To be alarmed or not be alarmed over gadolinium contrast agent revelations? That is the question.

The medical imaging community should not develop a gadolinium phobia while waiting for guidance from regulators over controversial gadolinium contrast agents. This is the opinion of Dr. Howard Rowley, Joseph Sackett Professor of Radiology at the University of Wisconsin, U.S., who will speak at today’s key session on MRI contrast agents.

“There is understandable concern but gadolinium is, and should be, expected to deposit in various tissues in the body and, based on what we know about other metals, it’s not a case for alarm. It doesn’t necessarily imply a toxic effect,” he told ECR Today in advance of the congress.

Other metals critical for normal physiology have also been found to deposit in the body and this can provide insight into the ‘imaging curiosity’ seen with gadolinium, he explained. Animal and human autopsies have shown, to date, no tissue injury at the sites where gadolinium deposits, he added. “At the levels of tissue deposition we’re seeing, it’s not toxic and there are no symptoms associated with them.”

Rowley, who is president of the American Society for Neuroradiology, is concerned the radiology community was drawing parallels between gadolinium deposition and nephrogenic systemic fibrosis (NSF), which is unrelated. Such parallels are unfounded, he continued.

“The important point is this is different to NSF, which can cause tissue injury and harm. But we shouldn’t infer similar mechanisms in the body between the two.”

The debate has become heated as unanswered questions abound and confusion reigns, with pressure on regulators to decide a position on contrast agents. Overall, the risk/benefit ratio was still largely in favour of using gadolinium, but Rowley acknowledged more research and observation were required, adding there is cause for caution but not alarm.

At today’s session, he intends to speak about the preclinical data around the recent discovery that gadolinium deposits in the body – a finding that has rattled radiologists. Gadolinium is a toxic heavy metal not normally found in the body but when chelated to reduce toxicity, it becomes a powerful contrast agent for MRI scans and has vastly improved the imaging of body organs and tissues. It has been used successfully for years, with eight agents approved for use. However, the element has found itself in the middle of a scientific controversy after it was discovered that patients with renal failure who had been administered gadolinium for scans were at increased risk of developing the condition NSF, which involves the thickening and scarring of the skin and internal organs.

continued on page 3
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Further research has since revealed that some of the agents can undergo dechelation in patients with normal renal function, resulting in gadolinium deposits in the brain and other body tissues. The findings have shocked the imaging community – what had been go-to contrast agents are now being viewed with some caution. With studies thin on the ground and numerous unanswered questions, radiologists have been left confused over how to approach the eight approved agents. Both the European Medicines Agency (EMA) and the U.S. Food and Drug Administration (FDA) are expected to clarify the situation and provide guidelines for use in 2017.

The issue has become controversial for two main reasons, said Prof. Val Runge, professor of radiology and physician at Bern University Hospital, Switzerland. Firstly, he said, “at this time, there are no definitive, proven associated symptoms,” despite several papers suggesting symptoms associated with gadolinium deposition. Secondly, the radiology community is arguing over which of the approved agents are implicated in gadolinium deposition and how they should be treated by the regulators. The agents can be classified into three general groups, Runge explained, the non-ionic linear agents ( Omniscan, Magnevist, and Cardiomax), which are more likely to undergo dechelation and have been implicated in gadolinium deposition; the ionic chelate agents with medium stability (Gadovist, Multihance, Primovist) and the macrocyclic agents (Dotarem, Gadavist, ProHance), which are the most stable and least likely to dechelate. The regulators could do one of three things, he explained. They could do nothing – say it’s too early and recommend more studies. They could take an intermediate position where they put restrictions on certain agents. Or they could remove some agents from the market. In Europe, the EMA is likely to pursue one of the two latter courses. “The problem is there is no easy answer,” he said. For example, where do the regulators draw the line between agents if they were to place restrictions, and were they to go for the third option, would they decide which agents to remove and in what time frame? Furthermore, could the manufacturers of the remaining agents increase supply to meet the shortfall in the market? These are not insignificant problems,” said Runge, who will review the published clinical papers in today’s session. “The question most likely comes back to the agents in the middle – should they be withdrawn or be limited? This is an ongoing discussion by medical authorities across the world.”

Rowley, however, is of a different mindset, believing it is unhelpful to argue one agent is better or safer than another. I don’t think the data include one agent is better or safer than another. “The other agents may have shockingly different implications and how they should be treated,” he said. “The regulators are faced with a tough decision.” In the meantime, radiologists will be waiting. Today’s session should provide clarity on the current landscape and thinking on gadolinium-based contrast agents with an overview of the research to date, as well as a discussion on dealing with the challenges facing radiologists using these contrast agents.

Specialist in new imaging technologies to deliver honorary lecture today

In recognition of his achievements in new imaging technologies, particularly in cardiovascular and thoracic applications, Professor Mathias Prokop from Nijmegen, the Netherlands, has been invited to deliver the Josef Lissner Honorary Lecture. “The future of CT: from hardware to software” today at the ECR.

Mathias Prokop is head of the department of radiology and nuclear medicine at Radboud University Nijmegen and professor of radiology at UMC Utrecht, the Netherlands. He received his bachelor of science in physics from Philipps-Universität Marburg and trained as a radiologist at Hannover Medical School in Germany. In 1998 he was appointed associate professor of radiology at the University of Vienna Medical School, Austria. His main research interests are body imaging with a special focus on multislice CT and new imaging technologies in cardiovascular and thoracic applications.

Prof. Prokop has authored more than 250 articles in peer-reviewed scientific journals, 50 book chapters, 300 scientific abstracts, and 300 invited lectures. He has also published a textbook on spiral and multislice CT of the body. He has served on several industry advisory boards and scientific committees, and has served as vice chairman of the Dutch Radiological Society.
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FROM DAY 2

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Cardiovascular and Interventional Radiological Society of Europe
Facial genetics and forensics take centre stage at ECR

Forensics and genetics will be in the spotlight at ECR 2017 as the ‘ESR meets Belgium’ session offer a look at medical imaging’s most original contributions to healthcare and crime investigation.

BY MÉLISANDE ROUGER

Facial reconstruction to identify victims.

Develter and his colleagues were the first to perform facial reconstruction to identify victims. “During the MH17 Ukraine plane crash in 2015, CT was very useful for victim identification,” he said.

Advanced decomposition of brain MRI or facial 3D surface images into modules, tailored for associations with underlying genetic variations. Images provided by Dr. Peter Claes.

Claes became interested in facial genetics after working in craniofacial reconstruction. To help decipher facial genetics, he uses the computer-based craniofacial reconstruction programme he developed for victim identification, and combines 3D surface processing, statistical modelling, analysis, mapping and prediction techniques. He has also created an array of algorithms and software for investigators who plan to use 3D facial datasets. Last year, he also co-organised the first international workshop on facial genetics in London.

The challenge in using images for the study of facial genetics is to focus on and measure the right elements, for instance the space between the nose and upper lip. Claes analyses the nearby bone faces in his database in combination with imaging of brain genetics and blood vessels structures in the brain, such as the circle of Willis.

Instead of analysing voxels, which “would take forever”, he relies on powerful software to map voxel images spatially as shown in the images illustrating this article. “Facial genetics can be useful in both genetics and forensics, by predicting genes from the face and faces from the genes, and moreover the linkage between the face and DNA points to the whole area of personalized medicine,” Claes added.

“We try to find genes associated with brain morphology and faces. And for faces, we try to predict the face from genetics, which is useful for identification in relation to crime scenes, in forensics and DNA matters,” Claes continued.

Victim identification will also be the focus of Dr. Wim Develter’s talk on high-end CT imaging in forensic pathology.

Forensic pathologist at the University Hospital of Leuven, Dr. Develter will highlight the role of CT in Disaster Victim Identification (DVI), a field in which he has gained experience ever since he worked in the aftermath of the Tsunami in Thailand in 2004.

CT is important in DVI and its use depends on the ongoing disaster. “During the MH17 Ukraine plane crash in 2015, CT was very useful for victim identification. After the terror attacks in Brussels airport in Zaventem in March 2016, CT helped us not only with the identification but also later with the enquiry,” he said.

Develter and his colleagues were responsible for the triage after the MH17 plane crash. They opened the coffins that came from Ukraine, inventoried the contents and selected which bodies would go to a specific identification chain (full classic identification or body fragments for anthropology and DNA sampling), in order to optimise and accelerate the identification process. Before this triage, a CT examination was performed to facilitate the operations and identify important objects such as personal belongings, prostheses,diamonds, or explosives.

Despite the advantage of CT the coffins had to be opened and soon the biohazard risk appeared. During the aftermath recovery of the bodies in Ukraine, chemicals were used for body preservation (a toxic and lethal dose of formaldehyde was measured) and apparent some bodies had remnants of toxic rocket carbonat. “After the necessary safety measures, our job continued,” he said.

CT also helps to find relevant information for the ongoing medico-legale investigation; the modality is used to help identify traces from the blast such as objects from the explosives. The injury pattern helps to determine the cause and manner of death. When pathologists and radiologists can provide this information it can help police with the inquiry.

Protocols can change according to the situation and the forensic team must adapt to local circumstances. “In Thalland I would choose between ventilation or lighting. It was more than 36 degrees in the morgue. I had some air or light but no electricity for both,” Develter said.

In Europe, DVI teams can contact mobile CT scans anywhere and receive the material within 1 to 3 hours. These services are typically used for clinical purposes in hospitals that need CT examinations once or twice a week but have no budget to purchase a scanner.

Regarding DVI and terror attacks Develter is also responsible for the education of the forensic pathologists in his department and is involved with the national Crisis Centre of Internal Affairs.

In his lecture, he will insist on the necessity for pathologists within DVI teams to be properly trained, through standard exercise and simulation, to extract the maximum information from the crime or disaster scene and to the subsequent investigation of the victims. “If your pathologist is not trained well, crucial information can be lost,” he said.

Dr. Peter Claes from Leuven, Belgium, will present his work in facial genetics as a session titled ‘Imaging genetics and beyond: facial reconstruction and identification.’

Claes is a senior researcher expert in the Medical Image Computing research group of the Processing of Speech and Image division of the Electrical Engineering department at Leuven Catholic University. He uses CT, MRI and 3D surface imaging modalities to grasp the link between people’s appearance and underlying genetic variations. “Your appearance is genetically driven. In families there is a strong link, even more so between identical twins, who share the same DNA profile and almost the same face. Physical features also influence your brain, the way you think. A lot of facial characteristics are shared, for example in Down’s syndrome patients, who present with the same features whether they are European or Asian,” he explained.

The link between genetic disorders and facial genes has been of interest to scientists for a while, but research is slow and tedious.

Registration: G. Villeirs, Ghent/BE
 EM 1 Emergency radiology

Introduction G. Villeirs, Ghent/BE

Additional value of dual-energy CT in abdominal emergencies E. Danse, Brussels/BE

High-end CT imaging in forensic medicine: experience after recent Brussels terror attacks W. Develter, Leuven/BE

Interlude: Imaging Belgian food K. Verstraete, Ghent/BE

Imaging genetics and beyond: facial reconstruction and identification P. Claes, Leuven/BE

Interlude: The Belgian Museum of Radiology R. Van Tuyllgen, Brussels/BE

Panel discussion: Acute pathology: emergency radiologists or organ subspecialists?
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Radiation dose concerns in paediatric cases propel PET/MRI into more widespread clinical use

As research on PET/MRI gathers momentum, stakeholders eagerly await news on outcomes and solid evidence of the benefits. Today’s New Horizons session promises to offer insight into how the latest evidence stacks up and what developments can be expected in the future.

“We are using PET/MRI hybrid imaging as part of our clinical trial protocol and from an a priori standpoint it makes sense to say that it works, but we need to prove that before we dive in and start using it routinely,” said Dr. Paul Humphries, paediatric radiologist at Great Ormond Street Hospital and University College Hospital, London, adding that the technology’s main appeal in paediatrics is the lower radiation dose required.

In his ECR talk, he plans to highlight why PET/MRI meets unmet medical needs in paediatric oncology. Historically, a child with cancer very often had a devastating terminal illness, but over the past 20 years survival of children with cancer has changed dramatically.

“We have a responsibility to children, so it is no longer the automatic death sentence it once was. Even for the more aggressive tumours in smaller children, like Wilms’ tumour, survival has really improved,” Humphries said.

Under these conditions, the radioactive dose that children receive during cancer therapy is all the more important because they are more radiosensitive and have a longer life expectancy than adults. If young patients are being cured, then the chance of getting a secondary effect of the treatment is much higher.

“If we can find an alternative means of reducing exposure to radiation during diagnosis or staging then that’s a sensible thing to do,” he emphasised.

Most paediatric radiologists work on the principle that even a small amount of radiation exposure puts a child at increased risk, and therefore they use the lowest reasonably achievable exposure. Because PET/MRI reduces radioactive exposure considerably, it is an attractive option for imaging in children.

