagnosis and treatment may depend on the relative weight placed on either of these options," the authors write.



A, Mediolateral oblique (left) and spot compression (right) mammograms in the right breast show a spiculated mass in the upper-outer quadrant. **B**, Sagittal dynamic breast MR images in the right breast show an enhancing mass with spiculated margins (the index lesion, IDC) in the right upper outer quadrant, an additional focus near the nipple (DCIS), and nonmass enhancement in the inferior quadrants (DCIS). The additional lesions were not visible at US and were biopsied with MR imaging guidance.

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February Public Information Outreach Activities Focus on Heart Health

In recognition of American Heart Month in February, RSNA is distributing public service announcements (PSAs) focusing on heart disease and screening.

In addition, RSNA is distributing the "60-Second Checkup" audio program to nearly 100 radio stations across the U.S. The segments will focus on the use of cardiac MRI to determine treatment options for men and women with heart disease.

New Videos on *RadiologyInfo.org*

Visit *RadiologyInfo.org*, the public information website produced by the RSNA and ACR, to view new videos, including Mammography and Breast US.

RadiologyInfo.org
For patients

Findings from Structural MRI in Military Traumatic Brain Injury

Blast-related injury and loss of consciousness is common in military traumatic brain injury (TBI). Structural MRI demonstrates a high incidence of white matter T2-weighted hyper-intense areas and pituitary abnormalities, with a low incidence of microhemorrhage in the chronic phase, according to new research.

Gerard Riedy, M.D., Ph.D., of the National Capital Neuroimaging Consortium in Bethesda, Md., and colleagues reviewed 834 participants with a history of TBI and 42 participants in a control group without TBI. All participants were military service members or dependents recruited between August 2009 and August 2014.

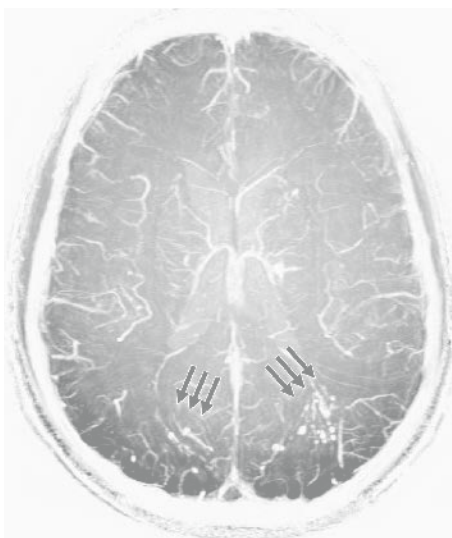
MR examinations were performed at 3T primarily with 3-D volume imaging at smaller than 1 mm³ voxels for the structural portion of the examination. The structural portion of this examination, including T1-weighted, T2-weighted, before and after contrast agent administration T2 fluid attenuation inversion recovery and susceptibility-weighted images, was evaluated by neuroradiologists using a modified version of the neuroradiology TBI common data elements (CDEs). Incident odds ratios (ORs) between the TBI participants and the control group were calculated.

The participants were diagnosed with predominantly chronic (mean, 1,381 days; median, 888 days after injury) and mild (92 percent [768 of 834]) TBI. Of these participants, 84.2 percent (688 of 817) reported one or more blast-related incident and 63.0 percent (515 of 817) reported loss of consciousness at the time of injury. The presence of white matter T2-weighted hyper-intense areas was the most common pathologic finding, observed in 51.8 percent (432 of 834; OR, 1.75) of TBI participants. Cerebral microhemorrhages were observed in a small percentage of participants (7.2 percent [60 of 834]; OR, 6.64) and showed increased incidence with TBI severity (P < .001, moderate and severe vs. mild). T2-weighted hyper-intense areas and microhemorrhages did not collocate by visual inspection. Pituitary abnormalities were identified in a large proportion (29.0 percent [242 of 834];

OR, 16.8) of TBI participants.

Researchers are in the processes of transmitting the multimodal imaging data sets to the Federal Interagency TBI Registry database (fitbir.nih.gov), which includes approximately 41,000 images per patient and also contains four functional MRI data sets, diffusion-tensor imaging, gadolinium perfusion and multivoxel MR spectroscopy.

“This database will allow researchers from around the world to bring their expertise to a critical problem for the injured U.S. military population and their families, namely the accurate objective diagnosis of TBI and the related concern of possible progression to chronic traumatic encephalopathy,” the authors write.

