Post-mortem imaging can reveal hidden trauma missed in autopsy

CT angiography (CTA) and other methods can shed light on death investigations in ways that autopsy can’t do. CTA, for example, allows doctors to look for bleeding points, while dual-beam CT depicts soft-tissue differentiation and bruising, and the technique is useful to investigate post-surgical deaths and identify trauma areas deep in the pelvis and around the spine, which are usually difficult to see without extensive dissection.

“Techniques used in the living will be increasingly applied to the dead, as well as those that aren’t – such as injecting air into structures such as the chest cavity to better visualise CT findings,” noted pathologist Dr. David Ranson, deputy director of forensic services at the Victorian Institute of Forensic Medicine (VIFM), Melbourne, Australia.

Death investigations now use a collection of tools that make a formidable complement – and often alternative – to the traditional autopsy. Imaging has already halved the forensic autopsy rate in Melbourne, and emerging techniques are gaining ground for the examination of deceased subjects.

For Ranson, CT provides a 3D record that can be consulted long after the body has been buried or cremated, when improved software might provide better detection and visualisation of disease, foreign objects and trauma, or when a second opinion is desired. Other benefits include early detection of dangerous elements, including sharp objects such as mesh or stents, and of infectious diseases indicated by cavitating lesions found in tuberculosis, for example.

In the recent spate of terror attacks, imaging has proved pivotal in both identifying victims and circumstances.

“The body is a structure that absorbs the explosion, and is often penetrated by glass, brick, and fragments of the device. These objects are protected from subsequent fire and the body becomes a preserved part of the crime scene. The objects can be identified and carefully extracted to allow for forensic examination,” Ranson told ECR Today ahead of the congress. “In addition, whole body CT is incorporated into the dismember victim identification process and has been recently used in Belgium and France.”

To illustrate how imaging can assist in the investigation of other objects in a forensic setting, he described a specific case.

“We were brought a suspicious suitcase. CT imaging revealed that a body was folded up inside it and that it had suffered trauma. Detection of surgical prostheses meant that we could also identify the victim, all before the suitcase was even opened,” he said.

In Melbourne, around 5,500 to 6,000 cases are handled at the VIFM each year to receive a routine whole-body CT scan. Barring dissection, automatic permission to examine a body is granted once it is registered, which includes taking fingerprints, oral swabs, blood and urine samples, and performing x-ray, CT, dental scans, and toxicology. Armed with these results, Australian forensic pathology teams can make a diagnosis of the cause of death.

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He believes developments such as software that streamlines out the bones to look for tumour metastases or skeletal multitrauma will be extended to death investigations in future and that greater use will be made of MRI, which like CT is ideal for tissue differentiation and depiction of oedema bruising.

**Improved clinical work**

At today’s session, Dr. Thomas Ruder; a consultant radiologist at the Institute of Forensic Medicine, University of Zurich, and clinical radiologist at the University Hospital of Bern, plans to describe how post-mortem imaging can improve clinical practice.

“This is an interesting field for clinical radiologists, and there are great opportunities for knowledge transfer and research,” he told ECR Today. “By correlating images to autopsy radiologists can better understand CT and MR findings. With no issue of radiation exposure, we can learn how kV and mA affect image quality. Also we can learn how to accurately distinguish between findings and interpretation, and this improves the quality of clinical reports.”

Ruder often uses a side-by-side comparison of ante-mortem images from local hospitals with post-mortem CT images to identify subjects. Post-mortem CT images may be reformatted to match almost any type of ante-mortem images, even high-quality ultrasound, he noted.

Post-mortem CT lung findings are particularly challenging. Internal lividity may look like pulmonary oedema, and it can even mask pneumonia.

“It is hard to correlate lung image findings to autopsy. One can’t cut the lung into thin cross sections and most likely pathologists won’t find focal findings in autopsy as seen in radiology. This means that we have to be very careful with the interpretation,” he said.

Awareness of the pitfalls related to forensic questions is also vital. Post-mortem CT can, for example, identify the cause of death in a case of hypertensive intracerebral haemorrhage, but imaging cannot clarify the manner of death in such cases, hypoxia may be a natural event or due to cocaine intoxication, and to determine this, toxicological analysis is required.

The future of post-mortem imaging looks set to depend on what is of most interest to investigators, and in the case of cardiac death, on their willingness to accept a probable cause based on imaging findings over a certain cause of death provided by autopsy, according to Ruder. This will shape research and allow better assessment of the true practical potential of imaging.

“Working in a legal setting comes with specific rules and guidelines, noted Prof. Dr. R. van Rijn, paediatric radiologist and chair of forensic radiology at the Emma Children’s Hospital, Academic Medical Center Amsterdam. “First, everything should be kept confidential and all documents and images should be accounted for, including a record of who has access to them in order to preserve the chain of evidence,” he stated. “Second, reporting has to be adapted in order to make the radiology report accessible to lay people, which requires a completely different skill set to clinical radiology.”

He also suggested forensic paediatric radiology might not appeal to everybody.

“The radiologist must be willing to act in court as an expert. Sentiments can be very strong, especially in cases of abusive head trauma,” he said.

**State of the Art Symposium**

**Thursday, March 2, 16:00–17:30, Room G**

**SA 8 Forensic and post-mortem imaging**

- Chairman’s introduction
  P.A.M. Hofman; Maastricht/NL
- Introduction to post-mortem radiology
  T. Ruder; Zurich/CH
- Post-mortem imaging; a pathologist’s perspective
  D. Ranson; Melbourne/AU
- Paediatric forensic post-mortem radiology
  R.R. van Rijn; Amsterdam/NL
- Post-mortem CT and MRI; imaging techniques
  A. Perison; Linkoping/SE
- Panel discussion: What should be the focus of future research?
  P.A.M. Hofman; Maastricht/NL

**ESOR Ten-Year Anniversary Session**

**Friday, March 3, 12:15–13:00**

**Room A**

**Introduction**

Paul M. Parizel, Antwerp/BE

ESOR President

**Ten years of ESOR**

Nicholas Gourtsoyiannis, Athens/GR

ESOR Scientific/Educational Director

**How did ESOR influence my professional development**

Oshaani Abyeyakoon, Cambridge/UK

**Teaching for ESOR: Tutoring scholars and fellows**

Christian Loewe, Vienna/AT

**Celebration**

For further information on the detailed programmes and registration, please visit myESR.org/esor
Eminent neuroradiologist to give honorary lecture on burnout and inequality

In recognition of his significant impact on the field of neuroimaging and his service to organised radiology, Professor Mauricio Castillo from Chapel Hill, NC, United States, has been invited to deliver the Wilhelm Conrad Röntgen Honorary Lecture ‘Dissatisfaction, burnout and inequality: three major challenges in radiology’ at ECR 2017.

Originally from Guatemala, Prof. Castillo completed his radiology and neuroradiology training at the University of Miami School of Medicine, Jackson Memorial Medical Center, and Emory University School of Medicine, Affiliated Hospitals in Atlanta respectively. His specialty and subspecialty choice was in large part motivated by his mentors.

“When I was a medical student, I was fortunate to work in the only teaching hospital that had a CT scanner and two board-certified radiologists. I was very impressed by the impact of imaging in patient care and by the way these two professionals used their large base of knowledge of medicine to generate a differential diagnosis based on imaging findings. Later on, while I was a resident, I developed a close relationship with Dr. Robert Quencer, which led me to become a neuroradiologist. One should never underestimate the influence we may have on our trainees and the influence our mentors have had on us,” he said.

Prof. Castillo’s research interests include paediatric neuroradiology, application of new imaging techniques and medical literature editing. He has authored more than 65 articles and 27 books, including the famous Neuroradiology Companion, a reference work covering the fundamentals of neuroradiology for residents, fellows and practitioners, now in its fifth edition.

Today Prof. Castillo continues to work in clinical research with innovative techniques, especially MRI.

“My interests continue to focus on the clinical utility of new imaging techniques, especially MRI. “My interests continue to focus on the clinical utility of new imaging techniques, especially MRI. "I expect a reduction of the duration of our MRI examinations, as it happened with CT over the past 15 years, with the incorporation of new techniques such as synthetic imaging. Besides, I think our protocols will be refined to target specific populations and diagnoses in which benefits and outcome changes will be obvious. Over the next decade we will also probably witness the development of new MRI contrast agents following the controversies surrounding the gadolinium-based ones, and the continued growth of molecular imaging in cancer and neurodegenerative disorders,” he said.

As universal healthcare is expanding in the United States, he predicts various changes in radiology practice in the years to come.

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Prof. Castillo has delivered more than 1,000 invited lectures all over the world but has never attended the ECR before.

“I am looking forward to building some very nice relationships in March,” he said.

Thursday, March 2, 12:15-12:45, Room A
Wilhelm Conrad Röntgen Honorary Lecture
Dissatisfaction, burnout and inequality: three major challenges in radiology
Mauricio Castillo, Chapel Hill, NC, US
HOT SHOTS FROM DAY 1

Photography: S. Kreuzberger, F. Hübli
Education central to improving imaging data quality in oncology clinical trials

Imaging data is key in multicentre clinical trials for cancer research but quality control is currently a major impediment, bringing the validity of the trials into question and potentially impacting on the quality of drugs put on the market, a panel of experts will argue today in a session held by the ESR and the European Organisation for Research and Treatment of Cancer (EORTC).

Imaging is increasingly contributing to cancer research thanks to the development of innovative techniques that depict functional and molecular processes. In most oncological clinical trials, imaging is now the primary criteria used to evaluate progression of disease or efficacy of the drug being tested.

The best way to obtain valuable imaging measurements is to involve the imagers who take part in these trials and educate the clinician investigators, experts will explain in the session.