From a research perspective, Humphries uses PET/CT for many of the haematological malignancies that come his way but much of his current work is on lymphoma, with the aim of determining whether PET/MRI is equivalent or non-inferior to PET/CT. He said he would prefer to avoid using CT for anatomical and attenuation correction for the PET scan.

At today’s session, he intends to discuss some of the preliminary findings of the study he is leading on PET/MRI in children with lymphoma. Previous research on PET/MRI in lymphoma has yielded encouraging results, but Humphries’ team is assessing PET/MRI performance for both staging/verifying and assessment of response to therapy in order to investigate whether it is as good as PET/CT.

“If patients don’t respond well to chemotherapy they will need radiotherapy so it is an important point in their management,” Humphries said. “Our current impression is that staging will be as good as PET/CT, but the real question relates to how the response assessment stacks up.”

Another benefit of PET/MRI is in delineating whether abnormal signal around operated sites in the central nervous system represents residual tumour or post-operative change – trauma or bleeding, for example. Choline PET is being used to study the rim of the tumour site to see if there is metabolic activity. If there is, it is a strong indicator of post-operative bleeding, Humphries said.

“Clearly, an ongoing challenge is to convince hospital managers to purchase a PET/MRI machine, given its high price compared to a stand-alone MRI scanner; he noted.

Prof. Dr. Gustav Andreisek, head of radiology at Canton Hospital, Münsterlingen, and professor of radiology at the University of Zurich, Switzerland, shared his thoughts with ECR Today on the value of PET/MRI in musculoskeletal imaging.

“This is a promising technique, but we need to better define its application and provide evidence of outcomes,” he noted. Most countries are likely to experience reimbursement issues with PET/MRI because providers will not be prepared to pay more for new technology unless it improves patient outcomes.”

Reflecting on the evidence base for PET/MRI, Andreisek said much of the research to date was technical, and as yet removed from the clinical setting. “The main question is whether we enhance patient care with it. I think there is an impact but this has not been shown, which is why PET/MRI is not being used in the clinical setting yet,” he said. “Also, with the exception of Japan, there are no guidelines worldwide to push this technique into routine use.”

Turning to the research that he had been involved in, Andreisek said that his group had used PET/MRI to help delineate the borders of the soft tissue tumours much more precisely and to define which part of the tumour has the highest cell turnover. This helps to direct biopsy and/or radiotherapy appropriately at the most aggressive tumour cells.

All in all, he thinks radiology has a strong tool with PET/MRI and MRI alone and that it was necessary to ask what additional benefits were offered by PET/MRI.

“It’s an interesting technique, fast developing with great potential and application, but as yet, radiological societies have not been in a position to declare PET/MRI as a state of the art technique,” he said.

New Horizons Session
Friday, March 3, 16:00–17:30, Room B
NH 12 The increasing clinical impact of MR/PET
• Chairman’s introduction
  L. Umutlu, Essen/DE
• MR/PET in paediatric oncology
  P.D. Humphries, London/UK
• MR/PET in cardiac imaging
  M. Dewey, Berlin/DE
• MR/PET in head and neck imaging
  M. Becker, Geneva/CH
• MR/PET in musculoskeletal imaging
  G. Andreisek, Münsterlingen/CH
• Panel discussion: Are we ready to fully integrate MR/PET into clinical diagnostic work-up?

Patient safety: how to manage radiation incidents and accidents

Clinical decision support can help improve patient outcomes

Experts to provide insights into new procedures to diagnose and treat lymphatic disease

By Becky McCall

myESR.org

ECR 2017

CLINICAL CORNER

Coronal whole body PET/MR image shows a patient with mediastinal lymphoma. (Provided by Dr. Paul Humphries)
Most ultrasound examinations in the U.K. are performed and reported by sonographers and radiographers with postgraduate training. Unlike in much of mainland Europe and in Australia, Canada, and the U.S., where sonographers tend to perform these examinations but rely on an overseeing physician to interpret the examination and write a report. However, now attention is focusing on the U.K. model due to an escalating need for ultrasound services, said Hans Edwards, senior sonographer in the Department of Radiology at East and North Hertfordshire National Health Service (NHS) Trust. This rising demand has resulted from the growing number of elderly patients, the increasing population overall, and the greater incidence of liver and vascular disease often linked to lifestyle choices, she explained.

At ECR 2017 Edwards will outline the three main models of ultrasound scanning in the UK. She will also discuss the history of the country’s sonographer-led model for ultrasound services and give recommendations to support sonographers outside the U.K. who are starting to report examinations.

“We have a service model that works very well in the U.K., but it took a long while to build up,” she added, saying that most scans are performed and reported by sonography specialists.

Edwards attributes the UK’s reliance on sonographers to several factors, including the financial model of the NHS, which prioritises safe, reliable, timely, accurate care and also affordable care. Furthermore, a shortage of radiologists since the 1970s, combined with the development of increasingly complex radiological procedures, has led to them handing their general ultrasound workload to specially trained radiographers.

Traditionally sonographers work closely alongside radiologists and are quick to adopt roles that radiologists, for one reason or another, might choose to delegate, she noted. Also, studies show detection rates and accuracy for ultrasound examinations are similar for sonographers and radiologists.

Looking to the future, she believes U.K. sonographers may give up simpler tasks to technicians, while continuing to develop further their own skills. As for mainland Europe, she anticipates that more sonographer-led ultrasound departments will emerge and independent reporting will become common practice for sonographers,” she said.

At the same session, a comparison of the training and education of sonographers between the U.K. and other countries will be covered in a lecture by Gill Harrison, ultrasound programme director in the Division of Midwifery and Radiography at City, University of London.

U.K. sonographers complete one to three years of postgraduate training to gain a certificate, diploma, or MSc degree in ultrasound. This includes an assessment both of clinical competency in their workplace and report writing.

“The interpretation of ultrasound findings is a crucial part of ultrasound education and is integrated into the curriculum,” she said, adding that guidelines from the British Medical Ultrasound Society and the Society and College of Radiographers both recommend that reporting findings is an integral part of the examination.

The emphasis is on hands-on, interactive training in the ultrasound skills suite at City, University of London. (Provided by Gill Harrison)
Patient safety: how to manage radiation incidents and accidents

Accidents during imaging are rare, but nevertheless when they do happen the results can be devastating. Ongoing education and safety awareness, whether relating to radiation exposure or other incidents, remain vital.

Interventional radiologists must try to display not only the dose-area product (DAP) on the fluoroscopy screen, but also the entrance skin dose (ESD), and they should change the radiation entrance field if the ESD exceeds 0.5 Gy, according to Prof. Dr. Dr. Reinhard Loose, emeritus professor of radiology at the University of Erlangen and former chair of the Department of Diagnostic & Interventional Radiology and Nuclear Medicine at Nuremberg Hospital.

For high dose procedures, including both interventional radiology and CT, dose parameters should be stored electronically preferably as a DICOM Radiation Dose Structured Report (RDSR), he noted.

The doses of different modalities and in interventional procedures, between different operators, should then be compared. Furthermore, radiologists should ask referees to check patients for injuries two to four weeks following high-dose examinations.

Skin and soft tissue injuries, such as erythema and necrosis, often affect the body area closest to the x-ray tube, usually the back. While the threshold for reactions is an ESD dose of about 2 Gy severe reactions develop above 5 Gy.

Loose cited one incident in which the Obesity of a serial replacement patient meant that the typical diagnostic coronary angiogram was exceeded by a factor of three. Then, during the valve repair, the fluoroscopic image quality was so poor that the operator changed to cine images. Tens of thousands of images were generated and the patient received an ESD of more than 50 Gy. Several skin transplantations followed a few months later.

While very complex interventions, and therefore doses, are increasing, angiography detectors are becoming more dose-efficient and EED tracking helps the radiologist to change the radiation entrance field as needed.

"While the threshold levels for national reporting of overexposure under the European Directive (96/55/EURATOM) are currently under discussion, all incidents should go to a local clinical incident reporting system, and this includes near misses without radiation. Communication between the staff members involved, the referee, and in some cases with the patient is essential," he pointed out.

Pregnant patients

The sense of safeguarding future life prospects is heightened when pregnant patients present for imaging. But what should happen when pregnancies are discovered only after a medical imaging procedure has taken place?

Abortion due to x-ray examinations is not justified in the vast majority of cases, according to Prof. John Damilakis, PhD, director of the medical physics department of the University Hospital of Iraklion, Crete.

Referring physicians and radiographers must investigate the reproductive status of all female patients of childbearing age prior to x-ray imaging, and a screening policy for pregnant patients must be defined prospectively," he explained.

This translates into a need for clear guidelines on pre-imaging protocols for determining pregnancy status. Posters in waiting areas constituted one key strategy.

Risk assessment tools

Management of pregnant patients depends mainly on concepts of dose and dose of pregnancy, according to Damilakis. His department has recently developed a free web-based tool (Conception Dose Estimation, CODE) http://embyros.dose.med.uoc.gr/gn/phyphax for estimating dose and risk.

The frequency of accidental exposure of pregnant patients is unknown, but in today's presentation he will draw on various studies that point to a significant number of unidentified pregnant cases in patients undergoing trauma identifying imaging tests, and incidental pregnancy diagnosed in emergency trauma.

As part of the project that led to the development of CODE, Greek obstetricians were asked how many pregnant patients exposed accidentally to diagnostic x-rays visited them over 12 months to seek advice about the biological effects of radiation on the embryo. Around 45% of respondents stated that one to five pregnant patients who had been exposed accidentally to radiation asked for information, undercutting the rate of accidental exposure of pregnant patients in the country, according to Damilakis.

During the first two weeks after conception, only high-dose radiation exposure can terminate pregnancy via miscarriage, but not diagnostic x-rays by age. Furthermore, radiation risks are more significant during organogenesis and the early fetal period.

Damilakis fears that some referring physicians and radiologists who lack knowledge in this area recommend termination of pregnancy following any x-ray examination. Meanwhile, others avoid all x-ray examinations for pregnant patients, despite the fact that the radiation risk for the conceptus is negligible, and this practice results in underdiagnosis for these pregnant patients.

In the second part of this double session, Thessin, EFS, Prof. David Lurie, PhD, head of an MRI research group and professor of biomedical physics at the University of Aberdeen, UK, plans to advocate ongoing MRI safety education for all staff at every level not just on initial appointment to a post.

"There will be a steady rise in MR scanners and scans conducted are steadily increasing. So it is very likely all radiology staff will have some involvement with MRI at some time during their career. Awareness of MR safety issues is paramount," Lurie told ECR Today ahead of the congress.

Incidents caused by the so-called missile effect are extremely rare these days, mainly due to better management of controlled areas in MRI facilities, he noted.

More common are the effects of the static magnetic field on small, treatment-related objects such as endotracheal tube components and on non-MR-safe implants including pacemakers, stents, and aneurysm clips.

"Any implanted device should be fully documented in a patient's notes. But these notes may not always be available, particularly in an emergency situation, and the patient is not always able to provide accurate information," Lurie said.

Action plans depend on the type of accident in question, but at the facility in Aberdeen, all incidents and near misses, including patients referred with pacemakers, are registered onto an online incident reporting system run by the local health authority and are reviewed by radiology management, including the MRI safety officer.

Lurie pointed to the literature indicating that adverse events during MRI are increasing. "This may be because hospitals are getting better at reporting such incidents, or it could be that pressure for higher throughput of patients is leading to less time being spent on preventative measures, even a simple thing such as instructing a patient on the correct use of foam earplugs takes time and effort," he concluded.

UK

A. Torresin, Milan/IT

Chairwoman's introduction

Radiation incidents and accidents in CT

M. Mahesh, Baltimore, MD/US

Radiation incidents and accidents in interventional suites

D.J. Lurie; Aberdeen/UK

Accidental exposure during pregnancy

J. Damilakis; Iraklion/GR

Thursday, March 3, 10:30–12:00, Room G

EF 2 Radiation incidents and accidents in medical imaging and their management (part II)

Moderator: M. Brambilla; Novara/IT

D.J. Lurie; Aberdeen/UK

Incidents and accidents in MRI

D.J. Lurie; Aberdeen/UK

Radiation incidents and accidents in nuclear medicine

M. Brambilla; Novara/IT

Management of incidents and accidents in imaging departments: the role and responsibilities of medical physicists

V. Tsuritsangi; Atrium/GR

These sessions are part of the EuroSafe Imaging campaign.
Clinical decision support can help improve patient outcomes

Clinical decision support (CDS) systems might enable radiologists to move from a healthcare service based on measuring success by means of the volume of examinations to one focused on improving patient outcomes.

The result of the CDS system was faster and earlier decision-making, and the patients that need complex treatment were now diagnosed and referred to the specialist sooner, noted Olauga Zufiría. The ESR’s iGuide will now be used routinely by the primary care physicians and the future plan is to roll it out across the hospital.