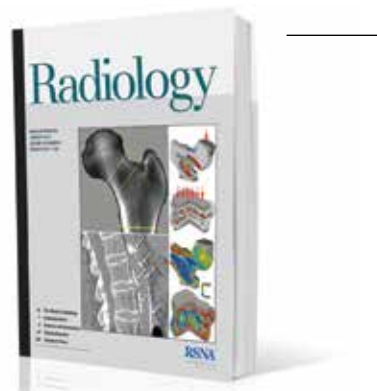


Susceptibility-weighted image shows extensive microhemorrhage (arrows) consistent with diffuse axonal injury in a 25-year-old man with blast-related mild TBI. (*Radiology* 2016; 279;2:InPress) © RSNA 2016 All rights reserved. Reprinted with permission.

Media Coverage of RSNA

In October, 1,619 RSNA-related news stories were tracked in the media. These stories reached an estimated 1.3 billion people.

Coverage included *The Huffington Post*, *Yahoo! News*, *Today*, *U.S. News & World Report*, *TIME*, *Woman's Day*, WCBS-AM (New York), KNX-AM (Los Angeles), WBBM-AM (Chicago), WPVI-TV (Philadelphia), KDKA-TV (Pittsburgh), WFLA-TV (Tampa), KTVU-TV (San Francisco), WJZ-TV (Baltimore), *Daily Mail*, *WebMD*, *Philly.com*, *Discovery News*, *HealthDay* and *Health.com*.



For Your Calendar

FEBRUARY 17-20

Mexican Society of Radiology and Imaging (SMRI) Mexico City, Mexico

Visit the [RSNA Booth](#)

• SMRI.org

MARCH 2-6

European Congress of Radiology (ECR) 2016

Vienna, Austria

Visit the [RSNA Booth](#)

• MyESR.org

MARCH 29 - APRIL 1

Association of University Radiologists (AUR)

64th Annual Meeting

Manchester Grand Hyatt

San Diego, California

• AUR.org

FIND MORE EVENTS AT RSNA.org/Calendar.aspx.

Education and Funding Opportunities

RSNA/ASNR Comparative Effectiveness Research Training

RSNA and the American Society of Neuroradiology (ASNR) are jointly sponsoring a hands-on interactive course in comparative effectiveness research training (CERT) targeted to junior faculty and senior trainees in radiology. Applications will be accepted beginning in early February.

The goal of the CERT program is to provide an introduction to the methodology and tools for performing comparative effectiveness research. Led by a faculty of well-established leaders, CERT will cover technology assessment, risk benefit analysis, cost-effectiveness evaluation, decision analysis, meta-analysis and systematic review. Delivered in a combination of online modules throughout the year, CERT consists of an in-person 1½ -day workshop, and didactic and small-group web-based sessions.

Each attendee is expected to develop a proposal for a grant application that could be submitted for the ASNR CER award, RSNA Research Scholar Award, Association of University Radiologists GE Radiology Research Academic Fellowship Award program, or other extramural funding.

For more information, visit RSNA.org/CERT.

Access Online Cases of the Day and Educational Courses

Experience the RSNA Annual Meeting anytime with RSNA's Online Cases of the Day. Covering a wide variety of subspecialty areas, online Cases of the Day present unique and challenging cases, often combining detailed images and relevant clinical details.

Online Cases of the Day offer CME credit for successfully completed activities with a correct case diagnosis, as well as SA-CME credit toward the American Board of Radiology (ABR) Maintenance of Certification (MOC) requirements.

Educational courses captured at recent RSNA annual meetings are also available online, offering an audiovisual presentation com-

plete with associated transcript and bookmarking feature.

Each online educational course offers CME credit, dependent on achieving an 80 percent passing score, as well as SA-CME credit toward the American Board of Radiology (ABR) Maintenance of Certification (MOC) requirements.

Several online educational courses can also be purchased in a USB format (\$55 members; \$80 non-members). Courses include a CME test that can be submitted for credit.

Access RSNA's Cases of the Day and educational courses at RSNA.org/eLearn.

Annual Meeting Watch



RSNA 2016 Online Abstract Submission Now Open

The online system to submit abstracts for RSNA 2016 is open. The submission deadline is noon Central Time (CT) on Wednesday, April 13. Abstracts are required for scientific presentations, education exhibits, applied science, quality storyboards and quantitative imaging reading room showcases.

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 efficiently.