When it comes to imaging in cancer research, a number of issues take centre stage. Difficulties associated with integrating imaging biomarkers into trials have been neglected compared with those relating to the incisions of tissue and blood biomarkers, largely because of the complexity of imaging technologies, safety issues related to new contrast media, standardisation of image acquisition across multidetector platforms and various post-processing options available with advanced software, as reported recently in The Lancet by the EORTC and leading researchers.

Unfortunately, radiologists are often not involved in multicentre clinical trials at the trial development stage and this may challenge the quality of the data acquired, according to Prof. Laure Fournier, a radiologist at Hôpital Européen Georges Pompidou in Paris. "Oncologists often just rely on measurements and don't ask for the image. They just want a value. But quality control of this value is something only the imager can do," said Fournier, who will focus on education issues in her talk.

"Radiologists must be trained to use the appropriate protocols for an ongoing trial. Image acquisition is usually not an issue, since good imaging criteria must be transposable to all machines. But radiologists must be trained to evaluate data according to international criteria, because these criteria are specialised. Clinicians, for their part, must understand the implications of using imaging data in their trials and they must be aware of these pitfalls when they design their studies." Communicating and raising awareness amongst all specialists is crucial. Clinicians must understand what is at hand and try to involve the imagers upstream more," said Fournier, who suggested regulating bodies such as the FDA or EMA should also be educated in that sense. "If the quality of imaging endpoints is not controlled, then quality in drugs put on the market is at risk," she said.

Fournier acknowledged the importance of centralised reviews by independent imagers, a strategy currently used by the EORTC to verify quality of imaging data. However, she underlined that this plan comes a little late and implies losses, because a lot of data has already been used by the time it is evaluated by an independent panel. "Patients have already been included and treatment discontinued based on local readings of images," she said.

Local communication and funding are cornerstones in future strategy development, according to Prof. Fournier. "Imaging departments need local funding to have the appropriate personnel to follow all the necessary protocols in the study," she said.

To improve quality control, the EORTC has adopted a practical risk assessment plan before study initiation and has identified 22 risks that might exist in the integration of imaging biomarkers into clinical trials, from risks to patient care to methodological and operational risks to the study.

Risk assessment should be done by a multidisciplinary team, including imaging experts, oncologists, and study project managers, and it should be reviewed and updated throughout the trial to ensure that actions have been or will be taken.

The authors also included a stepwise list of recommendations for investigators designing clinical trials that include imaging from protocol development to site activation and the end of the trial. "A position paper is just the first step; we need to start a discussion with stakeholders and improve the situation now. We need to know the danger, when we do clinical trials it's not just imaging the patient, there are many steps in preparation to help achieve quality so we need to identify risks first and have enough resources for this methodology before to avoid problems," Liu said.

By Mélisande Rouger

Dr. Yan Liu from Brussels is co-chair of today’s joint session of the ESR and the EORTC.

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Unfortunately, radiologists are often not involved in multicentre clinical trials at the trial development stage and this may challenge the quality of the data acquired, according to Dr. Yan Liu, clinical leader of the Medical and Translational Research, Radiotherapy and Imaging department at the EORTC headquarters.

"Ignorance of these pitfalls directly affects the quality of the imaging read-out, leading to trial failure, particularly when imaging is a primary endpoint. When radiologists are not involved early enough in the trial, risk identification is not in place. Involvement of radiologists should be encouraged and increased," said Liu, who is also a trained radiologist.

Lack of proper training for radiologists or radiographers is one of the main causes of quality problems and errors, because protocols are not properly introduced at the start of the trial. Imagers may not adapt their parameters according to what is being studied, nor may they include the necessary quantitative measurements in their reports.

The problem is that clinicians in charge of deciding clinical performance of drugs are not able to control the quality of these measurements, according to Prof. Laure Fournier, a radiologist at Hôpital Européen Georges Pompidou in Paris. "Oncologists often just rely on measurements and don't ask for the image. They just want a value. But quality control of this value is something only the imager can do," said Fournier, who will focus on education issues in her talk.

"Radiologists must be trained to use the appropriate protocols for an ongoing trial. Image acquisition is usually not an issue, since good imaging criteria must be transposable to all machines. But radiologists must be trained to evaluate data according to international criteria, because these criteria are specialised. Clinicians, for their part, must understand the implications of using imaging data in their trials and they must be aware of these pitfalls when they design their studies." Communicating and raising awareness amongst all specialists is crucial. Clinicians must understand what is at hand and try to involve the imagers upstream more," said Fournier, who suggested regulating bodies such as the FDA or EMA should also be educated in that sense. "If the quality of imaging endpoints is not controlled, then quality in drugs put on the market is at risk," she said.

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"Imaging biomarker and education for multicentre clinical trials" according to Dr. Yan Liu, clinical leader of the Medical and Translational Research, Radiotherapy and Imaging department at the EORTC headquarters.

"Imaging as primary endpoint in clinical trials: perspective of the EORTC" according to Dr. Yan Liu, clinical leader of the Medical and Translational Research, Radiotherapy and Imaging department at the EORTC headquarters.

The authors recommend performing an initial risk assessment plan before study initiation and have identified 22 risks that might exist in the integration of imaging biomarkers into clinical trials, from risks to patient care to methodological and operational risks to the study.

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The authors also included a stepwise list of recommendations for investigators designing clinical trials that include imaging from protocol development to site activation and the end of the trial. "A position paper is just the first step; we need to start a discussion with stakeholders and improve the situation now. We need to know the danger, when we do clinical trials it's not just imaging the patient, there are many steps in preparation to help achieve quality so we need to identify risks first and have enough resources for this methodology before to avoid problems," Liu said.

Joint Session

Thursday, March 2, 16:00-17:30, Room X

Joint Session of the ESR and EORTC

(English Organisation for Research and Treatment of Cancer)

Imaging biomarker and education for multicentre clinical oncological trials

Moderators: N.M. deSouza; Sutton/UK

L.S. Fournier; Paris/FR

J. Liu, Brussels/BE

» Imaging as primary endpoint in clinical trials: perspective of the EORTC

Y. Liu, Brussels/BE

» Imaging biomarker for clinical trials in brain tumours

M. Smit; Rotterdam/NL

» The importance of collaboration between the European Initiative on Biomarkers Alliance (EIBALL) and EORTC

S. Trattnig; Vienna/AT

» Training possibilities for radiologists involved in clinical multicentre trials

L.S. Fournier; Paris/FR

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THE NEXT EVOLUTION IN ULTRASOUND

ALOKA ARIETTA 850
COME AND ADMIRE THE NEXT EVOLUTION IN ULTRASOUND: THE ALOKA ARIETTA 850 – AT BOOTH X2/17

Innovating Healthcare, Embracing the Future

Hitachi Medical Systems Europe Holding AG, Switzerland
www.hitachi-medical-systems.com
Looking beyond the usual suspects: advanced imaging pinpoints rarer causes of stroke

Stroke is one of the top five causes of death and impairment in Europe, and given the continent’s ageing society, diagnosing and treating stroke will become increasingly important. But how much do non-specialists really know about the subject, particularly the more rare cases? Today’s Special Focus session will help to fill in the knowledge gaps.

Cerebral vasculitis in a patient with acute stroke. High-resolution vessel-wall image shows acute inflammation in black-blood technique. Provided by Prof. Dr. Olav Jansen.

Stroke is a more complex disease than only acute arterial vessel occlusion, according to Prof. Dr. Olav Jansen, chairman of the Department of Radiology and Neuroradiology Cam- pus Kiel at Universitätsklinikum Schleswig-Holstein in Kiel, Germany. There are many variations of the disease that he and his colleagues will go over in the session.

“With the introduction of endo-vascular thrombectomy medicine has found a sufficient answer for the most frequent cause of severe strokes,” he noted. “However, acute occlusion of larger brain supplying vessels is responsible for only 10–15% of all acute strokes. Besides macrova- scular disease and acute haemorrhage, there are more rare causes for acute stroke symptoms which have to be kept in mind in the imaging workshop of acute stroke patients.”

The primary way to image stroke is to use CT, but advanced options include CT angiography, CT perfusion, thrombus imaging, diffusion-weighted imaging (DWI), and perfusion-weighted imaging (PWI) to name a few. MRI in particular is playing a more prominent role.

“MRI is done in more complex and chronic cases and has new advan- tages with things like vessel-wall imaging,” Jansen said, adding that vessel-wall imaging, functional ima- ging, and thrombus imaging will be the way of the future when it comes to imaging stroke. “We need a more deep view into the disease of each patient for an individual diagnostic and therapeutic approach.”

The session, for which Jansen is the chair, will go over normal stroke cases and instead focus on the rare ones. This is important for radiologists because they have to know about the rare diseases and be more helpful for doctors, he said.

Sometimes the rare becomes common, as in the case for reversible cerebral vasocostriction syndrome (RCVS). “RCVS is a unifying term which describes a clinically and angiographically defined syndrome characterised by the following: severe headaches (thunderclap headaches), with or without focal deficits and seizures, reversible segmental and multi- focal vasocostrictions of cerebral arteries, and spontaneous reversi- bility of vascular changes within three months,” explained Prof. Dr. Jennifer Linn, from the Institute of Diagnostic Interventional Neuroradiology at University Hospital Carl Gustav Carus in Dresden, Germany.

The syndrome mostly affects women with a mean age at presentation of approximately 40 years, but the situation is changing.

“While it has previously been con- sidered to be a rare condition, RCVS has been increasingly recognised within the past decade in patients as cause of acute headache and/or both ischaemic and haemorrhagic stroke,” she said. “It is nowadays regarded as the most common cause of so-called focal subarach- noid haemorrhages in patients under 60 years of age.”

It is most likely due to a transient disturbance in the control of cereb- ral arterial tone, which can be trig- gered by a wide variety of precipita- ting factors such as pre-eclampsia or various drugs.