In conclusion, speaking about the potential difficulties of CDS, she said that care needs to be taken in the implementation process to avoid any negative impacts. One aspect is helping physicians to see the technology as a tool for continuous medical education, rather than as a threat to their autonomy. “CDS systems should not be used as a substitute for the clinician,” she commented.

Prof. Laura Oleaga Zufiría, chair of the Radiology Department at the Hospital Clinic in Barcelona. Although studies have been published, most have focused on how CDS affects the process of care and clinical decision-making. Comparatively few are randomised control trials.

Introducing the session, she intends to discuss the impact of CDS on patient outcomes. Her own hospital began a pilot study in 2013 with primary care physicians, to see how a basic CDS system affected the number of CT and MRI studies ordered. The study began using the American College of Radiology (ACR) Select CDS, but moved to the iGuide from European Society of Radiology (ESR) when it became available.

Physicians at her hospital were unable to order their own MRI or CT studies, but had to refer patients to a specialist. After the CDS system was implemented, the number of CT and MRI studies increased, but the number of referrals to the specialist decreased.

With an advanced CDS system, patients could be stratified into two or three different categories dependent on their complexity. The stratification would rely on the clinical information used to request an examination and the protocols pre-set into the system. Advanced CDS wouldn’t only select the correct modality – e.g., a CT scan for a physician referring a bedridden older male patient with suspected pulmonary embolism – but it could automatically check for prerequisites lab results, schedule the scan, load the right protocol in the CT suite, and prepare the injector.

Kauczor added that focusing on complex cases will help radiologists adapt to the future challenges facing the profession. The easy calls will be done by machines within the near future on radiologists will only have the task of signing them off. Trends pointing in that direction include big data, IBM’s Watson medical supercomputer, and the development of structured reporting.

One future challenge will be making clear that radiologists play their part in making a diagnosis and doing the preparatory work for treatment decisions. Another is evaluating the success of the new value-centred pay-for-performance radiology: “We need to develop metrics that will be accepted by clinical partners and insurers,” he said. “We want to be reimbursed, not by the simple number of exams, but by their value, and we need to define how we measure that. This is still part of the discussion.”

There are few studies evaluating the effect of CDS on patient outcomes, according to Prof. Laura Oleaga Zufiría. The ESR’s iGuide will now be used routinely by the primary care physicians and the future plan is to roll it out across the hospital.

In an interview with ECR Today before today’s session, Prof. Dr. Hans-Ulrich Kauczor, medical director at the University Clinic Heidelberg, Germany, outlined some problems with the volume-centred reporting of imaging results. In most countries, if a knee MRI examination is performed, there are some basic requirements that you must follow. For example, you might perform three sequences on two different planes, taking 15 minutes of examination time. The radiologist has little freedom to devote 15 minutes to an easy case, and 90 minutes to a difficult one. “Regardless of how long and detailed a report is, regardless of the complexity of the case, you get the same reimbursement,” he noted.

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In conclusion, speaking about the potential difficulties of CDS, she said that care needs to be taken in the implementation process to avoid any negative impacts. One aspect is helping physicians to see the technology as a tool for continuous medical education, rather than as a threat to their autonomy. “CDS systems should not be used as a substitute for the clinician,” she commented.

Prof. Laura Oleaga Zufiría from Barcelona will chair today’s session on clinical decision support.

Clinical decision support (CDS) systems might enable radiologists to move from a healthcare service based on measuring success by means of the volume of examinations to one focused on improving patient outcomes.
Experts to provide insights into new procedures to diagnose and treat lymphatic disease

The term ‘lymphatic vascular disease’ covers a broad category of conditions, including a very large number of diseases with various subjective complaints, which can accompany the lymphatic malfunction. In addition to physical examination, imaging is an important diagnostic tool; particularly when the diagnosis remains in question, the presence of lymphatic vascular insufficiency can be ascertained through different imaging methods.

In today’s Special Focus session titled ‘The role of lymphangiography’, these experts will discuss different radiological diagnostic tools and therapy options for lymphatic disease. Starting the session off will be Dr. Ernesto Santos Martín, from the Interventional Radiology Division at the Memorial Sloan Kettering Cancer Center in New York, who plans to familiarise ECR delegates with the indications for and the technique of intranodal lymphangiography (INL). According to Santos Martín, INL is a reliable, reproducible and less technically challenging alternative to pedal lymphangiography.

“In patients with chylothorax, percutaneous thoracic duct embolisation is an established alternative to the surgical ligation of the thoracic duct. It is a minimally invasive procedure, requiring an opacification of the lymphatic system prior to the transabdominal catheterisation of the thoracic duct. Classically, bipolar lymphangiography was required to opacify the lymphatic system, but as it is a technically demanding and time-consuming procedure, involving the cannulation of a small lymphatic duct on the dorsal aspect of the foot, followed by an infusion of oily contrast material over a period of hours, it has not been done frequently. Thus, not many doctors are able to perform this procedure today,” he explained.

The leading cause of chylotho-rax is the iatrogenic disruption of the thoracic duct or its tributary lymphatics. An undiagnosed postoperative chylothorax may result in malnutrition, sepsis or death. Therefore, rapid diagnosis and early intervention are of paramount importance. Difficulties associated with bilateral pedal lymphangiography are a significant limitation of percutaneous thoracic duct embolisation and present a barrier to its widespread use, meaning alternative techniques needed to be implemented.

‘Intranodal lymphangiography was first described in 1997, with no need of incisions. Due to the difficulty of lymph node puncture, it was not widespread. However, this problem has been solved by using ultrasound guidance, which has enabled to puncture palpable lymph nodes,’ said Santos Martín. In 2012, Nadolski and Itkin described the feasibility of ultrasound-guided intranodal lymphangiography as an alternative to pedal lymphangiography in six patients undergoing thoracic duct embolisation.

“Compared to the bipolar approach, INL is less technically difficult; furthermore, it diminishes procedure time,” Santos Martín said, adding that the development of INL has enabled confirmation of two different virtues. “First of all, INL has diagnostic properties which allow the study of lymphatic abnormalities such as leakage, malformations and others. Furthermore, due to the embolic properties of the occluded oil, it has therapeutic capabilities and can help to seal off lymphatic leaks. The simplicity of the intranodal approach under ultrasound guidance is the enabling development of new applications of INL such as novel lymphatic therapies via intranodal access and MR lymphangiography.” he added.

The latter will be the key topic of the second presentation of today’s session. Prof. Lionel Arrivé, from the Department of Radiology at Hôpital Saint Antoine, Paris, plans to explain the indication, technique and success of non-contrast magnetic resonance lymphography, a modality which uses heavily T2-weighted fast spin echo sequences with 3D acquisition and very thin section source images obtaining a specific display of lymphatic vessels.

It is a unique and non-invasive imaging modality that can be used in different fields, including, but not limited to, evaluation of lymphoedema patterns and diagnosis of upper and lower limb lymphoedema, cystic lymphangioma, various lymphatic disorders such as lymphatic injuries resulting in chylous collections, chylothoraces and chyluria, and lymphatic pathologies of the liver, the spleen, the kidneys and the chest.

Being a relatively new imaging technique, non-contrast MR lymphography is still in a honeymoon period and certain limitations such as suboptimal spatial resolution remain. However, due to ongoing advances in software and hardware, in the near future it could become the imaging modality of reference for the investigation of lymphatic pathology, as Arrivé will illustrate today.

Last but not least, Prof. Hans Schild, Director of the Department of Radiology at the University Clinic Bonn, Germany, will discuss the indication and technique of thoracic duct embolisation as well as available therapeutic alternatives for patients who cannot undergo this procedure, among other topics.

Special Focus Session
Friday, March 3, 0830–1000, Room F2
SF 9 The revival of lymphangiography
• Chairman’s introduction
  B.A. Radeff, Heidelberg/DE
• Theranostic lymphangiography
  E. Santos Martín, New York, NY/US
• MR lymphangiography
  L. Arrivé, Paris/Fr
• Thoracic duct embolisation
  H.H. Schild, Bonn/DE
• Panel discussion: Lymphangiography, are you convinced?

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How to deal with primary bone tumours: the radiologist’s, pathologist’s and surgeon’s perspective

Due to their widely varied nature, primary bone tumours may pose unique diagnostic challenges. Thus, their management often requires a multidisciplinary approach, as will be shown by three experts in today’s Multidisciplinary Session on the subject.

The term ‘bone tumour’ is a broad category, including a bewildering number of bone tumours with a wide variety of radiological appearances. The spectrum ranges from bone-forming tumours such as osteoblastoma and osteosarcoma, to fibrous bone lesions such as fibrous dysplasia and exostifying fibroma, and bone marrow tumours, to cartilage-forming tumours, bony metastases and other bone tumours or tumour-like lesions such as simple bone cysts and giant cell tumours – to name just a few examples.

Imaging plays a key role in establishing the initial diagnosis and subsequently affects the initial management. Undiagnosed lesions are best divided into biologically nonaggressive and aggressive categories. If the lesion is aggressive, biopsy is indicated; otherwise, watchful waiting with follow-up imaging is the norm.

Radiographs are the primary screening technique used for bone tumours and tumour-like lesions. They are recommended as the initial imaging modality for the evaluation of bone pain, and standard radiographic techniques are typically adequate for tumour imaging. Aggressive features are detected on radiographs by the evaluation of different imaging characteristics, including periosteal reaction, cortical reaction and, above all, the margin of the lesion and the zone of transition between lesion and adjacent bone. In other words, when a lesional margin is sharp and a narrow transition zone is radiographically considered to be nonaggressive, especially when the margins have a sclerotic border, a diagnosis of malignancy is more likely.

In order to reach a diagnosis, the age of the patient, the location of the lesion, any pre-existing conditions and the radiological appearance need to be considered in turn, explained Dr. Steven James from the Department of Radiology at the Royal Orthopaedic Hospital in Birmingham, UK.

Age is considered to be the most important piece of clinical information when assessing a bone tumour, as most bone tumours have a predilection for a specific age group. For example, giant cell tumours occur in skeletally mature people, while the Ewing sarcoma typically occurs in patients aged 10–20, and conventional osteosarcoma has two age peaks: one occurring during infancy and adolescence, and the other, arising in previously irradiated or Paget’s bone, in adults older than 50 years.

Regarding the location, many bone tumours, independent of whether they are malignant or benign, often occur in a characteristic location in the skeleton. Some tumours tend to follow the distribution of red marrow, while others such as osteosarcoma have a predilection for sites of rapid bone growth, like the metaphysical region. Moreover, a lesion in a long bone can be characterised by its longitudinal and its transverse location. So when considering the location, both the longitudinal position in the bone and the transverse orientation need to be taken into account, as this aspect alters the differential diagnosis, James said.

In this session, he plans to go over the fundamental requirements for bone tumour imaging point by point and to discuss local and distant imaging strategies for staging.

In regard to local staging, MRI is usually the modality of choice, he added. MRI can extend the diagnostic evaluation by demonstrating components such as cartilage, vascular tissue, fat and lipid. Even when a specific diagnosis cannot be made, MRI can help by narrowing the differential diagnosis, thus, it has changed from a single study-based diagnosis (based on radiographs) to a multimodal imaging approach, which, according to James, is often required to reach a correct imaging diagnosis and to allow communication with oncology, surgeons, pathologists and oncologists.

In today’s session, chaired by Dr. Mark Davies from the Royal Orthopaedic Hospital in Birmingham, James will be joined by Prof. Lars-Gunnar Kindblom, from the Department of Pathology at the Sahlgrenska Academy in Gothenburg, Sweden, who will discuss the pathologist’s perspective in the diagnosis of bone tumours and how to correlate imaging features of malignancy with histological findings.

Prof. Lee Jays, a consultant orthopaedic oncology surgeon from the Royal Orthopaedic Hospital, besides giving the surgeon’s perspective, will point out imaging requirements for robotic surgery and especially illustrate the need for a multidisciplinary approach in the management of patients with primary bone tumours.

Multidisciplinary Session

Friday, March 3, 08:30–10:00, Room D
MS 9 Primary bone tumours

• Chairman’s introduction
A.M. Davies; Birmingham/UK

• Fundamental imaging
S.L.J. James; Birmingham/UK

• Why I need the radiologist: the pathologist’s perspective
L.-G. Kindblom; Gothenburg/SE

• The surgeon’s perspective
L. Jays; Birmingham/UK

• Multidisciplinary case presentation and discussion

RTF MEET & GREET SESSIONS

Visit the RTF Booth in the ESOR & Rising Stars Lounge (M Building) to meet Radiology Trainees Forum (RTF) representatives from different European countries!

Join your European colleagues and representatives in an informal and relaxed discussion, exchange opinions and points of view with them and present your ideas. Take advantage of this great opportunity!

Don’t miss the RTF Highlighted Lectures, moderated by RTF Board members Atis Svare and Luisa Andrade (tomorrow, Saturday, March 3, 10:30–12:00) in Room O.