For more information about abstract submissions, contact the RSNA Program Services Department at 1-877-776-2227 within the U.S. or 1-630-590-7774 outside the U.S. Students, clinical trainees and post-doctoral trainees are eligible to receive \$500 travel awards for top-rated abstracts accepted for presentation at RSNA 2016. Full eligibility requirements are available with the 2016 Call for Abstracts.

Important Dates for RSNA 2016

Wednesday, April 27	Member Registration and Housing Open at 10:30 a.m. CT	Friday, October 14	Deadline for International Badge Mailing
Wednesday, June 1	Non-Member Registration and Housing Open at 10:30 a.m. CT	Friday, November 4	Final Housing and Discounted Registration Deadline at 5 p.m. CT
Wednesday, June 8	Exhibitor Registration and Housing Open at 10:30 a.m. CT	Saturday, November 5	Increased Registration Fee Applied, \$150 for most categories
Wednesday, July 27	RSNA Online Program Opens	November 27 – December 2	102 nd Scientific Assembly & Annual Meeting

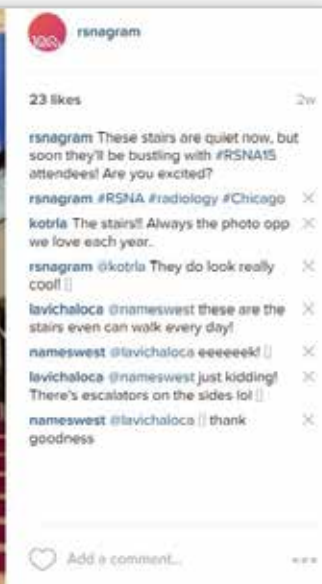
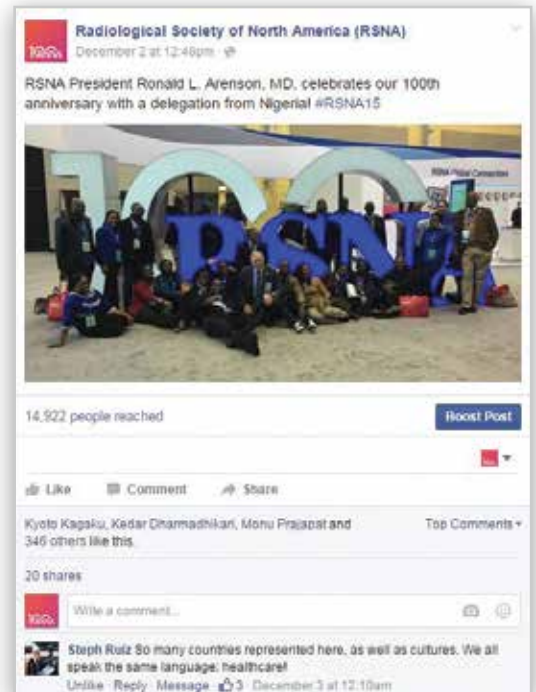
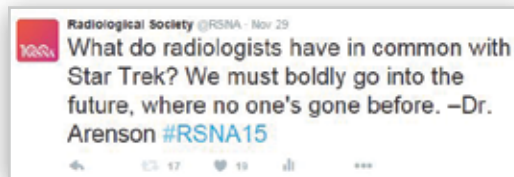
A Banner Year for Social Media at RSNA 2015

Almost three times more people participated in social media at RSNA 2015 compared with the previous year's meeting. RSNA content was seen by users more than 5.8 million times across four platforms – Twitter, Facebook, LinkedIn and Instagram.

The hashtag #RSNA15 was a nationally trending topic on Twitter on two separate days during the meeting. Other trending topics that week included Black Friday, Cyber Monday and the Paris Climate Talks. Tweets from all attendees using the official meeting hashtag were seen more than 105 million times.

New for RSNA 2015, RSNA posted pictures and interacted with attendees on Instagram, a photo-sharing social media platform. The number of users following RSNA's account more than doubled during the meeting, and responses to posts were positive.

Even though the annual meeting is complete, you can stay informed about RSNA news and happenings by connecting with RSNA on all its social media platforms. Visit [Facebook.com/RSNAfans](https://www.facebook.com/RSNAfans) and like our page. Follow @RSNA on Twitter, @RSNAGram on Instagram, and Radiological Society of North America (RSNA) on LinkedIn.



COMING
NEXT
MONTH

Although virtual autopsies have yet to reach wide use in the U.S., one RSNA 2015 presenter stresses the benefits of the emerging procedure over the traditional approach in a March feature story.



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