RCVS presents in a very specific way, however. “The imaging hallmark is a so-called ‘sausage on a string’ angiographic appearance of the cerebral arteries caused by mul- tifocal segmental alternating va- socostrictions and dilatations. The changes have to be reversible within three months in contrast to findings in primary angiitis, for instance,” Linn continued.

“Reversible midbrain CT and MRI signs can either be normal or show ischaemic and/or haemorrhagic complications, in other words acute or subacute ischaemic strokes and/or focal subarachnoid haemorrhage, or parenchymal haemorrhages,” Linn continued.

Furthermore, sheechoes Jan- sen’s statements and also predicts future trends in the field will focus on advancing imaging techniques – and specifically on MRI, which will provide a deeper understanding of less frequent causes of both hae- morrhagic and ischaemic stroke and allow faster diagnosis.

Linn, too, is convinced general radiologists should still be aware of the more rare causes of stroke.

During the session, ECR dele- gates will hear from Dr. Pasquale Mordini at the University Institute of Diagnostic and Interventional Neuroradiology, University Hos- pital Inselspital, Bern, Switzerland. Mordini will discuss watershed infarcts – the ‘internal’ and water- ral ones, as well as the pathophy- siology of cerebral circulation.

The other presenter during the session is Prof. Vincent Costalat from the Department of Neuro- radiology at CHU Gui de Chauliac in Montpellier, France, who will discuss thrombosis of cerebral veins and dural sinuses. He will review the radiologic anatomy of the intracranial venous system (vascular territories, imaging techniques) and help attendees to diagnose deep vein and dural sinus thrombosis and understand dural vein occlusions.

### Special Focus Session

**Thursday, March 2, 08:30–10:00, Room E2**

**5F a Stroke, beyond the usual suspects**

- **Chairman’s introduction**
  - O. Jansen, Kiel/DE
  - Understanding watershed infarcts
  - P. Mordini, Bern/CH
  - Reversible cerebral vasocostriction syndrome
  - J. Linn, Munich/DE
  - Thrombosis of cerebral veins and dural sinuses
  - V. Costalat, Montpellier
  - Panel discussion: Rational imaging in patients with acute stroke symptoms
Multinational human imaging studies in hyperpolarised MR make sustained progress

Hyperpolarised MRI is state-of-the-art molecular imaging and one of the most exciting new areas in radiology today. Although it is still investigational, a handful of researchers are making steady progress with studies in humans. Later today, researchers from the U.K., Germany, and Israel will discuss the use of hyperpolarised MRI in cancer, cardiology, and respiratory medicine in a New Horizons session about imaging tissue metabolism in real-time.

BY BECKY MCCALL

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BY BECKY MCCALL
Pelvic ultrasound investigations and the risk of infections - do you know how your patient feels?

Ms. Judy Birch from the ESR Patient Advisory Group (ESR-PAG) shares her personal experiences and those of many other patients she has supported with Dr. Christiane Nyhsen from the ESR Working Group on Ultrasound.

Dr. Christiane Nyhsen carriers out a survey on infection prevention and ultrasound probe decontamination on behalf of the ESR Working Group on Ultrasound.

Christiane Nyhsen: When you enter an ultrasound examination room, how do you feel? What can ultrasound practitioners do to make patients feel understood and at ease?

Judy Birch: I think it is important for practitioners to show an interest in the person with eye contact and a smile, introducing themselves is important (with name and grade so the patient knows who they are talking to). It also puts patients at ease to ask “How are you today?” giving them a chance to say if they are particularly stressed or in pain. It also shows interest to ask things like “Did you receive information about the procedure?” or “Have you had an ultrasound before?” If yes, was it an internal examination? If not, explain what is involved. Mention hygiene measures you use “We use a probe cover and sterile gel or sachets and the probe is disinfected after each patient” will be reassuring to your patient.

CN: What are your personal experiences? How difficult is it to live with chronic pelvic pain? How can staff in the US department ensure that examinations are the least painful possible?

JB: Since my teens I have had numerous pelvic ultrasound examinations due to chronic pelvic pain with later diagnosis and surgery for severe endometriosis. I was monitored because of ovarian cysts and my pain was initially dismissed until it increased so much it became unbearable. A laparoscopy revealed that I had widespread endometriosis with co-existent severe pelvic infection including a tubo-ovarian abscess that had been present for a long time. The type of infection was not investigated. However, even after further surgery the pain did not end there. I have remained in constant pain ever since.

Living with chronic pelvic pain is extremely stressful. Staff should know that examinations, especially internal ultrasound scans, can trigger or worsen pain in this group of patients. Ultrasound practitioners need to be sensitive to this, proceeding slowly and avoiding sudden movements when inserting/manipulating the probe. They should reassure, talk to and acknowledge the patient, if the patient is in pain.

Most of my personal experiences with ultrasound in different countries have been positive, with the exception of one occasion where the ultrasonographer was very rough. I had a gynaecology consultation immediately afterwards and the gynaecologist noted that I was bleeding. I told him that the examination had been very painful. He was very disapproving with the ultrasound practitioner.

CN: The ESR Ultrasound Working Group carried out a survey regarding infection prevention and control measures in ultrasound, which was recently published in Insights into Imaging. The results show a wide range of practice in Europe (see figure), in particular that not all ultrasound practitioners disinfect probes after every patient, probe covers are not always used for internal or interventional procedures, and sterile gel is not necessarily chosen for interventional or internal examinations. How do you feel about the survey results? To what extent do you think patients are aware of the potential risk of infection transmission when undergoing ultrasound examinations?

JB: Thorough disinfection of ultrasound probes is absolutely essential. It is shocking that probe covers and sterile gel are not systematically used in all interventional or endo-cavity ultrasound procedures. It is also unsatisfactory that some ultrasound practitioners only decontaminate the probe at the end of the patient list.

In my experience patients don’t generally discuss this aspect of care as they are mainly concerned with the diagnostic and treatment and how to manage their pain. Patients often have ultrasound examinations before surgical and other procedures where there is a risk of infection.

CN: When you had ultrasound examinations yourself, was equipment hygiene ever mentioned by the respective practitioners?

JB: I know that probe covers and gel are often used as some practitioners mention the former prior to the examination. However, I was not aware that there are different types of gel including non-sterile gel. Similarly, until quite recently, I was not aware of the equipment disinfection issues and wide variation between departments in how this is managed. If patients were aware that there is a potential risk of infections being transmitted in this way and that there is such wide variation in practice, I am sure they would be very concerned.

CN: What would you like to see from the manufacturers of ultrasound equipment, probe covers and ultrasound gel? Where do you think more research is needed? How could changes in EU or national legislation help?

JB: Patients need educating, as do practitioners and the industry. It would be hugely helpful to have common guidance on how this should be approached. This information should be provided to patients undergoing such examinations so that they know exactly which precautions are taken to prevent infections.

CN: And finally, which take-home message would you like to give staff performing ultrasound examinations?

JB: Ensure you are familiar with, follow and communicate “best practice” in your department to staff patients. Show an interest in your patient. Be reassuring and understanding in particular when patients are in pain. Your attitude can make a real difference!


GN: What are your personal experiences? How difficult is it to live with chronic pelvic pain? How can staff in the US department ensure that examinations are the least painful possible?

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Tell us what you think.

Comments from the ESR Patient Advisory Group regarding infection control practice in Europe. A B C


Dr. Christiane Nyhsen is a consultant radiologist at Sunderland Royal Hospital, UK, Honorary Senior Lecturer at Newcastle University, and a member of the ESR Working Group on Ultrasound. Judy Birch is co-founder of the Pelvic Pain Support Network (PPSN) and a member of the ESR Patient Advisory Group (ESR-PAG).

ECR TODAY | THURSDAY, MARCH 2, 2017

CLINICAL CORNER
A new way to estimate radiation risk in screening mammography?

BY PETER HOGG, RAED ALI, CLAIRE MERCER, ANDREW ENGLAND, ANDREW TOOTELL

Human body and breast phantoms positioned on a full field digital mammography (FFDM) machine in cranio-caudal position.

When screening mammography is justified in terms of risks and benefits, the radiation risk is quantified by mean glandular dose (MGD). MGD is the radiation dose received by the most radiosensitive part of the breast tissue – glandular tissue. However, the radiation dose to other body tissues is not considered by MGD. Breast tissue radiosensitivity changes with age and this is also not included in the MGD calculation. Moreover, MGD (mGy) is likely not to be easily understandable by screening clients and, given the forthcoming move to provide annual screening, we developed a mathematical model to estimate the total risk of radiation-induced cancer from screening mammography during a female patient’s lifetime. Our model is based on average breast thickness and average glandularity. Our study aimed to report on intra-procedural vessel damage and discuss its technical details and clinical significance.

Randomised trials of endovascular stroke therapy have revolutionised the management of patients with acute cerebral ischaemia. When screening mammography has proved to be safe and effective for the treatment of acute cerebral ischaemia from large vessel occlusion, based on results from recent randomised trials of endovascular stroke therapy. Mechanical recanalisation treatment is limited by the risk of symptomatic intracranial haemorrhage and the narrow therapeutic time window beyond which there is no proven benefit. Arterial dissection and perforation are rare intra-procedural complications of stent-retriever thrombectomy and its mechanisms, risk factors, outcomes and rescue approaches have not been well described. Our study aimed to report on intra-procedural vessel damage and discussed its technical details and clinical significance.