For more detailed information please visit the RTF Meeting Point in the ESOR & Rising Stars Lounge.
Optimising the management of acute appendicitis

Appendicitis can be a tough diagnosis to make, especially in ‘difficult’ cases such as elderly, obese and pregnant patients. In today’s session, ECR delegates will get the chance to familiarise themselves with challenges in the diagnosis of acute appendicitis and to learn about optimal diagnostic strategies and the important role of imaging in the management of acute appendicitis in specific populations.

Appendicitis is the most common urgent cause of acute abdominal pain seen in emergency departments. Approximately one in every ten individuals will have acute appendicitis during their lifetime. The cause is unknown, but is probably multifactorial, including hormonal obstruction as well as dietary and familial factors.

The main goals of acute appendicitis management are an early diagnosis and prompt surgical or conservative intervention. However, a correct diagnosis is often delayed, because on the one hand, many patients do not seek medical attention in a timely manner; and on the other, appendicitis can be an overall difficult clinical diagnosis to make.

Many surgeons use an aggressive approach, accepting a certain number of negative appendectomies – approximately 30% of appendectomies are unnecessary, while a significant surgical delay occurs in 20% of patients with appendicitis. The use of advanced abdominal imaging such as ultrasound, CT and MRI have reduced these numbers to 3% and 5%, respectively, by enabling accurate diagnosis of acute appendicitis, as well as many of its clinical mimics.

However, certain conditions make the diagnosis of acute appendicitis even more difficult; as Prof. Julien Pouliart, from the Department of Radiology at Westinde Hospital, The Hague, Netherlands, will illustrate in today’s presentation, Imaging algorithms for acute appendicitis in difficult patients.

Pouliart will go over point by point the pros and cons of high-end ultrasound, ultra-low dose CT and MRI in diagnosing appendicitis in obese and elderly patients, highlighting their roles in relation to clinical findings to differentiate between uncomplicated and complicated appendicitis in difficult patients, as well as the pros and cons of different imaging strategies.

However, the obese and the elderly are not the only ‘special’ cases – there are also pregnant patients to consider. Anatomical and physiological alterations associated with pregnancy make it difficult to reach the correct diagnosis in these patients, as, for example, pregnancy can result in upward displacement of the appendix and non-specific leukocytosis. The range of differential diagnoses of right-sided pain in pregnancy is broad, including benign causes such as haemorrhagic corpus luteum cyst and renal colic as well as conditions requiring surgical intervention, such as ovarian torsion and cholecystitis. Difficulties in rendering a definitive diagnosis of appendicitis may result in delayed treatment and complications from delayed diagnosis of appendicitis.

During his talk, Dr. Pierre-Alexandre Poletti, from the Department of Radiology at the University Hospital of Geneva, Switzerland, will provide an insight into the diagnosis of acute appendicitis in pregnant patients and highlight the role of high-end ultrasound, ultra-low dose CT and unenhanced MRI in this clinical setting.

“Due to its availability and lack of ionising radiation, ultrasound with a graded compression technique is usually the imaging modality of choice to be performed at admission of pregnant patients with right lower quadrant pain. However, it is often indeterminate, especially during the last trimester of pregnancy”.

Concerns about dose in the use of CT make unenhanced MRI a good second choice to be used after an indeterminate ultrasound. However, this technique is not always immediately available in every centre, and delaying the diagnosis due to the fear of performing CT may have disastrous consequences for the mother and the foetus.

In this session, ultra-low-dose CT (<2mSv) may be an interesting alternative to standard CT, said Poletti.

Also in this session, Dr. Marc Zins, from the Department of Radiology at Hopital Saint Joseph in Paris, will discuss the cost-effectiveness of different imaging modalities of high-end ultrasound, ultra-low dose CT and MRI in acute uncomplicated and complicated appendicitis, also with special regard to difficult patients, while Prof. Marja Boermeester, from the Department of Surgery at the Academic Medical Center in Amsterdam, Netherlands, will speak about the evidence-based treatment of acute appendicitis.

Herbert Fritz was the first author to publish on the importance of early diagnosis and surgery for acute appendicitis, and for more than a century, appendectomy, which today can generally be performed with low morbidity and very low mortality, has been the treatment of choice, remaining the standard of care for most patients.

An alternative strategy is antibiotic therapy, with appendectomy reserved for those who do not respond to this treatment or those who develop complicated appendicitis.

Although many controversies exist over the non-operative management of acute appendicitis, antibiotics have an important role in the treatment of patients with this condition. Thus, Prof. Boermeester plans to specifically address the role of clinical history, physical examination and laboratory findings and to emphasise the role of imaging in the management of acute uncomplicated and complicated appendicitis.

Special Focus Session

Friday, March 3, 16:00–17:30, Room E1

SF 12b Challenges in the diagnosis of acute appendicitis

+ Chairman’s introduction
  J. Stoker, Amsterdam/NL
+ Acute appendicitis during pregnancy: high-end ultrasonography, ultra-low dose CT or unenhanced MRI?
  P-A. Poletti, Geneva/CH
+ Imaging algorithms for acute appendicitis in difficult patients (obese, elderly, other)
  J. Pouliart, Paris/Fr
+ What is the cost-effectiveness of different imaging modalities in acute appendicitis?
  M. Zins, Paris/Fr
+ Evidence-based treatment of acute appendicitis: conservative vs surgical management?
  M.A. Boermeester, Amsterdam/NL
+ Panel discussion: Optimised imaging algorithms in the diagnosis of acute appendicitis
The role of radiology in body identification and in determining cause of death in refugee casualties

In recent years, Europe has been witnessing large-scale migration from African countries and the Middle East, leading to problems with regard to safety, funding and, above all, ethical issues.

In July 2016, 149 body bags were recovered and assisted by performing pre-autopsy CT scans in order to facilitate identification and give a proper burial to these migrants. The Italian navy recovered the boat and thanks to a memorandum of understanding between the Ministry of the Interior, the Ministry of Education and the Commissioner’s Office for Missing Persons, post-mortem activities aimed at the identification of the victims were performed. The main purpose of this operation was to do everything possible to give back names and surnames to these people, a gesture of respect for human dignity. Remains were recovered and kept inside body bags in refrigerated trucks. The bodies of these poor victims arrived in inescapable conditions, partially skeletonised and often unrecognisable with faces disfigured due to having been underwater for about a year. Forensic pathologists and anthropologists from several Italian universities were recruited, along with laboratory, which specialises in identifying decomposed, burned or mutilated remains.

Moreover, during these years, there have been numerous accidents during attempts to cross the Mediterranean, which resulted in more than 3,500 deaths in 2016 alone from a population of 65 million forced to leave their country. The bodies of these ‘victims of hope’ are often not recovered, inhibiting proper identification and causing deep wounds in their families, as well as administrative problems. Just think of the impossibility of reuniting families in the event that a relative is declared missing.

The role of radiology in body identification and in determining of the cause of death in shipwrecked refugee casualties

Giuseppe Lo Re, PhD, MD is professor of radiology at the Section of Radiology, DiBiMed, University of Palermo, Italy.

In April 2015, an overcrowded boat with an estimated 700 migrants on board headed for Italy sank off the Libyan coasts. It was the deadliest migrant disaster in the Mediterranean, which resulted in more than 3,500 deaths in 2016 alone from a population of 65 million forced to leave their country.

Since the first large-scale sinking off Lampedusa in 2003, Italy has been trying to find the names of all those who have perished along its Mediterranean borders, creating a European database where different features can be catalogued, allowing relatives in other EU countries or family members back home to find their deceased relatives. It’s a gesture of respect for human dignity and it has been shown that not knowing, leaving relatives of people probably dead in limbo, is comparable to torture,” said Prof. Cristina Cattaneo, head of the Labanof Forensic Pathology Laboratory, which specialises in identifying decomposed, burned or mutilated remains.

Deceased migrants are very often identified thanks to the last phone numbers they called or numbers written on paper or even inside their clothing.

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The role of radiology in body identification and in determining cause of death in refugee casualties

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Manufacturers provide glimpse into CT’s bright and dynamic future in ECR 2017 exhibition halls

By Inga Stevens

With trends such as preventative screening continuing to make progress throughout the world, CT scanners are continuing to evolve to handle more complex cases, and manufacturers are increasingly looking at ways to extract more value from the information provided by existing capabilities. Against this background, suppliers of systems are going head to head with their latest equipment and software advancements, and delegates at ECR 2017 are guaranteed to have front-row seats to explore the latest innovations on offer.

According to Valerie Brasart, the company’s molecular imaging and CT product marketing director for Europe, Revolution ACT is engineered to lower operating costs and to help with a better return-on-investment and a quicker break-even position.

“...it also features smart technologies designed to help improve productivity by streamlining user workflow and access to information. In particular, inspired by our most premium product, Revolution CT, the console for Revolution ACT has been designed to make it easy to learn and use,” she explained.

Siemens Healthcare is another vendor focused on providing an excellent return on investment for radiology customers and has developed an entirely new platform for CT that is showcasing at this year’s congress. Based on the Somatom go. platform, the vendor offers two scan variants the 32-slice Somatom go.Neu, which is particularly suited to radiology providers who want to establish a new CT department, and the Somatom go.64, which is equipped with a wider detector to radiology providers who want to keep moving between the CT scanner and the control room, enabling radiographers to stay with patients while carrying out the scan.

Sectra is highlighting its CT liver surgery planning application that facilitates segmentation, measurements, and visualisation of important and relevant information such as the entire hepatic vascular system, including portal and hepatic veins, healthy parenchyma, and lesions. The volume of each target can be measured with high precision and if needed, displayed in 3D. For planning of partial liver resection and pre-planning of radiofrequency ablation, cutting the plane on the 3D view of portal vein and hepatic vein territories calculations can be performed. The result can easily be saved as a 3D pdf file, facilitating communication with referring physicians; the company points out.

Carestream is keen to demonstrate the benefits of cone beam technology with its OxiLight 3D Extremity system, which can capture images of patient extremities, including knees, legs, and feet. The system uses less radiation than traditional CT is compact and affordable, and can be used in a wide range of facilities, according to the manufacturer. The device has received FDA 510(k) Clearance and is approved for sale in the U.S. and Europe.

Toshiba Medical is celebrating the 10th anniversary of Area Detector CT technology after its introduction in 2007. At this year’s ECR, the company is highlighting its latest feature that seeks to improve resolution while further lowering radiation levels.

“Our forward projected model-based iterative reconstruction solution, called FIRST, is a fully automated and integrated reconstruction technique that, in clinical practice, can be used for all scanning procedures including cardiac and 4D studies,” said Neela Zomer, the senior manager of the CT business unit. “FIRST lowers the radiation dose and improves image quality at lower levels while the reconstruction of an 8cm volume takes only three minutes.”

Combining premium CT technology with the economic advantage of an entry-level system, Toshiba is unveiling the 80 row Aquilion Lightning SP. The system is ideal for routine scanning and combines the VISION detector technology with 80 row elements and the 8cm-wide bore, small footprint, and short installation time makes it a patient friendly and cost effective scanner, Zomer said. With features usually found only in premium scanners, including AIDR 3D Enhanced dose reduction technology and metal artefact reduction, the system ensures there is no need to compromise quality to meet business goals and reduce the total cost of ownership, he added.

In other news in the CT world, Philips recently announced that it has launched the detector-based spectral CT scanner. The Philips 1000spectroscopy CT delivers on-demand colour quantification and the ability to characterise structures simply and at a low dose, the vendor noted. The scanner reportedly adds spectral resolution to traditional CT scanning through a new dual-layer spectral detector, and it identifies photons of high energy and low energy simultaneously allowing not only anaatomic views but also uses colour to characterise the material content of critical structures.

Technical Exhibition
Opening Hours
Thursday, March 2 to Saturday, March 4: 10.00–17.00
Sunday, March 5: 10.00–14.00

Eurosafe Imaging Stars: be a star for your patients
Gap widening between CT innovation and installation

Of all major imaging modalities on show in the exhibition halls, it’s arguable that none have undergone such transformation over the last decade as CT. Following a rapid rise to prominence as a workhorse tool for radiology in the early 21st century, safety and the increasing use of MRI and ultrasound in a wider array of applications, CT has had to reinvent itself.

The latest CT offerings provide greatly improved imaging capability, but also automatic dose-monitoring with smart dose protocols, much quicker scan speeds and a wider range of systems to cater for all provider types. Additionally the application of CT continues to expand as is evident in many of the clinical symposia being held this week. CT is diversifying, with use in radiotherapy planning and tracking treatment response, CT colonography and lung cancer detection (with low-dose scanning protocols). It continues also to be merged with other modalities (PET/CT, CT-interventional x-ray lab) and is even forging into quantitative imaging and radiomics with Spectral Dual Energy CT. While there is no doubt CT has an assured role for CT in the future of radiology and have allowed greater access to efficiency and safety of CT use, the lag between the exhibition floor and everyday use in European hospitals appears to be widening.

A recent COCIR survey of European countries found that in the past five years the age profile of CT systems installed has become more uniform, while other advanced imaging modalities such as MRI and cath-labs have remained stable. More than half of currently installed CT systems are six years old or older and, more alarmingly, the number of countries with 10% of CT systems older than ten years has trebled in the last seven years.

If we consider many improvements in dose modulation and monitoring have come to market in the last decade, then a significant proportion of currently installed systems still in use today are a long way from the safety and clinical standard on show today.

So what can be done? There is no easy fix. Health budgets are under scrutiny and control and the current economic picture for Europe does not suggest this will change anytime soon. In addition, radiologist numbers in Europe also continue to slowly decline, further limiting the momentum for a significant push to renew the ageing installed base.

That said, there are some developments that can help ease the situation. Firstly, a wider choice of component but lower-cost CT is now available. These systems boast many technical, efficiency and safety benefits over systems a decade old. Moreover, with healthcare analytics more commonplace, the ability to calculate return on investment versus legacy systems is getting easier for providers. Alternatively, the major CT vendors are also wise to the potential value to customers of refurbished systems and now offer certified, high-quality refurbished systems with attractive warranty and service options.

Other options are coming to the fore. Cone-beam CT (CBCT) for extremity imaging has been recently unveiled and use of CBCT for head trauma for emergency medicine is expected to follow soon. While currently priced equivalent to conventional mid-range CT systems, CBCT may offer a lower cost option to conventional CT and handle a significant proportion of CT procedures soon. Other forms of treatment, such as radiation therapy, will continue to be provided.

The business model for procurement is also evolving. Capital expenditure models are predicted to slow transition towards a mixture of managed services and risk-sharing partnerships between vendors and providers. This will certainly not happen overnight, as this requires long-term thinking and an alternative analytical relationship. However, with a greater focus on efficiency, cost control and operational analytics, we should expect to see more focus on the longer-term benefits of newer CT technology, rather than the short-term focus on upfront system cost.

#ECR2017

BY CHRISTIAN CZERNY

Research to gain increasing significance in head and neck imaging

During the last decade there has been growing interest in head and neck imaging. It is partially due to advances in modern imaging (functional imaging, hybrid imaging, MR imaging of previously difficult areas), but it is also greatly influenced by evolving surgical techniques and growing popularity of non-surgical treatment options. Therefore, head and neck radiology is in constant change. The demands for improved healthcare are greater than ever and diagnostic capabilities have greatly improved in response.

Subspeciality radiology, including the subspeciality of head and neck imaging, is slowly becoming an obvious necessity in busy academic hospitals and other types of clinic. The special knowledge required for the interpretation of head and neck diseases is now unquestioned. Furthermore, research, either basic or clinical, is vital to the advancement of this specialty. Since its foundation in 1987 the European Society of Head and Neck Radiology (EUSNR) has been highly successful in accomplishing its mission of teaching the state-of-the-art in head and neck imaging and cancer detection (with low-dose scanning protocols). It continues also to be merged with other modalities (PET/CT, CT-interventional x-ray lab) and is even forging into quantitative imaging and radiomics with Spectral Dual Energy CT. While there is no doubt CT has an assured role for CT in the future of radiology and have allowed greater access to efficiency and safety of CT use, the lag between the exhibition floor and everyday use in European hospitals appears to be widening.

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The European Institute for Biomedical Imaging Research (EIBIR) was founded in 2006 by the European Society of Radiology (ESR) to support researchers in applying for funding and in managing collaborative research projects.

Over the last ten years, EIBIR has helped researchers secure more than €47 million in funding going on to become part of more than a dozen research projects. Many of these projects have been aimed at improving the diagnosis or treatment of various types of cancer. A special session, today at ECR 2017, will cover the work of the most recent EIBIR-supported projects related to cancer.

The project GlucoCEST Imaging in Neoplastic Tumours (GLINT) is expected to have a major impact on European clinical oncology practice and beyond. It aims to develop an innovative image-based metabolic evaluation technique which will allow for less invasive, more reliable and earlier cancer diagnosis. This ground-breaking novel MRI method builds on recent research revealing the sensitivity of a technique named glucose-based chemical exchange saturation transfer (glucoCEST) to detect native D-glucose glucose uptake in tumours and that glucose analogues, such as 3-oxy-methyl-D-glucose (OMG), can be used as potential non-invasive tracers using the same technique.

Currently clinicians use fluoro-deoxyglucose (FDG) PET to detect glucose uptake and metabolism in tumours and determine whether cancer treatment is working. The GLINT method will avoid the use of expensive radiolabelled compounds and develop an innovative radiation-free MRI technique. This will significantly reduce patient exposure to radiation and allow for closer monitoring of tumour progression and treatment, leading to improved clinical decisions and outcomes. By offering a less expensive complementary method to FDG-PET, the GLINT project will also contribute to the sustainability of healthcare systems throughout Europe.

The impact of this technology on breast cancer diagnosis, prediction, monitoring and assessment of treatment response will be evaluated by a clinical study that will test established and novel PET tracers in patients. Imaging data will be correlated with established and novel molecular biomarkers, the results will be compared to those obtained from whole-body PET, MRI and PET/CT.

To learn more about radiation protection and safety in medical imaging while enjoying a cup of coffee or tea and networking with your colleagues.

www.eurosafeimaging.org
The Subgroup was created in March 2016 to explore the clinical impact of tools for automatic dose monitoring and to provide recommendations and best practice in CT, as well as to measure radiologists’ awareness of the level of radiation dose obtained from such systems. To reach these goals the Subgroup has drafted a questionnaire that will be distributed to European Society of Radiology (ESR) members. The results of the questionnaire could be especially helpful in preparing recommendations on how to improve the CT dosimetric behaviour in radiological departments (with the help of such tools).

The dose monitoring tools allow a precise external audit of dose behaviour in the radiology department, while tracking the general dosimetric trend, which mainly depends on the adopted imaging protocols. These protocols are usually designed by an anatomical orientation with few concerns about the specific clinical context in which the exam is performed. In parallel, the attention to dose reference levels (DRL) is oriented by the anatomical segments, and not by the clinical context.

One example is that lung CT for screening has the same scan length of a lung CT for node characterisation, as well for pulmonary embolism, but these three exams are highly different by indication, and as a consequence by imaging protocols that influence the dose levels. Therefore, it is clear that the actual dose reference levels, based on the anatomical focus, do not reflect the standard of dose anymore. Furthermore, in the same clinical context, there is potential variability in pati- ent anatomy, physiology and target dose level, which influences the CT imaging protocol.

Dose monitoring systems therefore can be a helpful tool for estab- lishing new dose reference levels based on the clinical context and on the patient’s specific characteristics, driving the actual DRL based on anatomy toward clinical indication reference levels.

The Subgroup has held a dedicated session on the European CT Dose Repository. It will focus on the current adoption and impact of dose-tracking tools in the daily practice of radiological departments, and provide an overview of the work carried out by the Euro- Safe Imaging Subgroup.

Technological and scientific developments have led to a remark- able increase in radiation exposure. Thus, the technical implementa- tion and benefits of dose-tracking tools will be presented in the first talk. The implementation of radia- tion dose reference levels monitoring (EDRM) systems, which passively or activ- ely collect all the radiation dose index (RDI) from ionising radiation modalities, will be introduced and open issues related to integration, eg. standards, protocols, etc. will be discussed.

The session will also present how dose-tracking tools change the daily practice of radiographers and radio- logists. Radiographers and radio- logists play a crucial role in dose optimisation and thus their respon- sibility and behaviour towards CT protocols will be reviewed.

The session will conclude with a presentation on the American Col- lege of Radiology (ACR) Dose Index Registry (DIR), which was concep- ted in 2006 and launched in 2007 to address the uncertainty of doses in various imaging examinations (it is designed to assist practice and insti- tutions in comparing dose indices with national values. The DIR has over 1,600 participating institutions, both domestically and internatio- nally). The current exam set is currently in the DIR.

Dr. Emanuele Neri from Pisa, Italy, is chair of the EuroSafe Imaging subgroup on European CT Dose Repository.

The CT Dose Repository Subgroup is one of the four EuroSafe Imaging subgroups.

The European CT Dose Repository Subgroup

The CT Dose Repository Subgroup is one of the four EuroSafe Imaging subgroups.

ESUR takes stock of strengths, threats and opportunities

Although the European Society of Urogenital Radiology (ESUR) is rather small in numbers, it is great in achievements. Indeed, ESUR has built a tradition of organising high-level symposia and workshops, as well as participation in international meetings. It also produces numerous papers for highly ranked journals. These activities largely contribute to the visibility of ESUR and urogenital radiology. This success is due to the initiative of the subcommittees and working groups, and the individual enthusiasm of local organisers of annual symposia and workshops. A fin- ally and familiar atmosphere has become a typical characteristic of ESUR meetings.

The Society is particularly proud that ESUR members will become Presidents of the European Society of Radiology (ESR): Bernd Hamm from Berlin (2012/13) and Lorenzo Derchi from Genoa (2018/19). Many other ESUR members are involved in the work of the ESR in other roles.

Strengths: visibility and scientifi- c output

The 23rd ESUR Annual Sympo- sium (chair: Nicolas Grever) took place in Bordeaux in 2016 and was very successful from all points of view. Early in 2016, ESUR members participated in a satellite sym- posium on the state-of-the-art practice of urogenital imaging in Munich, hosted by the Oman Radiology and Molecular Imaging Society (ORMIS), which was attend- ed by an enthusiastic audience of predominantly young radiologists and clinicians.

From the early days of the Con- tract Media Safety Committee (CMSC), ESUR has taken the lead in producing guidelines on the safe use of contrast media (version 5.0), in collaboration with the main companies. The guidelines are widely accepted, translated into several languages, and locally adapted by many national societies. Recent meetings include a session during the International Congress of Medical Radiology in Buenos Aires, Sep- tember 2016 (H. Thomore) and a workshop in Jakarta, Indonesia in November 2016 (S. Horono). In early 2017 a workshop will be held in Peru with the contribution of G. Piovella. Twenty eight countries have participated so far in the ESUR Glob- al Educational Programme on Safe Use of Contrast Media.

The workshop has a multime- dia program (mpMRI) in June 2016 (Berlin; B. Hamm) attracted a large audience of mainly young radiologists. This proves that there is awareness within the commu- nity of mpMRI that mpMRI is rapidly evolving and con- tinuous education is required to improve competence in performing high-quality mpMRI examinations and to improve reporting based on the PI-RADS v2 classification.

This PI-RADS v2 is a result of a joint effort by the American College of Radiology (ACR), ESUR, and the AdMetsch Foundation, and is based on the ESUR guidelines on prostate mpMRI by the Prostate Imaging Work- ing Group (ESUR 2012/13) and 2011. This acceptance by the urologi- cal community has been confirmed with the publication in European Urology (Eur Urol 2016; 78(6):819-825).

In June 2017, the workshop on mpMRI will be held in Copenhagen (Y. Loge), building on the wave of enth- usiasm of previous meetings. The 2018 workshop is most likely to be held in Lille, France (P. Fujish).


ESUR: Strengths, visibility and scientifi- c output in collaboration with other societies

The involvement of ESUR in the ESR and ECR guarantees input from experts in urogeni- tal imaging in future policy and further improvements on the scientifi- c output.

It is of mutual interest to mem- bers of the American Society of Urogenital and Abdominal Radiology (SAR) and ESUR to contribute to their respective symposia. The perspective of urogenital imaging has been accepted on both sides of the ocean, wide- spread, albeit at times from slightly different angles, but always aimed at improving radiologists’ compe- tences and patient care. M-F. Bellin presented the honorary ESUR Leac- tures on New paradigms in renal tumour imaging at the 2016 SAR Annual Meeting in Hawaii (contri- butions by J. Barentsz, J. Futterer, and C. Massiello. Likewise, there is strong collaboration with the Asian Society of Abdominal Radiology (ASAR) through exchanging contribu- tions to the annual meetings. The collaboration with both SAR and ASAR must be strengthened to enhance the visibility of the sub- specialty of urogenital imaging and ESUR in particular.

The cooperation with the Euro- pean Society of Gastrointestinal and Abdominal Imaging (ASGIR) has been further formalised with bilateral active participation. This widens the range of topics for gene- rally radiologists offered at the res- pective meetings. A joint paper on recommendations for MRI of pelvic floor dysfunction has been accep- ted by European Radiology (R.E. El
ESR establishes Working Group on Value-Based Imaging

Responding to trends within healthcare – and particularly in radiology – that are already prevalent in the United States and increasingly also in Europe, the European Society of Radiology established a working group (WG) on value-based imaging (VBI) in 2016.

This working group, under the umbrella of the ESR Board of Directors, is charged with assessing the status of value-based approaches in Europe, developing a definition and concept of VBI for the ESR, and positioning ESR in a strategically open manner to shape this emerging paradigm.