We studied patients prospectively included in the SONIJA Registry (2012–2013), a mandatory, externally audited registry that monitors the quality of reperfusion therapies in Catalonia, Spain. During practice, intraprocedural vessel injury, successful recanalisation, procedural time, symptomatic intracranial haemorrhage, dramatic neurological improvement and independent functional outcome at three months were recorded. Among the 1,640 patients included, intraprocedural complications occurred in 7.6% of them, 55.6% of which were arterial dissection and 14.6% were arterial perforation. None of the complications were related to general anaesthesia. Intra-procedural vessel damage was associated with less successful recanalisation and longer procedural time. Arterial perforation was notably much more associated with symptomatic intracranial haemorrhage than arterial dissection. Intraprocedural vessel injury was associated with poor early response, low functional independence and high mortality at three months. We concluded that intra-procedural vessel damage was rare, but when it occurred, it was associated with highly unfavourable outcomes. However, 18.6% of patients had functional independence, suggesting that in some complicated patients good neurological recovery is achievable.

Scientific Session
Thursday, March 2, 1030-1230, Room E3
SS 611 Stroke: endovascular treatment
Moderators: S. Bahle, Dortmund/GE; M.A. van Buchem, Leiden/NL

» Iatrogenic complications during mechanical thrombectomy for acute ischaemic stroke: potential mechanisms, rescue strategies, and clinical outcomes in a multicentre study

Data from our mathematical model will be presented in our paper as regression equations, as well as relationship graphs between screening commencement age (year) versus total effective risk during female lifetime (case/100000) for each screening frequency (annual, biannual, triennial). Using these graphs, it is easy to obtain the risk of radiation-induced cancer from any screening programme, using screening commencement age and frequency by interpolation method.

Scientific Session
Thursday, March 2, 1400-1530, Room K
SS 714 Breast imaging
Moderators: C. Faleron, Bia Laurin/MT; E. Zachmann, Malmo/SE

» Mathematical modelling of radiation-induced cancer from screening mammography
In the first session of today’s joint ESR/RSNA course on hybrid imaging, ECR delegates will learn, among other things, about the basics of physics in PET imaging.

“Different processes involved in PET studies and their properties of positron-emitting isotopes to the way in which PET images are being created and used to signal the position of the biologically active molecule which shall be investigated will be described,” said PET-physicist Dr. Jan Axelson, from the Center for Functional Brain Imaging at Umeå University, Sweden, ahead of the congress.

“Noticing that positrons are anti-matter, it will be shown how the radioactive/decay spits out a positron, which in turn goes through an annihilation position where the positron together with an electron is converted from mass to pure energy, carried away by two gamma photons in opposite directions. Furthermore, an overview of the historical development from the first two-detector positron scan with a PET detector and hybrid PET/CT and PET/MRI scanners will be provided,” he added.

In this session, Axelson will be joined by Dr. Ciprian Catania, from the Department of Radiology, Massachusetts General Hospital, and Harvard Medical School, Boston, who will address the influence of MRI physics on image quality in hybrid imaging.

“MRI physics influence PET in several ways, potentially leading to artefacts or bias that can affect qualitative and quantitative PET studies. The purpose of this presentation is to present such MRI-related artefacts, to describe their origin and their impact on PET atta

DECR TODAY | THURSDAY, MARCH 2, 2017

BY KATHARINA MIEDZINSKA

ESR and RSNA combine to show power of hybrid imaging

Hybrid imaging systems such as PET/MRI are gaining more and more ground in different medical areas. Although some modalities and tracers are still recent developments, they hold considerable promise in the management of different diseases and in future, they may play a central role in diagnosing and treating cancer, neurological and other patients.

In this day-long joint session of the ESR and the Radiological Society of North America (RSNA), international experts will provide an insight into how much hybrid imaging systems have to offer.

For patients with brain tumours, the use of hybrid PET/MRI allows molecular and anatomic imaging in a single session, which reduces the burden of diagnostic imaging, especially for debilitated patients. Also, it reduces unnecessary image interpretation. MRI is the primary modality for brain tumour imaging, and the CT component of PET/CT examinations typically does not contribute much to the evaluation of brain tumours.

“Molecular imaging can complement MRI for the diagnostic evaluation of neuro-oncology patients, in particular for the early evaluation of response to therapy and for distinguishing true tumour recurrence from treatment effects,” explained Dr. Jonathan McConathy, from the Department of Radiology at UAB Hospital, Birmingham, Alabama.

McConathy plans to discuss different brain tumours, including glioma and brain metastases from systemic malignancies, focusing on radio-labelled amino acids for brain tumour imaging such as O-15(I) or C-11-fluorodeoxyglucose (FDG) and 3-[(a-rhodamine)ethyl]fluoro-L-tyrosine (FETI) and 3-[(a-rhodamine)ethyl]fluoro-L-tyrosine (FETI) and 3-[(a-rhodamine)ethyl]fluoro-L-tyrosine (FETI), which are both used to detect primary and recurrent tumours with a high accuracy.

In the third session of the course, Prof. Henryk Barthel, from the Department of Nuclear Medicine at the University Hospital Leipzig, Germany, will address the use of hybrid imaging in neurodegenerative disorders, showing that it might be valuable across a broad span of diseases.

“Hybrid brain PET/MRI is a new exciting approach, which has a great potential to improve clinical and research imaging in neurodegenerative disorders. In clinical routine, it will improve early and differential diagnosis of dementias and Parkinsonian syndromes. By employing hybrid PET/MRI we will potentially also increase our diagnostic capabilities in amyotrophic lateral sclerosis and Cervenfeld-Jakob Disease,” he said, adding that in clinical trials, patient stratification and drug effect assessment will likely be improved, especially with regard to therapeutic approaches targeting neuropathological proteins and affected neurotransmitter systems.

“Compared to separate PET and MRI sessions, this will be possible with improved patient care and greater comfort with high image data quality, at the price of acquiring the technology and running costs. As such, it is the task of the next few years to establish a reasonable imaging routine and indications for the use of hybrid PET/MRI in neurodegenerative disorders,” said Barthel.

Finally in the fourth session, Dr. Steven Patrick Rowe, from the Department of Nuclear Medicine at John Hopkins School of Medicine, Baltimore, Maryland, and Dr. Mathew Elber, from the Department of Molecular and Medical Pharmacology at David Geffen School of Medicine at UCLA, Los Angeles, California, will discuss Hybrid Imaging in the male, specifically addressing the role of hybrid imaging in staging treatment evaluations and follow-up and the differences in information given by the use of different tracers.

Joint Course of the ESR and RSNA (Radiological Society of North America): Hybrid Imaging

Thursday, March 2, 08:30–10:00, Room M 5
- MC 51a The ABCs of hybrid imaging
  - Moderators: A. Drzezga; Cologne/DE
  - K. Riklund; Umeå/SE

Thursday, March 2, 10:30–12:30, Room M 5
- MC 61a Hybrid imaging in the female
  - Moderators: A. Dragoș; Cologne/DE
  - K. Riklund; Umeå/SE

Thursday, March 2, 14:00–15:30, Room M 5
- MC 71a Hybrid Imaging of the brain
  - Moderators: A. Dragoș; Cologne/DE
  - K. Riklund; Umeå/SE

Thursday, March 2, 16:00–17:30, Room M 5
- MC 81a Hybrid Imaging in the male
  - Moderators: A. Dragoș; Cologne/DE
  - K. Riklund; Umeå/SE
Success in diagnosing complications following abdominal surgery relies on exact knowledge of previous surgical procedures

The term ‘abdominal surgery’ broadly covers surgical procedures that involve opening the abdomen, including such procedures as appendectomy, bowel and inguinal hernia surgery, exploratory laparotomy, cholecystectomy and other laparoscopies.

Any patient who undergoes a surgical procedure is at risk of developing complications afterwards; and it is these complications that will be discussed by Prof. Zsolt Tarján, from the Department of Diagnostic Radiology and Oncology at the Semmelweis University in Budapest, in today’s Special Focus Session titled ‘The postoperative abdomen: lost in translation?’

The likelihood of developing postoperative complications is multifactorial; besides the age and general health of the patient, the type of anesthesia, surgical urgency, surgical site and many other factors play an important role. In regard to abdominal imaging, previous surgical procedures and the related surgical anatomy. Radiologists need to entirely understand the specific situation, also in regard to an efficient communication with the surgeon,” Nolz said.

He especially plans to address the incidence of immediate postoperative vascular complications and their outcome, the management of different diagnostic strategies including appropriate imaging modalities and last, but not least, surgical procedures most commonly exposed to vascular complications like transplantation, which, according to Nolz, are the surgical procedure most frequently affected by vascular complications with an incidence of approximately 20%.

Also, defining criteria for bowel obstruction can be especially challenging. So far, enteroclysis, CT-enterography and enterography may be considered as the optimal imaging algorithm and MR-enterography may be considered as the proper diagnostic imaging approach. Not infrequently, a series of these examinations is required to establish the final diagnosis, based on which a decision about conservative treatment, or elective or reconstructive surgery, can be made.

Also in this session, Dr. Marco Rengo, from the Department of Radiological Sciences, Oncology and Pathology at the University of Rome, will discuss the main surgical techniques of bariatric surgery and the mechanisms of the most common immediate and delayed complications.

The session will close with a panel discussion, raising the central question: “Where might we go wrong and how can we avoid it?”

**Special Focus Session**

**Thursday, March 2, 16:00-17:30, Room B**

**SF 8 The postoperative abdomen: lost in translation?**

- **Chairman’s introduction: Presentation of a challenging case**
  - Z. Tarjan, Budapest/HU

- **Inflammatory complications (peritonitis, abscess)**
  - R. Nolz, Vienna/AT

- **Vascular complications (bleeding, thrombosis, ischaemia)**
  - M. Rengo; Latina/IT

- **Complications of weight-loss surgery**
  - M. Rengo; Latina/IT

- **Panel discussion: Where might we go wrong and how can we avoid it?**
The public desire for lung cancer screening and the ability of the medical profession to implement it are currently at odds, despite recent findings that suggest screening via low-dose CT can reduce mortality.