The imaging value-chain

Value in healthcare is commonly defined as the achieved health outcome per unit of currency spent. This equation has obvious limitations – outcomes can be difficult to measure and directly link to specific expenditures – but it captures the difference with volume-driven approaches that reward healthcare professionals for services provided with limited or no regard to their appropriateness or clinical utility. The imaging value-chain expands the healthcare value-equation to encompass a variety of factors that contribute to the added value provided by medical imaging and the different services radiologists provide. Importantly, it places the radiologist in context with referring and treating physicians and patients. For example, a value-based approach would assess radiology reports in terms of actionable recommendations, clarity and understandability, perhaps even tracking and evaluating the treatment decisions that are made based on radiology recommendations.

Value-based imaging also emphasizes a more patient-centric approach, focusing on health outcomes and the patient experience from their perspective. A premium is put on patient satisfaction throughout the entire patient experience, from referral to scheduling communication before and after the examination, and of course performing the procedure itself, to achieve the optimal medical outcome as quickly as possible.

A paradigm for the future?

A radiological practice that is defined as the achieved health outcome per unit of currency spent is a paradigm that allows radiologists to position their value. A significant amount of work has been spent on quantifying radiology metrics already exists, and some value-based metrics such as impact on the length of patient hospital stay, impact on treatment decisions, changes in diagnosis, etc. But more work is needed to develop metrics that assess the impact of value-based imaging on health-care outcomes. And while no metric or equation can ever reflect the true patient value, it reduces value-based imaging to a quantifiable practice and focuses on medical services with proven clinical utility. For medical imaging, this means that appropriate referrals, justified radiation exposures and optimized examination will become a necessity.

Many aspects of embedding value-based imaging in clinical practice require the support of IT tools. Radiology has long been among the medical specialties most advanced in their adoption of IT applications. The rapid development of new technologies and the expected big data revolution will reinforce these trends. In addition to linking referrals, radiologists and patients more closely, it will create a more even playing field with regard to information access, not only to mention the possibilities for quantitative analysis to understand and improve practice patterns.

Measure for measure

Metrics occupy a central role within value-based imaging. For a variety of reasons, it is not the quantity of reimbursement of imaging services that defines the true value that radiologists’ contributions to the patient-care process is actually providing. The ESR’s journey: from quality and safety areas to value-based, patient-centred radiology

A first glimpse of the WG’s work and future plans was provided during the ESR Annual Leadership Meeting 2016. The WG is working on an ESR concept for VBI as well as a working plan for the coming years, enhancing relevant initiatives with a value-based dimension. Even though VBI is a relatively new concept, for the ESR it is very much a foundational principle. Value-based imaging is an umbrella of the ESR Board of Directors, under the chairmanship of Prof. Raymond Oyen is head of the department of radiology at University Hospitals Gasthuisberg in Leuven, Belgium, and President of the European Society of Urogenital Radiology (ESUR).
ESGAR uses past success to fine-tune annual meeting for 2017

The European Society of Abdominal and Gastrointestinal Radiology (ESGAR) is a leading educational and scientific society composed of a highly diverse group of members that has now spread all over the world, being represented at a national level in both hemispheres – from Sweden to Australia.

ESGAR aims to enhance subspecialisation training and the evidence-based practice skills of all those interested in abdominal imaging. The ESGAR annual meeting is a well-recognised and well-attended forum that meets the educational and scientific needs of all, and provides opportunities for younger radiologists to present their research. An exciting new programme for 2017’s ESGAR Annual Meeting, to be held in Athens, has been put together. The postgraduate course will address everyday clinical challenges through ‘Imaging of the post-operative abdomen’. Some fine-tuning of successful concepts from previous years has been carried out in order to fulfil the requirements of meeting delegates. Among many other topics, abdominal oncologic imaging will be highlighted during workshops and joint sessions with our partner societies. The very successful ESR-ESGAR leadership session that took place in Prague will be repeated, serving as a platform to debate the organisation of abdominal radiology in Europe.

The Society also provides an extensive array of educational programming for professionals with different profiles and backgrounds all year round. Throughout classroom-based courses, all those interested in abdominal imaging have an opportunity to master technological advances, learn abdominal imaging from an organ and disease-based perspective and understand how to incorporate diagnostic and imaging-guided therapy into the multidisciplinary management of patients. New initiatives have been proposed for 2017, such as the first ESGAR workshop focusing on clinical research methods and grantsmanship. Thanks to the positive and enthusiastic feedback from the attendees, it will most probably be renewed to give talented young ESGAR members the unique opportunity to invest in research and understand how to translate it into patient care.

The continuous innovations in medical imaging capabilities and the progressive development of new ways of studying biological tissues present challenges for ESGAR in identifying opportunities for change in the forthcoming years. Looking forward in such a challenging environment will most probably require the Society to invest further in uniting the biomedical and physical sciences and in developing an infrastructure to support well-designed research. This would allow us to document the effects of new imaging modalities and new clinical applications on patient outcomes. ESGAR’s next Annual Meeting will be held in Athens, an ideal destination, and will certainly provide useful insights into these challenges. We do hope you will be part of it and contribute to the continued success of ESGAR.

Prof. Celso Matos is chair of the imaging department at the Champalimaud Clinical Centre in Lisbon, Portugal, and ESGAR President.

ESGAR’s next Annual Meeting will be held in Athens, Greece, June 20–23, 2017.
EuroSafe Imaging Stars: be a star for your patients

EuroSafe Imaging is the European Society of Radiology’s (ESR) flagship initiative to promote quality and safety in medical imaging for the benefit of patients by strengthening medical radiation protection across Europe following a holistic and inclusive approach.

EuroSafe Imaging is committed to supporting the Bonn Call for Action published by the International Atomic Energy Agency (IAEA) and co-sponsored by the World Health Organization (WHO). Based on this it has issued the EuroSafe Imaging Call for Action, a 12-point action plan to achieve EuroSafe Imaging’s objectives of promoting appropriate use in radiological imaging, maintaining radiation doses within diagnostic reference levels, encouraging the use of the ALARA principle, promoting the use of up-to-date equipment, empowering patients and joining forces with various stakeholders.

The EuroSafe Imaging Stars initiative was launched under the umbrella of EuroSafe Imaging in early 2016 to support the Call for Action. It has been designed to identify and recognise imaging facilities that enable compliance with radiation protection and that are committed to putting the principles advocated and concepts developed by the European Society of Radiology into practice.

The Stars initiative enables the European Society of Radiology to collect dose data for analysing trends in medical imaging. In addition, the Stars network can use the data for benchmarking and comparing their results with those of their peers. The EuroSafe Imaging Stars initiative provides imaging departments with an incentive to embrace a holistic approach to quality and safety in radiology and thus the Stars network takes efforts to give radiation protection greater visibility while having a positive impact on clinical practice at the same time.

To participate in the EuroSafe Imaging Stars initiative, imaging departments have to perform a self-assessment on their level of radiation protection. Therefore, an applicant department has to complete an online application form. The list of criteria of the self-assessment is divided into five sections and imaging facilities will be awarded up to five stars depending on how many criteria of a certain level they fulfil. However, some criteria are mandatory, for example participation in the survey series to collect CT dose data entitled ‘Is your Imaging EuroSafe?’ In addition, the self-assessment also includes questions on the PCT protocols and automatic dose recording, dose optimisation, justification, equipment quality clinical audit, or the use of a clinical decision support for imaging referral guidelines. After successful evaluation, the participating imaging departments are awarded the respective number of stars from one to five and listed on the ‘Wall of Stars’ according to the level attained. Participating facilities have to undergo the self-assessment biannually to renew their star status.

EuroSafe Imaging aims to promote quality and safety in medical imaging well beyond Europe and to reach other regions to follow suit. Thus, imaging departments worldwide can apply to become a EuroSafe Imaging Star, provided that the departments have an ESR member in good standing. EuroSafe Imaging serves as a role model for radiation protection campaigns on other continents, where initiatives like Latin Safe (LAC country), the pan-African AFROSAFE initiative, Canada Safe Imaging and Japan Safe Imaging have recently been established.

As of January 2017, 41 facilities from 17 countries worldwide have joined the EuroSafe Imaging Stars network, with another 25 applications currently in the process of evaluation.

If your department is not a EuroSafe Imaging Star yet, don’t miss the chance to apply online or at the EuroSafe Imaging booth, located in the ECR exhibition area.

You can also attend the dedicated session on the EuroSafe Imaging Stars today, 18:00-17:30, Room M6. This session will present the EuroSafe Imaging Stars initiative in detail while also focusing on limitations and how to improve the concept.

By Guy Frija and Lorenzo Bonomo

EuroSafe Imaging Stars: Innsbruck Medical University in Austria

EuroSafe Imaging Stars is EuroSafe Imaging’s latest initiative to promote quality and safety in medical imaging. By recruiting a network of imaging departments committed to best practice in radiation protection, the Stars initiative will give radiation protection efforts greater visibility, have a direct impact on clinical practice and enable the European Society of Radiology to collect data for analysis and benchmarking.
Hungarian Society of Radiologists in 2016

The Hungarian Society of Radiologists (HSR), founded in 1922, had yet another fruitful year in 2016. We had our biennial national radiology meeting in June in Budapest, with more than 450 participants and more than 360 lectures. The main topics included emergency radiology, quality control and modern MR techniques. We had numerous clinical-radiological symposiums where the importance of cooperation and consultation between radiologists and clinicians was emphasised. The topics included MSK, stroke, emergency medicine, gynaecology, pulmonology, urological radiology, liver diagnostics and interventional radiology. We also had joint symposiums with the Hungarian Society of Nuclear Medicine as well as the Hungarian Society of Emergency Medicine. Moreover, there were 29 invited foreign speakers from countries like Austria, Belgium, Croatia, Germany, Turkey and the UK on various topics of diagnostic and interventional radiology. We were very proud to welcome the official delegation from the Royal College of Radiologists in 2016, led by then-president, Giles Mackell, who presented five lectures on modern MR techniques and MR diagnosis on liver, breast, gynaecological and rectal tumours. It was also our honour to enjoy two lectures by Professor Paul M. Fari- zel, President of the ESR.

In addition, two more activities related to breast imaging and the International Day of Radiology (IDoR) and neuroradiology research in Pécs may be of interest for our readers. The Section of Breast Imaging of the Hungarian Society of Radiologists held a successful professional meeting and public appearance press conference on IDoR. This year’s breast imaging subject was a good opportunity to have a roundtable conference among national screening centres and authorities about subjects such as differences in screening protocols, transition to digital mammography, the steps towards tomosynthesis and how to prevent medical fraud. This is an important issue in our country because the authorities are not effectively protecting the public from medical frauds who offer patients screening and diagnostics with non-approved equipment, which does not use compression or radiation.

The Hungarian IDoR press release referred to EUSOBI’s five points against breast cancer, which included statements like ‘mammography saves lives and life quality – it can decrease breast cancer death by up to 45%’ and ‘a woman has breast symptoms, the breast radiologist is the doctor to meet’. (See also https://healthmanagement.org/htw/healthmanagement/issuearticle/mammography-is-the-most-proven-screening-method).

Hungary introduced an organized screening programme with free participation very early on (2003), which involves all women between 45 and 65 years of age for a biennial mammography examination. Even after completing the 7th cycle, the average participation is quite low (45–60%). Their focus is to motivate the public to be more health conscious, to raise breast cancer awareness and to achieve 70–75% participation in the nationwide breast-screening programme. In 2015, a Tesla Siemens MR scanner was installed at the Pécs Diagnostic Center, mainly for research purposes. In the same year, a small MR research group was established including an information technologist, a physicist, a biologist and several physicians from the neighbouring neurology and neurosurgery clinics. This research group, named MTA-PTE Clinical Neuroscience MR Research Group, became an official Hungarian Academy of Sciences-funded research group in 2012, and this successful structure has not changed since. In the past five years, the research group has published around 80 articles in peer-reviewed international journals with a cumulative impact factor of around 60. These publications have already received over 350 independent citations. The research group, due to the widely different background of its members, has diverse research topics inherently connected by the utilisation of cutting-edge MR imaging and evaluation methods. These topics focus on two main aspects. The first is basic research on human ‘higher-level’ cognitive brain functions that cannot be assessed using animal models (language organisation, addiction, schizophrenia, etc.). The second is basic and clinical research of different neurologic disorders where in the structural alterations of the central nervous system plays a prominent role during their pathomechanisms (epilepsy, TBI, multiple sclerosis, migraine, etc.). Besides being part of the Hungarian Brain Research Programme, our research group also participates in EU Seven Framework projects (Center-TBI, I. Family).

By Viktor Bérczi, Gábor Forrai, Peter Bogner

#ECR2017
myESR.org
European Radiology: 25 years of excellence

The ESR’s flagship journal, European Radiology, celebrated 25 years of publication in 2016. We spoke to Prof. Albert L. Baert, the journal’s Editor-in-Chief from 1995 to 2007, Prof. Adrian K. Dixon, who headed European Radiology from 2008 until 2013, and our current Editor-in-Chief, Prof. Maximilian F. Reiser. Together, they gave us a comprehensive account of the journal’s development during the last quarter of a century.

ECR Today: How have you seen the journal develop during the past 25 years?
Albert L. Baert: During this time period the number of published articles has increased spectacularly from 60 articles per year in the first issue to more than 400 per year now. For example, no less than 4,674 issues to more than 400 per year from 60 articles per year in the first articles has increased spectacularly.

Maximilian F. Reiser: The journal’s development during the last quarter of a century.

Adrian K. Dixon: Helping with the rise in the Impact Factor and speeding up the turnaround time for decisions and subsequent publication.

Maximilian F. Reiser: Over the last three years, the number of submissions has increased dramatically. While we are extremely happy that so many authors are interested in publishing in European Radiology, it also means an increased workload for the Editorial Office and the editors. This has presented us with many difficulties, but we have undertaken enormous efforts and managed to tackle this growing number of manuscripts. We were lucky enough to be able to recruit two excellent new Deputy Editors to our team, Dr. Suajil Deawi from London, UK, and Prof. Jean-François Geschwind from New Haven, US. Prof. Ralph Kulik from Baden, Switzerland, Prof. José María García Santos from Murcia, Spain, and Prof. Peter Vock from Berne, Switzerland, continue to support me with their competence and expertise, which I am very grateful for.

ECRT: Which direction do you think the journal, and publishing in general, will take in the future? Maximilian F. Reiser: With the introduction of European Radiology Experimental, our family of ESR journals has been supplemented in a very logical way. Insights into imaging has developed wonderfully under the guidance of Prof. Robert Herman, so that in the future, all three journals can best meet the individual demands of radiological scientists.

The proliferation of open access journals presents established scientific journals with a challenge; something that also concerns European Radiology. Our top priorities are to make sure that the quality of our published articles meets the highest scientific standards and that our readers can rely on the fact that all published manuscripts have undergone a strict independent and anonymous peer review process.

Prof. Albert L. Baert: As my colleagues mention, it is quite remarkable to notice that the end of printing scientific material on paper may be in sight due to electronic publication, which is now widely accepted by the scientific community. The increasing trend to ‘open access’ will certainly be another challenge for the future years!

Prof. Prof. Adrian K. Dixon: Emeritus Professor of Radiology at Cambridge University and an honorary consultant radiologist at Addenbrooke’s Hospital, Cambridge. He was Editor-in-Chief of European Radiology from 2008 to 2013.

Prof. Maximilian F. Reiser is the outgoing chair of the Ludwig Maximeum’s University’s department of radiology in Munich, and has been the Editor-in-Chief of European Radiology since 2014.
Belgian Society of Radiology to promote appropriate use of medical imaging

In Belgium, about 1,400 radiologists assume the important daily task of providing high-quality imaging in the diagnosis, staging and follow-up of women, men and children seeking medical care. With about 11 million inhabitants, each radiologist in Belgium serves an average population of about 8,000.

The Belgian Society of Radiology, founded in 2013 according to Belgian law on professional organisations, is an effective merger of three pre-existing radiological societies, including a scientific and a professional wing. Its goals are to defend, study, protect and foster both the scientific and professional interests of all Belgian radiologists. The merger of the three societies has had several advantages: it has allowed harmonisation of professional interests, increased visibility and accessibility of radiological executive bodies for all stakeholders, and has facilitated more efficient and influential representation at the governmental level.

Professional defence

Such representation is very important. It is a recurring problem that radiological work not is assessed on its merits, but rather on its budget that is invariably perceived as too large, including excessive remuneration. Both policymakers, opinion leaders, the (popular) press and the general population tend to associate growing medical imaging expenses with the greediness of radiologists, especially in a fee-for-service system. Certainly, the Belgian medical imaging budget is a closed budget. That means that any budget over-run in the past has been compensated repeatedly through depreciation in reimbursement. The misconception idea that Belgian radiologists, working in a fee-for-service system, greedily encourage their referring clinicians to order as many radiological examinations as possible to raise their income is a total myth and awfully naive. In a closed budget system, only the workload is increased, not the profits.

Thirdly, the volume of medical imaging in Belgium is exclusively determined by the number of exams ordered by referring physicians (general practitioners and specialists) as radiologists have no auto-prescription right, i.e. they are not allowed to order radiological examinations. Not all ordered examinations turn out to be justifiably ordered, i.e. consistent with guidelines for appropriate use of medical imaging, but add to the total volume of medical imaging and put additional pressure on the medical imaging budget. Although it is tempting to label such exams as ‘a useless waste of time and money’, they can be understandable to some extent, as physicians (especially in emergency departments) are constantly expected to make the right diagnosis and initiate the right treatment in all circumstances, even for trivial complaints. For them, medical imaging is often an obvious solution to measure their anxious patients or to be on the safe side even though the indication is not in accordance with the guidelines. Nevertheless, it is a very legitimate question whether national health insurance providers should be financially responsible for such investigations.

For that reason, the Belgian Society of Radiology has been positively collaborating with the government for many years to promote the appropriate use of medical imaging through initiatives such as the publication and electronic distribution of the Belgian Medical Imaging Guidelines (www.health.belgium.be/radiologie-belgium), an annual media campaign ‘Medical images are no holiday snaps, use them wisely’ aiming at informing the general population through radio spots about the disadvantages of unnecessary exams, and a quarterly magazine Focus on Medical Imaging (www.focusmedicalimaging.be), targeted at referring physicians in an attempt to improve the efficient use of imaging in selected clinical cases. Such initiatives seek to promote the use of non-irradiating techniques such as magnetic resonance imaging (MRI) instead of CT scans, and to avoid unnecessary examinations, enabling budget control through volume-reduction rather than repetition of MRT examinations.

The positive effects of these initiatives have been limited by two major problems so far:

Substituting MRI for CT requires sufficient access to MRI, and this poses a particular problem in Belgium because the use of an MRI machine is subject to a national policy, a constraint that has never existed for the use of CT scanners. Therefore, CT scanners are sufficiently accessible and available throughout the country, in contrast to MRI scanners, which suffer from long waiting lists. Referring physicians therefore frequently opt for a ‘quicker’ CT scan instead of an MRI, despite the fact that CT for some patients, or for some symptoms, is not the most appropriate exam. This adds to the total population radiation dose, but also inflates the total amount of exams (first a quick CT and then an MRI anyway). After long negotiations, the Belgian Society of Radiology came to an agreement with the Federal Government to extend the national programme with an additional MRI scanners (seven in Flanders and five in Wallonia, now totalling 11 machines throughout the country, 1.1 machines per 100,000 inhabitants) but their effect on the substitution rate still needs to be established.

Although adherence to the guidelines can be expected to improve through information campaigns, this process is a passive one. Solutions such as an active decision support system (e.g. ESR Guide), embedded in an electronic ordering system, provide referring physicians with pertinent evidence-based imaging guidelines tailored to the clinical context of their patient at the time of ordering an exam. Hence, patients will be referred for unjustified exams less often, alleviating the pressure on the medical imaging budget through volume-control rather than tariff deprecation. Therefore, the Belgian Society of Radiology is currently collaborating with the government for the nationwide implementation of such an active decision support system in Belgium.

Scientific activities

The Belgian Society of Radiology has an independent Scientific Council, fostering and promoting all kinds of scientific activities. It publishes scientific news and information on major issues on the ESR website (esr-web.be), provides a scientific meeting database and an online database of educational resources and supports PhD theses, along with many other activities.

The Annual Symposium is held every year in November, and Section Meetings are held throughout the year in every radiological sub-discipline. It is of great interest that two new Sections have been founded recently: the first one is the Young Radiologist Section, gathering all Belgian residents-in-training and radiologists within five years of their graduation. This is a very active sector that succeeds in attracting many young radiologists to its dedicated meetings, as well as to the Annual Symposium, during which it organises an extremely well attended parallel programme dedicated to the young. The most recent section is the Leadership, Management and Quality Section, aiming at increasing the engagement of radiologists in leadership and encouraging them to take part in ongoing managerial education and attend leadership development programmes.

Scientific reporting and publishing is also encouraged through the Journal of the Belgian Society of Radiology (www.jbsr.be), formerly published as the Journal Belge de Radiologie (JBR-BTR). It is an open-access online journal indexed by several services, such as CrossRef, DOAJ, EBSCOHost and Google Scholar.

Conclusion

The Belgian Society or Radiology is a recently unified society that manages both the professional and scientific interests of the very active Belgian radiological community. Through the integration of both interests, a more efficient and influential representation at the governmental level has been achieved, promoted a more confident approach towards future challenges.

Prof Geert M. Villes is professor of radiology at Ghent University Hospital and President of the Belgian Society of Radiology.
European Diploma in Radiology continues to thrive

As EDiR Scientific Director I am very happy to announce that 300 candidates have sat the EDiR examination at ECR 2017. This beats the previous record number of candidates at a single examination, increasing the number who sat for the ECR 2016 examination by more than 140%.

This important step forward has been possible thanks to the new examination structure which was implemented at ECR 2016. Due to the exponential growth in the number of candidates at the EDiR examinations, new approaches to the oral part of the EDiR were necessary with the aim of reaching the maximum number of potential candidates. While candidates used to be tested in the old oral examination one by one, they now take the Clinically Oriented Reasoning Evaluation (CORE), which is a computer-based examination that simulates the daily routine of a radiologist at work. This way more candidates are able to take the examination simultaneously and their skills, attitudes and knowledge can be easily evaluated. Additionally, the new platform enables the possibility of taking the examination online such as the first online EDiR that was successfully conducted in Istanbul last October.

Furthermore, the evaluation and scoring process has been improved by the CORE section and it has proved to be better at discriminating the candidates who have the competences according to the European Training Curriculum for Radiology (ETC) Levels I and II from those who do not have them.

Now the scores of candidates taking the CORE section are more homogeneous than those of candidates who previously took the oral section. This means that the examiners are more consistent when marking the case.

The box plots below depict the variation in the scores (y-axis) of the candidates per examination (x-axis). The spacing between the top and the bottom of the boxes of the oral examinations is larger than in the CORE examinations. This means that there is more variability in the scores for the oral part than for the CORE part. This could be due to several reasons, such as that now the same examiner marks the same case for all the candidates and therefore applies the same criteria for all of them. The scoring is more objective in the CORE part and the examiners assign the same score to similar qualities of exams. This fact guarantees the quality of the examination and makes EDiR a very objective and reliable test for the knowledge in radiology.

Based on the results obtained after the statistical analysis, we can confirm that these results will be true for any examination. Actually, for any examination we can foresee that a candidate that fails the CORE part will have around 63.99% and a candidate that passes the CORE part will have around 83.44%.

Giving its high scientific standards, the EBR aims to extend access to the examination, and I would like to highly recommend all heads of department to encourage their residents and younger colleagues to take the EDiR. This would be a breakthrough towards European harmonisation of educational standards in radiology.

Prof. José Vilar is former Head of Department of the Hospital Dr. Peset in Valencia. He is the current EDiR Scientific Director (since ECR 2015), and an EDiR examiner.

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**European Radiology**

**25th Anniversary Session**

Friday, March 3, 2017, 16:00-17:30, Room 2

**Celebrating Years of European Radiology**

**First performance evaluation of a digital CT (QCTi) system**

**T.A. Fichtner, T.U. München**

**64-CT-CTA-advanced magnetic resonance imaging of hepatic-circular contrast dynamics with intravital grading and portal blood flow T. Knappe, S. G. Zentgraf**

**EBR proctored MR guidelines 2012**

**B. G. H. Berends, Netherlands**

**Hybrid graphic stochastic models and polygon-based contrast media enhanced ESR, contrast medium safety committees guidelines**

**E. J. Herrmann, Switzerland**

**Retinal reconstruction techniques for computed tomography Part 1, technical principles**

**P. C. Weiskopf, Germany**

**myESR.org #ECR2017**
ESCR expands activities in cardiovascular imaging education and research

The former European Society of Cardiac Radiology is now the European Society of Cardiovascular Radiology (ESCR) with a record number of members of more than 1,500. The name change was unanimously voted upon during the General Assembly in Krakow in October 2016. From now on the ESCR will continue its work under this new name. This modification reflects the evolving interest and demand from Society members to also cover topics in the field of vascular imaging.