The problem is lung cancer screening remains controversial and is not as straightforward as most people think, according to Prof. Stefan Diederich, head of diagnostic and interventional radiology at Marien Hospital, Dusseldorf, Germany, and president of the International Cancer Imaging Society.

Advocates have been made, but until recently, trials that looked at the effectiveness of detecting lung cancer via screening and the ability to save lives have returned disappointing results and no recommendations for use. The sea-change in attitude, however, first began with studies using a low dose CT scan for the identification of malignant nodules. This led to an unexpectedly high number of cases of lung cancer discovered at early stages, Diederich said.

The randomised National Lung Screening Trial (NLST) was conducted to see if CT could save lives, and the study reported a high number of lung cancer cases discovered at early stages, associated with a 20% reduction in mortality from lung cancer discovered at early stages, according to data from the National Lung Screening Trial (NLST) was conducted to see if CT could save lives, and the study reported a high number of lung cancer cases discovered at early stages, associated with a 20% reduction in mortality from lung cancer discovered at early stages.

As such, predicting what the future might hold for lung cancer screening is difficult. In today’s session, Dr. Anand Devang consultant thoracic radiologist at the Royal Brompton and Harefield NHS Foundation Trust, U.K., and honorary senior lecturer at the Imperial College London, National Heart and Lung Institute, intends to talk about the opportunities for further research in lung cancer screening and discuss these unanswered questions around cost effectiveness and implementation.

He told ECR Today that there were opportunities to focus efforts on understanding how screening programmes can be optimised in the future and that focus needed to concentrate on some key areas. These included: selecting the most appropriate people for screening, and sufficiently engaging with them to ensure they turn up for their screen; identifying workflow requirements to implement screening; understanding the optimal frequency of screening; and how to best manage findings from scans, both lung nodules and other incidental findings.

“Some of the answers to the questions will be provided from analyses of data from existing screening trials,” Devang said. “For other aspects, new research studies will be needed, either randomising screening patients to different interventions or by modelling and simply comparing outcomes with historical data.”

One trial in progress at the moment is the Dutch-Belgian NELSON trial, which many health authorities in Europe are waiting for, he said. “A second positive trial would be immensely supportive of lung cancer screening, and its results will also go some way to answering questions related to cost effectiveness and applicability in different populations.”

There is certainly a growing appetite among the medical community and patients for lung cancer screening, especially as early diagnosis is key to preventing lung cancer deaths. But while there are no guidelines currently, any future implementation will be a challenge and is likely to have a significant impact on many aspects of radiology he added.
The new classification system for inner ear malformations: the INCAV system

Our study was conducted to explore a more specific, definitive classification system that is based on radiological criteria for inner ear malformations.

The INCAV system is easy to select the most suitable ear implant indication and makes it easy to select the most suitable ear for implantation.

We found 43 patients who had inner ear malformations demonstrated by both magnetic resonance (MR) and computed tomography (CT) images with retrospective evaluation of the medical records between August 2010 and February 2015 by using Sennaroglu et al’s classification system.

One month after evaluation of 43 patients with Sennaroglu et al’s classification system, we re-interpreted MR images blinded to the previous results. Abnormalities of the inner ear structures on MRI were noted according to our new classification. We analysed inner ear structures by dividing them into five subgroups, and each subgroup was given a letter: internal acoustic canal (I), cochlear nerve (N), cochlea (C), vestibular aqueduct (A) and vestibule (V), which taken together form INCAV.

Based on their malformations, these anatomical structures were assigned grades and classified by using increasing numbers based on the malformation’s order of severity.

One month after interpreting the MR images, we evaluated the CT images blinded to the results of MRI, and the abnormalities of the inner ear structures visible on the CT images were independently noted according to our new classification. We also separated the inner ear structures into five anatomical subgroups, the same way as in the evaluation of MR images, except for the cochlear nerve. In CT, we used the cochlear nerve canal instead of the cochlear nerve. For the cochlear nerve canal (N), we noted cochlear nerve canal was normal. N₂ cochlear nerve canal was abnormal.

Among those 43 patients, there were 80 inner ear malformations and six normal inner ears. Specifically, there were 18 ears with isolated vestibular aqueduct syndrome, seven ears with IP-I, 16 ears with IP-II, six ears with IP-III, two ears with Michel aplasia, two ears with common cavity, seven ears with cochlear hypoplasia and three ears with internal auditory canal stenosis.

We found that the INCAV system is easy to use for radiologists and is useful to referring otolaryngologists. The benefit of using the INCAV system for radiologists is that it forces them to think about the malformations of inner ear structures one by one, to assign each ear structure a category and to give a number to categorise their findings.

Additionally, the benefit for otolaryngologists is that it allows them to evaluate cochlear implant candidates preoperatively and to understand all malformations and the grades of the malformation for each ear separately. It also allows them to make an exact cochlear implant indication.

The INCAV system is a schema for putting the malformations’ order of severity in the context of the INCAV system. It contains a lexicon of findings from MR, in particular, and CT imaging. It contains a lexicon of standardised terminology for inner ear malformations.

The INCAV system is easy to select the most suitable ear implant indication and makes it easy to select the most suitable ear for implantation.
Software applications and acceleration technology dominate MRI offerings in technical exhibition

MRI has undergone over 40 years of continuous development and evolution, and the emphasis this year among manufacturers is on advances in software innovations and acceleration technology. Judged on the companies’ booths in the ECR 2017 exhibition halls, speeding up the workflow and improving image quality remain top priorities.

Philips’ range of neuro-diagnostic applications includes black blood imaging, 4D-Trance and MultiBand emphasis this year among manufacturers is on advances on software innovations and MRI has undergone over 40 years of continuous development and evolution, and the MRI offerings in technical exhibition Software applications and speeding up the workflow and improving image quality remain top priorities. Tours complex multiparametric ports can bring complex data to enable neurological anatomies and simultaneous acquisition of multiple slices in the brain for functional MRI examinations. Imaging professionals often face challenges with their existing neuro-diagnostic tools, which lack effective imaging and visualization techniques, explained Eric Jean, general manager of MRI at Philips. “Our new applications provide physicians with a comprehensive portfolio of tools designed with the needs of complex neurological examinations in mind, delivering visibility into neurological anatomies and multi-dimensional data to enable diagnostic decision support,” he said.

From the brain to the prostate and everywhere in between, exhibitors at ECR 2017 are highlighting the benefits of their latest MRI applications. For example, Sectra’s Advanced Visualization portfolio, fully integrated in its PACS, supports complex multiparametric MRI studies, such as breast, female pelvic, and prostate MRI. Sectra’s advanced application for visualization and analysis of MRI prostate examinations features automatic identification of relevant sequences, which are displayed in a structured manner to improve reading efficiency. The sequences are quickly retrieved, and subtraction and vendor-neutral apparent diffusion coefficient (ADC) calculations, as well as uptake and wash-out maps, are automatically processed and displayed. The application includes all of the necessary measurement tools, including anatomical centre synchronisation and time-intensity curves for localising and characterising lesions, according to the company.

Meanwhile, GE Healthcare is showcasing an expanded Signa MR portfolio that is designed to improve cost, quality, and access to bring the diagnostic benefits to more patients.

New to the portfolio is the Signa Vantage, a 1.5T/3T MRI scanner that seeks to maximise workflow while delivering on patient comfort. It has one of the lowest power consumptions in the industry for a 1.5T/3T body unit, claims GE. Another addition is the Signa Architect, a 3T machine that is supported by both an advanced 96 channel and 128 channel radiofrequency systems. “All of these products are powered by SIGNAWorks, a new platform intended to deliver enhanced productivity,” said Stéphane Maquaire, the MR product marketing director for Europe at GE Healthcare. “The portfolio contains NeuroWorks, BodyWorks, CVWorks, OrthoWorks, OncoWorks and PaedWorks, covering a wide variety of contrasts, 2D and 3D volumetric data, including motion correction capabilities.”

Visitors to the Siemens Healthineers stand are being introduced to a number of products and services that aim to increase efficiency and reduce costs. The 1.5T Magnetom Sempra MRI unit has the DotSO software so that users can react flexibly to each case and to the condition of the individual patient, while at the same time standardising the examination, Maquaire said. The device is also equipped with Eco-Power technology that monitors and controls the state of the helium used to cool the magnet, reportedly cutting energy consumption by up to 30% in stand-by mode.

The vendor also pledges to speed up MRI scans with new acceleration technology, Compressed Sensing. This enables imaging of patients with arrhythmias and those with respiratory problems, and the company is already working with its partners to expand this tool and bring further applications to the market.

The Calon 3T device with 4D-Trance and Saturn technologies is designed to increase signal-to-noise ratio by up to 20%, allowing for faster sampling and higher resolution images, combined with the ability to stack protocol sequence results in neurological exams. Research suggests these sequences can be performed in under five minutes: Sag T1, Ax T2, Ax T2 FLAIR, Ax T2*, and Ax DWI/ADC.

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Philips is showcasing a suite of MR-based software applications dedicated to neurology. The suite of neuro-diagnostic applications is available on the vendor’s Ingenia family of MRI systems, utilising its offstream digital broadband architecture. Important features include a high-resolution 3D brain image with reduction of the blood signal, contrast-free dynamic 4D (4D) imaging of the brain vascular anatomy, and simultaneous acquisition of multiple slices in the brain for functional MRI examinations. Imaging professionals often face challenges with their existing neuro-diagnostic tools, which lack effective imaging and visualization techniques, explained Eric Jean, general manager of MRI at Philips. “Our new applications provide physicians with a comprehensive portfolio of tools designed with the needs of complex neurological examinations in mind, delivering visibility into neurological anatomies and multi-dimensional data to enable diagnostic decision support,” he said.

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continued from page 17

ECR 2017. Increased signal-to-noise ratio on the unit helps shorten exams and improve image quality and this, combined with the ability to stack protocol sequences, enables fewer exams to be done in under five minutes according to the manufacturer. Furthermore, the system boosts access to barbiturate and claustrophobic patients with its 79cm patient aperture and in-bore MR Theatre option. Also, the company has introduced enhancements to its Vantage Titan 3T MR system to help with neurological and musculoskeletal imaging and has upgraded the Saturn Gradient and Atlas Speeder coils to produce images of soft tissue and cartilage that can help make diagnoses and aid decisions on rapid, effective treatment for patients with concussion, brain trauma, and other conditions.

For those familiar with Siemens’ history and technology in this area, the presentation may come as a surprise to find that the developer and supplier of digital x-ray imaging systems is promoting its SR Pulse 710 wide-bore 1.5T MR system to a European audience.

‘We did our research, and this has not stopped DBT clinical value. Recent surveys suggest holding the greatest potential and commercial impact from breast MRI? Regulation and reimbursement

A 32-channel head coil facilitates high-resolution imaging of the brain, with the 512 x 112 acquired resolution existing in visualization of cortical and hippocampal detail. (Provided by Toshiba)

So why have we seen little or no commercial impact from breast MRI? Regulation and reimbursement

The first and most complex barrier to adoption is the varying degree to which breast MRI is regulated and reimbursed across Europe. Very few countries have breast MRI incorporated into common screening and diagnostic pathways, let alone reimbursed, especially in Northern Europe. Some Southern European countries have more flexibility for breast MRI use, though only Australia in Western Europe has full reimbursement for breast MRI.

Increasing adoption of breast MRI is also not mean feat; research on use of DBT and breast ultrasound has been ongoing for many years, yet large-scale uptake into screening programmes has remained controversial; even the effectiveness of conventional mammography screening continues to be debated. More positively the emergence of DBT, ultrasound and MRI, especially in the context of breast density, has raised awareness that the current ‘one size fits all’ approach may not well serve all patients. Instead, pre-screening of breast density measurement is gaining momentum, especially in the United States, allowing a more adaptive approach to screening.

Technology

From a technological view, MRI has proved varied to cater for a huge array of applications and remains the gold standard for imaging. The technological capability for repeatable, quality MRI already exists. However, as in other more routine scans such as abdominal and cardiac MRI, greater optimization and automation is required before large-scale breast MRI is viable. This includes design of shorter MRI protocols, reducing the current scan time of between 15–30 minutes, to under five minutes. In doing so, this will enable greater patient throughput and lower costs per exam. Additionally, specific focus on developing technology to increase the speed of breast MRI reading is essential, especially with the growing crisis of radiologist shortage across Europe.

Cost

Above all the cost of MRI remains the biggest hurdle to market penetration. MRI is an expensive modality in comparison to conventional mammography and ultrasound. Most of the current installed base of MR are over-subscribed, making the case for wider use of MRI harder. There are also other financial considerations to account for. Most arguments for use of new modalities for established clinical practice focus on relatively simple cost analysis. However, in the case of screening, the issue is wider. Rarely has there been a return on investment (ROI) analysis conducted to include the impact of MRI may have on reducing in false positives, radiologist time, fewer biopsies and of course, quality of patient care. Over time implementation of clinical analytics will help to identify this for providers, but today, most providers and front-line screening institutions do not have the necessary IT infrastructure to easily provide such a complete picture.

So, while mammography has initiated shown great potential for improvement in mammography screening and diagnosis, its widespread adoption is far from a certainty. Only with a concerted effort both in terms of clinical research and a more comprehensive analysis of the benefits to providers and patients will it become a central tool in European breast imaging.

Breast imaging is a highly contentious area and one of the most fiercely debated across all of radiology. Almost every month alternative guidance on comparative use of traditional digital mammography, digital breast tomosynthesis (DBT), traditional and automated breast ultrasound (ABUS) and breast MRI is offered, followed by a raft of rebuttals and counterrebuttal. Interestingly from a commercial perspective, this has not stopped DBT or ABUS from making steady market penetration in Europe as alternative options to conventional mammography.

In stark contrast, breast MRI has made little impact to the commercial MRI market, despite potentially holding the greatest potential and clinical value. Recent surveys suggest MRI mammography (MM) accounts for as little as two percent of MRI scans performed in Europe.

Clinical evidence supporting the use of MRI for breast imaging is growing in volume and credibility, such as the recent findings that a follow-up MM scan for patients with equivocal findings from conventional mammography offered absolute certainty for tumour detection. Further evidence and larger trials are required, such evidence suggests MRI has a significant role to play in breast imaging in the future.
VPH-DARE@IT project develops novel biomarkers and platforms for earlier and differential dementia diagnosis

Developing new platforms for researchers, clinicians and patients, as well as novel biomarkers, to enable earlier and differential diagnosis of dementia form the main objectives of a major EU-funded project, the subject of a dedicated session today at ECR 2017.

The VPH-DARE@IT consortium, managed and coordinated by the Center for Computational Imaging & Simulation Technologies in Biomedicine (CISTIB) at the University of Sheffield, with support from the European Institute for Biomedical Imaging Research (EIBIR) in tasks relating to dissemination and the scientific and commercial exploitation of results, officially began in March 2013 for a four-year duration that ends in March 2017.

Moderator: M. van Gils; Tampere/FI

- Introduction
- Patient care platform
- Mechanistic model-based biomarkers
- Phenomenological model-based biomarkers

EIBIR Session
Thursday, March 2, 08:30–10:00, Room X

EIBIR Session 1
VPH-DARE@IT: Novel biomarkers and platforms for earlier dementia diagnosis

The technological aim of the VPH-DARE@IT project is to create a viable series of platforms that can be applied and used throughout Europe. The clinical research platform (MULTIX) has been designed to allow researchers to access large amounts of information such as MRI scans and patient histories. This ‘Big Data’ approach is a powerful research tool that through interconnected IT technology can interact with the project’s patient care platform. This lets the clinician input patient data and take advantage of the knowledge generated by the research platform and the clinician’s experience to provide better patient-specific care. This is based around an advanced interactive and user-friendly platform that provides all relevant data to clinicians, supporting them with diagnosis and communication. The patient care platform will help clinicians to evaluate cognitive and motor skills, as well as lifestyle and environmental factors. This then feeds back into the integrated system, in turn helping to design further clinical studies.

In addition to the platforms, the project is also yielding a considerable number of results that are likely to be highly utilised beyond the project’s lifetime. These include a range of imaging biomarkers extracted from imaging data and identified by the project as suitable inputs for the phenomenological and biomechanical modelling required to develop the platform, which are expected to be widely used in the scientific and commercial fields well after the project ends this year.

The VPH-DARE@IT consortium is made up of 20 partners from across Europe, which includes major universities, research institutes, major industry and SMEs. The project is also yielding many clinical trial results that are expected to feed into the integrated patient care platform.

At ECR 2017, attendees have the opportunity of learning more about this major research project at a special session today, ‘VPH-DARE@IT: Novel biomarkers and platforms for earlier dementia diagnosis’ and by visiting the project’s booth in the M building.

To learn more about the project, visit the website: www.vph-dare.eu
Appropriate image quality of diagnostic imaging procedures: Wishful thinking or concept for ensuring quality and safety?

Ensuring and improving the quality and safety of diagnostic imaging procedures for the benefit of the patients is one of the challenges faced by radiology departments in daily routine, especially in view of the ever-increasing complexity of examinations.

While this is true independent of imaging modality computed tomography (CT) deserves special attention as its application is, on average, associated with the highest radiation exposure to the patients among imaging procedures that require the use of ionizing radiation. Currently CT is one focus of the EuroSafe Imaging campaign, the flagship radiation protection initiative of the European Society of Radiology launched in 2014, which has, among others, the objective of promoting appropriateness in radiological imaging.

With ‘appropriateness’ being defined as ‘the quality or state of being just right for the requirement, achieving an image quality appropriate for a particular radiological examination implies that the quality of the resulting image data has been set to a level just good enough for answering the specific clinical question with high diagnostic accuracy and confidence, but without being excessively ‘brilliant’.

In view of ‘appropriate CT examination, in turn this means their acquisition has been performed at the lowest radiation exposure achievable, i.e. resulting in the lowest potential harm to the patients. Despite being subject to various limitations, several subjective and objective metrics for measuring image quality have been introduced and are currently in use, e.g. for comparing imaging hardware, for quality assurance (QA) and for the optimisation of imaging procedures. However, even when related to the radiation exposure associated with a particular examination, physical image quality measurements are only meaningful in clinical routine if these can be directly related to diagnostic quality of the image data acquired in patients. Therefore, defining ‘appropriate image quality’ in diagnostic imaging (e.g. CT) is a very challenging task, as robust, clinically meaningful and easy-to-use measurement methods for image quality are still missing to date.

Furthermore, the image quality of actual clinical examinations is influenced by several factors such as patient characteristics (e.g. size, weight, age, etc.) as well as the imaged body region. Consequently, image quality achieved in practice will vary even if examinations are acquired using the same set of parameters, i.e. using the same acquisition protocol resulting in equivalent nominal radiation exposure.

In addition, image quality will also depend on the technical status of the imaging hardware and software employed. For example, CT systems might feature iterative image reconstruction technology, the use of which can significantly alter image data appearance and can be exploited for reducing radiation exposure by adjusting acquisition parameters.

The level of image quality that is deemed ‘appropriate’ for answering a particular clinical question with high diagnostic accuracy and confidence needs to be specific to each clinical indication. The ‘appropriateness’ of the image quality of a procedure should therefore only depend on the diagnostic task, while being independent of factors such as patient characteristics or the imaging hardware and software used for the examination.