Clinical consequences

<table>
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<th>Cardiac MR (n=78,036)</th>
<th>Cardiac CT (n=58,849)</th>
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<tr>
<td>No further invasive diagnostics</td>
<td>32.5 % (n=25,381)</td>
<td>36.0 % (n=21,364)</td>
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<tr>
<td>Impact on interventional procedure</td>
<td>6.0 % (n=4,680)</td>
<td>21.7 % (n=12,730)</td>
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<td>Direct referral to catheter laboratory</td>
<td>2.5 % (n=1,925)</td>
<td>4.9 % (n=2,890)</td>
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<tr>
<td>Patient discharge</td>
<td>4.4 % (n=3,404)</td>
<td>5.0 % (n=2,950)</td>
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<tr>
<td>Change of drug regime</td>
<td>5.6 % (n=4,409)</td>
<td>2.4 % (n=1,422)</td>
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Multiple clinical consequences for one imaging study possible. ESCR MR/CT Registry Data analysis as per October 2016.

Table 1: Data on the clinical consequences of MR and CT studies, generated from the ESCR Cardiac MR/CT Registry.
The Russian Society of Radiology (RSR) was founded in 1916. Its founding father was the famous Russian radiologist Prof. Mikhail Nemenov (1890–1950). After the disintegration of the Soviet Union in 1991, the Society was re-organised into the Russian Association of Radiologists (RAR). In 2016, the Russian radiological community decided to change the name of the Society back to the original one – the Russian Society of Radiology.

The RSR has been involved in ESR activities since 1972 when it joined the European Association of Radiology (EAR) upon invitation from Prof. Guy Delorme, then-president of the EAR. Every year 500 to 600 Russian radiologists attend the annual congress of the ESR, the European Congress of Radiology (ECR), and our country is always in the top ten ECR countries by attendance. It is important to note that since 2011 the number of oral presentations and abstracts from Russia has been steadily increasing. The presence of Russian radiologists in different committees and subcommittees is more and more visible, and one can mention the names of I. Turin, I. Pronin, E. Maražić (Croatia), member of ESR Executive Council; Prof. Gusieppe Gugliemi (Italy), President of the European Society of Musculoskeletal Radiology; Prof. Mansoor Fatehi (Iran); Prof. Parizel delivered an honorary lecture. The presence of Russian radiologists became ESR members with the help of the RSR. Russian cities and towns and over 1,500 nuclear medicine specialists, but we are expecting rapid growth in the number of oral presentations and abstracts from Russia have been involved in ESR activities. We are happy to see that more and more Russian radiologists pay their ESR membership fees through their national society (RSS). In 2016, 60 Russian radiologists became ESR members with the help of the RSR.

The RSR has ambitious plans to expand its activities in all spheres of modern radiology and nuclear medicine. Our future would be unthinkable without close cooperation with the ESR and other European and international radiological societies. The Russian Society of Radiology and the RSR would like to congratulate ECR 2017 attendees from all over the world and wish them a great congress!

More information on the Society can be found at www.russian-radiology.ru

Prof. Mikhail Nemenov (1890–1950), the founder of the RSR.

Prof. Pavel Vlasov was the first President of the RSR (1922–1932). He was followed by Prof. Vladimir Kharchenko, who for many years directed and improved our professional organisation. He still plays an important role in the Executive Board of the Society. Prof. Alexander Zhubanov, a well-known Russian specialist in ultrasound, served as President of the RSR in 2007–2011. From 2011 to 2016, Prof. Nadejda Rokhova served as President of the RSR. Under bar guidance the Society expanded its activities and launched some new initiatives. In 2016, Prof. Valentin Sinitsyn was elected as the new Society’s president, and the RAR was renamed the RSR with some changes in the Society’s statutes. The RSR annual meetings take place in the second week of November, around the date of the International Day of Radiology (IDDR, November 8). The RSR organises and supports multiple teaching and scientific meetings in different formats all over Russia. The country has a new system of CME and participants in these courses can collect CME credits.

In 2016, the RSR Jubilee Congress had a record attendance with 2,058 participants from 287 Russian cities and towns and 13 foreign countries. The ESR was a guest of the congress with a nine-hour booth to promote ECR 2017. Among our special guests and honourable speakers were Prof. Boris Bokšč (Croatia), member of ESR Executive Council; Prof. Giuseppe Gugliemi (Italy), President of the European Society of Musculoskeletal Radiology; Prof. Mansoor Fatehi (Iran); Prof. Christoforos Fatehi (Iran); and Prof. Valentin Sinitsyn (ECR 2014 President) and Prof. Nadejda Rokhova, both leading Russian radiologists, presented state-of-the-art lectures on the modern aspects of diagnostic imaging.
Radiologists from different countries in the European Union face a variety of professional issues. Income, labour conditions, relationship with the industry and other factors affecting radiologists are changing in Spain, and in Romania as well. At the annual meeting of the Romanian Society of Radiology (Sociedad Española de Radiología Médica – SERAM) must adapt to these new circumstances in order to continue providing a good service to its members.

The economic crisis and its impact on our profession

The economic crisis has been especially rough in the Mediterranean countries, and in Spain it has had a deep impact not only on the recruitment of radiologists but also on technology acquisition. Technological obsolescence is a concern for radiologists in Spain, and also for SERAM. An external document explaining the state of radiology equipment in our country has been published in Spain, SERAM is working on the specification of rules or recommendations that define not only the best technical characteristics of all radiological equipment, but also when it needs to be updated or replaced.

New relationships with the industry and its impact on radiological education

There is a demanding ethical code in Spain that has to be followed by both sponsors (industry) and radiologists. However, the national transposition of new European regulations of the sector forces us to face a new situation with a different way of managing sponsorship funds for training, especially concerning fiscal uncertainty due to tax arrangements. This new situation, added to the low income of many radiologists, might threaten many training activities aimed at these professionals. SERAM is facing this new situation by playing an active role in the dialogue between industry, radiologists and professional organisations and institutions. Otherwise, it might be difficult to continue arranging this specific training.

New ways of training

In this new and predictable scene, SERAM must change and adapt the way we arrange courses and conferences so that they become more available and can benefit from the new technologies. We believe that training activities should change both formats and ways of delivery and benefit from the new ways of communication. Virtualisation, social networks, video streaming and other emerging ways of communicating should be at the core of any training activity. The SERAM National Conference is one of the most important events of its kind and possibly the biggest in the Spanish-speaking world intended to expand in future meetings and widen their scope in order to enhance radiology training in Spanish.

Professionalism

All these changes mentioned so far are already taking place or will be a fact in the coming months, which is leading us to redefine our profession.

One important goal of SERAM is to promote professionalism so that our members can benefit from better management skills and access documentation and information that will allow them to reach the highest standard in their daily practice.

Professional accreditation and certification is another way of promoting radiologists and another objective of SERAM. Thus, we are working with other medical societies and professional institutions in order to implement the most advanced models of competence certification. Our purpose is to make certification of professionals and radiology units more accessible. The final result will be a better service for our patients.

Beyond radiology

Radiology is changing fast and this is a reality of which SERAM is very keenly aware. In a few decades’ time, our profession will have nothing in common with the way we see it now. Therefore, we must adapt to the new technologies: artificial intelligence, collaborative networking, 3D printing, 4.0 industry, which are just some of the innovations that will be a reality in a few years, and which will be a challenge for us.

But this challenge is something that we cannot and must not take for granted. We have to establish new ways of collaborating with other disciplines, and in order to achieve this, SERAM is participating in projects with engineers and physicists so our conferences and courses become really multidisciplinary.

Conclusion

SERAM is facing new and demanding challenges. Radiology is immersed in a revolution that is not only technological, but also economic and social. We think that we will succeed if we face this situation by enhancing professionalism, applying new technologies, certifying our radiologists and promoting multidisciplinarity. We are working hard to adapt to these changes and hope we will be successful because our members deserve a bright future.

Prof. Ángel Gayete Cara is Clinical Chief of Radiology at Parc de Salut Mar (Hospital del Mar) in Barcelona, Spain, associate professor at the Autonomous University of Barcelona, and President of the SERAM. Prof. Pablo Valdés Solís is Head of Department at Agència Sanitària Costa del Sol in Marbella, Spain, and Vice-President of the SERAM.

Novelties and perspectives in 2017 for radiologists in Romania: education, subspecialisation, research

The next SRIM Congress of Radiology will take place in Bucharest, Romania, October 6–8, 2017.

The main priorities in 2017 for the Romanian Society of Radiology and Medical Imaging (SRIM) will be completing the restructuring and upgrading of the best practice guide in medical imaging and strengthening professional relationships with other imaging professional European subspecialty societies. These societies include the European Society of Gastrointestinal and Abdominal Radiology (ESGAR), the European Society of Neuroradiology (ESNR), the European Society of Oncologic Imaging (ESOI), the European Society of Pediatric Radiology (ESPR), the European Society of Thoracic Imaging (ESTI) and the European Society of Uniparental Imaging (ESUI).

The Society will also work to structure the final specialty exam in line with the European Society of Radiology (ESR) model and standardise this model across all training centres in Romania.

Disseminating information received from affiliated ESR professional subspecialty societies, like the European Society of Cardiovascular Imaging (ESCI), the European Society of Emergency Radiology (ESER) and other subspecialty and professional societies, will also continue to be one of SRIM’s main activities in 2017.

In addition, advising and following up on the training of resident doctors and young specialists to ensure research publishing, and subspecialisation will continue. The Ministry of Health has also decided to return to a five-year duration for residency training in radiology starting on January 1, 2017. The main objective of SRIM is to raise the scientific level and professional knowledge within different imaging fields. To this end, SRIM will organise the following radiology events for the year 2017. We hope that 2017 will be an excellent and fruitful year for all radiologists and their teams, with new opportunities and new horizons in radiology and medical imaging.

Prof. Ioana Lupescu is professor of radiology at the University of Medicine and Pharmacy ‘Carol Davila’, Faculty of Medicine, Bucharest, Romanian head of the radiology, medical imaging and interventional radiology department of Fundeni Clinical Institute, Bucharest, and President of the Romanian Society of Radiology and Medical Imaging.
Special Exhibition:
The Better Half:
Jewish Women Artists Before 1938

JÜDISCHES MUSEUM WIEN
1010 Vienna, Dorotheergasse 11
www.jmw.at

Bettina Ehrlich-Bauer, Self-portrait, 1928 © Belvedere Archives, Vienna, Photo: Bruno Reiffenstein
**THEATRE & DANCE**

**Die Welt im Rücken**
- based on the novel by Thomas Melle
- AKADEMIETHEATER | 19:30
- 1030 Vienna, Lisztstraße 1
- Phone: +43 1 51444 4145
- www.burgtheater.at

**Kunst**
- by Yasmina Reza
- BURGTHEATER | 20:00
- 1010 Vienna, Universitätsring 2
- Phone: +43 1 51444 4145
- www.burgtheater.at

**Harold und Maude**
- by Colin Higgins
- KAMMERSPIELE DER JOSEFSTADT | 19:30
- 1010 Vienna, Josefstädter Straße 26
- Phone: +43 1 42 700 300
- www.josefstadt.org

**Grünmandl**
- Famous Austrian actor and comedian
- Andreas Vitések revives the life and career of a well-known predecessor
- RABENHOF | 20:00
- 1030 Vienna, Rabengasse 3
- Phone: +43 1 712 82 82
- www.rabenhoftheater.com

**THEATRE & DANCE**

**Einf Käthchen.Traum**
- by Gernot Plass, based on ‘Das Käthchen von Heilbronn’ by Heinrich von Kleist
- TAG – THEATER AN DER GUMPENDORFER STRASSE | 20:00
- 1060 Vienna, Gumpendorfer Straße 67
- Phone: +43 1 5865222
- www.dashtag.at

**Das Mädl aus der Vorstadt**
- by Johann N. Nestroy
- THEATER IN DER JOSEFSTADT | 19:30
- 1080 Vienna, Josefstädter Straße 26
- Phone: +43 1 42 700 300
- www.josefstadt.org

**Opera & Musical**

**Don Giovanni**
- by Wolfgang Amadeus Mozart
- VOLKSPER | 19:00
- 1090 Vienna, Währingerstraße 78
- www.volksoper.at

**Turandot**
- by Giacomo Puccini
- Conducted by Paolo Carignani
- With Elena Pankratova, Heinz Zednik, Ryan Speedo Green, Stefano La Colla, Anita Hartig
- WIENER STAATSSPER | 19:30
- 1010 Vienna, Opernring 2
- www.wiener-staatsoper.at

**Schikaneder**
- Musical by Stephen Schwartz & Christian Struppeck
- RAHMUNDTHEATER | 19:30
- 1060 Vienna, Wallgasse 18-20
- www.musicalvienna.at

**Concerts & Sounds**

**Wolfgang Muthspiel Quintet**
- Jazz
- KONZERTHAUS | 19:30
- 1030 Vienna, Lothringerstraße 20
- www.konzerthaus.at

**OZMA ‘Welcome Home’ (France)**
- PORGY & BESS (JAZZ) | 20:30
- 1010 Vienna, Riemergasse 11
- www.porgy.at

**State Champs (US)**
- ARENA (POP & ALTERNATIVE) | 20:00
- 1030 Vienna, Baumgasse 80
- www.arena.co.at

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Please note that all theatre performances are in German.