Since the radiation exposure of imaging procedures employing ionizing radiation, e.g. of CT, is required to stay within diagnostic reference levels (DRL), these need to be accounted for by any future concept or metrics with regard to the appropriateness of image quality. This is especially true for clinical DRLs no longer defined by examined body region, but instead specific to particular clinical indications. Work on the definition of clinical DRLs for CT examinations is currently ongoing as part of the EuroSafe Imaging campaign.

While successfully defining criteria for the ‘appropriateness’ of image quality for each clinical question would ideally result in a technology independent ‘ground truth’ for confident and reliable diagnosis, quantitative metrics for easily measuring the ‘appropriateness’ of image quality based on patient image data are lacking to date. Their development should be part of future research in medical radiation protection, since reproducibly achieving appropriate image quality in clinical routine should be the ultimate goal of every optimisation of imaging procedures. In order to render these efforts for ensuring quality and safety of imaging procedures sustainable, a review process in view of the appropriateness of image quality and, if applicable, the radiation exposure associated with the modality employed should be implemented in clinical routine.

Dr. Wolfram Stiller is a physicist at University Hospital Heidelberg, Germany, dedicated to research in the field of a very computed tomography. He is a member of the ESR Radiation Protection Subcommittee and the EuroSafe Imaging Steering Committee.

EuroSafe Imaging Session

Thursday, March 2, 10:30–12:00, Room X
EU’s Focus on appropriate image quality: what we have to know
Moderators: W. Stiller, Heidelberg/DE
F. Deferme; Antwerp/BE
J. Damilakis; Iraklion/GR
H. Geijer; Örebro/SE
S.T. Schindera; Aarau/CH
F.R. Verdun; Lausanne/CH
C. Hoesslein; Magdeburg/DE
H. Geiger; Delft/DE

- EuroSafe Imaging on ‘appropriate image quality’: introduction
- Metrics and methods for quantitative image quality determination: a physicist’s perspective
- Balancing diagnostic image quality and radiation exposure in clinical routine: a radiologist’s perspective
- Image quality assessment via model observers: connecting objective and subjective perspectives
- Implementing a review process on image quality: experiences from a EuroSafe Imaging Star

This session is part of the EuroSafe Imaging campaign.

Show your support for radiation protection and safety in medical imaging and
JOIN OUR MORE THAN 51,000 FRIENDS of EuroSafe Imaging now

www.eurosafefimming.org

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Medical societies establish European Alliance for Medical Radiation Protection Research (EURAMED)

For the first time, five medical societies within Europe, the European Society of Radiology together with the European Association of Nuclear Medicine (EANM), the European Federation of Organisations for Medical Physics (EFOMP), the European Federation of Radiographer Societies (EFRS) and the European Society for Radiotherapy and Oncology (ESTRO), have joined forces and agreed on a collaboration to improve the safe application of ionising radiation in medical care by developing and exploring common research strategies and by actively promoting the translation of results into clinical practice.

The EURAMED launch event took place during the European Radiation Protection Week in September 2016 in Oxford, UK.

The EURAMED Working Group (as of December 2016) comprises: Christoph Hoeschen (Uni Magdeburg/DE, Chair), John Damilakis (EFOMP), Wolfgang Dörr (ESTRO), Guy Frija (EFRS), Gerhard Glattling (EANM), Johann Lansdorp (ESTRO), Kristoff Muylle (EFOMP), Graciano Paulo (EFRS), Wolfgang Stiller (ESR), Virginia Tsalapaki (EFOMP), Jonathan McNulty (EURADOS) and Monika Hierath (EIBIR, Support).

Prof. Christoph Hoeschen is professor of physics at the institute of medical technology and vice dean of medical technology and vice dean at the Otto-von-Guericke University Magdeburg, Germany and EURAMED Steering Committee Chair.

The EURAMED Working Group (as of December 2016) comprises:

- Develop an aligned approach and response to European research calls.
- The EURAMED Working Group (as of December 2016) comprises: Christoph Hoeschen (Uni Magdeburg/DE, Chair), John Damilakis (EFOMP), Wolfgang Dörr (ESTRO), Guy Frija (EFRS), Gerhard Glattling (EANM), Johann Lansdorp (ESTRO), Kristoff Muylle (EFOMP), Graciano Paulo (EFRS), Wolfgang Stiller (ESR), Virginia Tsalapaki (EFOMP), Jonathan McNulty (EURADOS) and Monika Hierath (EIBIR, Support).

This has resulted in the establishment of the European Alliance for Medical Radiation Protection Research (EURAMED), under the umbrella of the European Institute for Biomedical Imaging Research (EURAMED), which was officially launched at the Oxford Radiation Protection Week in September 2016. This European platform represents a consortium of associations involved in the application of ionising radiation in medicine, with the goal of jointly improving medical care and its radiation protection issues through sustainable research efforts.

EURAMED complements existing and established European platforms in several other fields of radiation protection and will create visibility for the medical field in this context. The other platforms are:

- Multidisciplinary European Law Dose Initiative (MELDII)
- European Radiation Dosimetry Group (EURADOS)
- European Platform for Nuclear and Radiological Emergency Response and Recovery (NERIS)
- European Radiotherapy Alliance (ALLIANCE)

The first major step in overcoming the fragmentation and lack of visibility for radiation protection in the medical field was the development of a common strategic research agenda (SRA). For this, a group of representatives named by the medical associations dealing with ionising radiation has worked together to identify the most important topics in radiation protection research in medical applications.

The research topics considered necessary and most urgent for effective medical care and efficient terms of radiation protection are summarised in five main themes:

1. Measurement and quantification in the field of medical applications of ionising radiation
2. Normal tissue reactions, radiation-induced morbidity and long-term health problems
3. Optimisation of radiation exposure and harmonisation of practice
4. Justification of the use of ionising radiation in medical practice
5. Infrastructures for quality assurance

This SRA is considered a living document, and hence any comments and suggestions by stakeholders or facilitators of medical radiation protection are most welcome. The current version was approved by the boards of the five societies in November 2015, and has been available since July 2016 at www.euramed.eu. In addition, it has been submitted for publication to Insights into Imaging.

The long-term goal of EURAMED is to establish an independent and sustainable platform in order to increase its visibility and become eligible for participation in European and international projects. Establishing EURAMED as a legal entity is considered important in order to facilitate and coordinate European research activities in the area of medical radiation protection. This will allow it to assume an umbrella function for the harmonisation of practice, ensuring an improvement in the European radiation protection safety culture within medicine.

The mission of EURAMED is to:
- Jointly improve medical care through sustainable research efforts in medical radiation protection
- Identify common research areas and define a common strategic research agenda
- Serve as a platform for medical radiation protection research, linking researchers and clinicians, adopting a harmonised approach to lobbying at European level to impact the European research funding landscape

The EURAMED Working Group (as of December 2016) comprises:

- Introduction of EURAMED
- C. Hoeschen; Magdeburg/DE
- Cardiovascular effects of radiotherapy in breast cancer patients: potential mechanisms
- W. Dörr; Vienna/AU
- Circulating biomarkers reflecting dose exposure
- R. Tamarat; Fontenay-aux-Roses/FR
- General physical principles used for optimisation
- G. Paulo; Coimbra/PT
- Dose distribution in interventional radiology
- H. Schlant; Munich/DE
- This is part of the EuroSafe Imaging campaign.

EuroSafe Imaging Session

Thursday, March 2, 16:00–17:30, Room L 8
EU’s European Alliance for Medical Radiation Protection Research (EURAMED)

Moderators:
- G. Frija; Paris/FR
- C. Hoeschen; Magdeburg/DE
- W. Dörr; Vienna/AU
- G. Paulo; Coimbra/PT
- H. Schlant; Munich/DE
- This session is part of the EuroSafe Imaging campaign.
EuroSafe Imaging Stars: Kuopio University Hospital in Finland

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.

One of the EuroSafe Imaging Stars institutions is the Kuopio University Hospital (KUH) Diagnostic Imaging Center in Finland. The KUH Imaging Center provides primary to tertiary level diagnostics for 850,000 inhabitants in eastern Finland and with approximately 180,000 annual studies, encompasses all fields of diagnostic and interventional radiology.

Please read below an interview with Dr. Juhana Hakumäki from the KUH Diagnostic Imaging Center, which is a five-star facility.

ECR Today: Your radiology department joined the EuroSafe Imaging Stars network. Why did you apply and what are your thoughts on this initiative?

Juhana Hakumäki: We applied because the initiative’s cause is important and deserves far more public attention. We also wanted to see where our facility stands in terms of safety.

ECRT: One important contribution EuroSafe Imaging Stars are expected to make is to participate in the data collection initiatives through the ‘Is your Imaging Eurosafe?’ surveys on CT dose. What is your opinion on these surveys and how useful do you think the EuroSafe Imaging survey findings will be for your daily clinical activity?

JH: The surveys are increasingly important for operating comparisons as more data is being acquired by participants. We know that our CT doses are generally speaking very low, but if someone is able to push the limits we are happy to show that but also hear from others on how to keep doing it.

ECRT: Would you recommend other facilities to become EuroSafe Imaging Stars? If so, what arguments would you use to convince them?

JH: Absolutely! If radiation safety processes are in good shape, it is relatively easy to become a four, even five-star facility. This provides the patients and stakeholders an important signal. I would also say that it is a very visible and rewarding way to empower and thank the employees for their skills and efforts.
ESR iGuide – delivering the ESRs imaging referral guidelines at the point of care

The first pilot implementations of ESR iGuide, a clinical decision support system using the European Society of Radiology’s (ESR) imaging referral guidelines licensed by National Decision Support Company (NDSC) Europe, started in 2016, while the ESR put in place the structure for maintaining its referral guidelines in cooperation with the American College of Radiology (ACR).

In this article, we review an eventful 2016 for ESR iGuide, take a look at the process of implementing decision support in hospitals and catch a glimpse of some preliminary data on how ESR iGuide can improve the appropriateness of imaging referrals.

2016: putting the pieces into place

As ESR iGuide implementations are under way in a number of European and Middle Eastern countries, NDSC has established partnerships with hospital information system (HIS) and electronic medical record (EMR) providers in order to integrate ESR iGuide into referring doctors’ native workflows. Following the upload of the first version of the ESR’s referral guidelines, which are based on the ACR Appropriateness Criteria, into NDSC’s platform in February the ESR established a working group on imaging referral guidelines to maintain and update the content of ESR iGuide. The creation of a joint Rapid Response Committee (RRC) between the ACR and ESR will facilitate transatlantic cooperation on clinical imaging guidelines.

Pilot tests: what an ESR iGuide implementation looks like

With this institutional set-up in place, and following the establishment of NDSC’s European headquarters, NDSC began to work with EMR providers to integrate ESR iGuide and implement the ESR iGuide solution for several hospitals across Europe in order to conduct pilot tests of the software. Following in the footsteps of the Barokona University Clinic, where ACR Select (NDSC’s platform in the United States) has been used for outpatient General Practitioner’s referrals since 2014, the first pilot projects will be concluded in 2017 and evaluated thereafter.

The ESR iGuide content has been translated for users into Croatian, Dutch, German, Italian, Russian, Spanish and Swedish. Aside from the crucial role of effective change management and the support of an institution’s leadership from the start, configurability and user-friendly access to the guidelines are essential aspects of a successful decision support implementation. Any ESR iGuide installation starts with a number of key scope definitions to make sure EDS meets each site’s specific needs. Hospitals can determine for which modalities, clinical areas, user or patient groups they want to enable decision support, when appropriateness alerts should be displayed, and select the workflow options – modality-driven, indication-driven, or both – they want to use. In addition, the ESR’s referral guidelines can be localised to reflect national regulations or institutional requirements. Once scope and context questions are clarified, NDSC maps the orderable hospital procedures to the ESR iGuide exam catalogue and enables ESR iGuide in the hospitals’ IT environment in cooperation with the EMR provider. Detailed review meetings and testing sessions ensure that potential issues are addressed before the system goes live. NDSC’s reporting package, which is also configured during the implementation process, enables users to track the usage of ESR iGuide and analyse its impact. Supported by NDSC, hospital staff involved in the implementation project team then train referring physicians to use the system.

Once ESR iGuide is switched on, pilot sites collect data for several weeks or a few months as referring physicians start using ESR iGuide. The system’s structured reasons for exam indications. The results of the Barokona pilot project were published at the WICONA Europe 2016 conference. Guided by the Croatian Ministry of Health, ESR iGuide was implemented at five sites in Croatia over the summer of 2016 by NDSC and the Croatian EMR provider IN2. The data collection phase ran from go-live in October until the end of January 2017. Preliminary results indicate that up to 25 per cent of referrals for diagnostic imaging were either inappropriate, or could have been done using a more appropriate alternative diagnostic imaging modality. Aside from statistically significant improvements in the appropriateness of referrals, the data captured through the use of ESR iGuide has led to findings for other qualitative improvements in the referral process.

For more detailed information please visit the RTF Meeting Point in the ESOR & Rising Stars Lounge. Join us also at the RTF Quiz with Quizzmasters José Cáceres and José Vilar today, 12:30-13:30 in Room B (second level) and the RTF Delegates’ Meeting (General Assembly today, 16:00-17:30 in Room 0.96/0.97 (entrance level).
EuSoMII to integrate information and communication technology with medical imaging

The year 2016 was a crucial one for the European Society of Medical Imaging Informatics (EuSoMII) and for imaging informatics. The Society has completely redefined its vision and mission. Its mission is to foster the transition from research projects in medical imaging informatics to clinical and educational applications, mainly regarding the following domains:

- Intelligent structures and processes for knowledge management in medical diagnosis and therapy
- Seamless information sharing for healthcare delivery and for clinical research purposes
- Standards and quality assurance methods and tools
- Clinical computer applications of medical images
- Standards in imaging informatics supporting interoperability of medical devices and software (IHE-based)

The vision of the EuSoMII is to integrate information and communication technology with diagnostic and therapeutic medical imaging. It wants to become one of the leading platforms in Europe related to medical imaging informatics. The Society wants to bring together radiologists and nuclear physicians with other imaging informatics professionals, such as clinical physicists and software engineers. The EuSoMII is now officially recognized as a sub-specialty society of the European Society of Radiology (ESR), and from 2017 the Society will be affiliated with the ESR journal European Radiology. Insights into Imaging and European Radiology Experimental. In addition, close collaboration will be sought with other societies that are active in these fields and using intensive use of the clinical application of these new developments in information technology.

The EuSoMII Annual Meeting was organized in collaboration with the European Society of Oncologic Imaging (ESOI) in Valencia at the La Fe University Hospital, October 6–8, 2016. The meeting was organized with the intention of giving its attendees the opportunity to understand the importance of informatics for oncologic imaging, in both clinical practice and research. The meeting was able to provide more insight into how information technology may contribute to enhancing the multidisciplinary management of cancer patients and improving communication between medical specialists and patients. A comprehensive series of workshops was offered to participants, tailored to both clinicians and computer scientists. It was a unique event in which discussions were held in a multidisciplinary setting with a focus on innovations in healthcare. It was also the first year of the EuSoMII webinars, in which the Society outlined its educational and scientific plan, and addressed topics related to standards in eHealth, structured reporting, CAD, learning, and PACS replacement. The 2017 webinars are broadcast on the first Thursday of each month at 19:00 (CET) and are accessible to all members. The first webinar after the ECR will be given on March 9, 2017 by Bradley Erickson, with the title ‘What is deep learning and how might it impact radiology?’

In 2016 we will focus on bringing more radiologists and other professionals in imaging informatics, such as clinical physicists, software engineers and information technology specialists. EuSoMII will also create a Young Members’ section for members 35 years old or younger, mainly with the idea of launching a future leaders programme for residents, fellows and doctoral students, and with the intention to engage young radiologists more actively in the new developments in imaging informatics that lie ahead of us.

So here is your official invitation. It’s the perfect time to join EuSoMII or to renew your membership, and we would love to help you become more involved in the Society. Please feel welcome to reach out to me or one of our board members to express your interest. We will do all we can to help you find a fun and fulfilling role in EuSoMII.

www.eusomii.org

Prof. Sergey Morozov, MD, PhD
MPH is CEO of the Radiology Research and Practical Centre, Moscow, Russia. Chief Radiology Officer of Moscow and President of the European Society of Medical Imaging Informatics (EuSoMII).
The ESR e-learning platform 
Education on Demand: a look back at the first two years

Education on Demand provides continuing medical education to radiologists and radiologists in training, offering various learning resources such as recorded European School of Radiology (ESOR) courses, e-learning modules, self-assessments, literature modules and quiz cases, all following the European Training Curriculum for Radiology.

We spoke to the Editor of Education on Demand, Dr. Sue Barter from Cambridge, UK, and Prof. Laura Oleaga from Barcelona, Spain, representing the ESR Education Committee. They give us some insight into the achievements of the platform since its inception at ECR 2015.

ECR Today: During its first two years, how successful do you think Education on Demand has been?

Dr. Sue Barter: I have been honoured to be given the task of building on the foundations laid by Prof. Andrés Palkó. The e-Learning platform Education on Demand was launched to provide a resource where all the various educational material can be accessed by ESR members to meet their needs for online education in a rapidly changing technological world.

Prof. Laura Oleaga: We are thrilled that since its launch, nearly 4,500 individuals from 277 different countries have used the platform, and have submitted more than 37,000 tests – a very impressive figure. This success is a testament to the excellent effort by the e-Learning board members and the ESR office staff, who have worked hard to ensure the content is high quality, up to date and relevant.

ECRT: What different aspects does the platform offer, and which audience do you think benefits most?

Laura Oleaga: Education on Demand is totally free for members of the ESR. The platform contains a variety of modules; some are based on recorded lectures, some on current literature and some are quiz cases and self-assessment modules. These cover all areas of radiology. The user can access the platform from all electronic devices, including smartphones and tablets.

Sue Barter: Seventy-five percent of our users come from Europe, the majority are trainees, and this is the focus group for most of the activities offered on the platform, although all the content is suitable for those wishing to brush up knowledge on any topic.

Recorded ESOR and ESRF courses are also available and in demand, since they are excellent preparation for the European Diploma in Radiology in the ‘usual’ highly popular ESOR format.

ECRT: Education on Demand offers e-CME accredited content: how many points are currently available and what are the benefits of e-learning compared to live events?

Laura Oleaga: There are currently more than 260 modules available on the platform, more than half of the modules are accredited by the Austrian Medical Chamber and this is recognised in many countries, namely Austria, Albania, Bulgaria, Cyprus, Estonia, Germany, Ireland, Israel, Italy, Lithuania, Netherlands, Poland, Romania, Slovakia, Switzerland, Turkey, and the United Kingdom.

Sue Barter: We are constantly working to get new modules and have them accredited. There are over 360 e-CMEs (Continuing Medical Education credits) available. We see a steep trend upwards with an increase of 57% in 2016 compared with the previous year and 1,400 certificates issued in total, which demonstrates that there is a demand for CME which can be obtained remotely.

ECRT: What new features have been implemented recently, and what are you working on for the future?

Laura Oleaga: A new classification for modules suitable for undergraduates ‘Level U’ has been implemented for medical students. This will allow them to deepen their knowledge of radiology. A similar classification of modules suitable for radiographers is in progress in cooperation with the European Federation of Radiographer Societies (EFRS). We are also working with the EFRS to produce modules on radiation protection based on some work they have already done.

Sue Barter: One of our goals is to have more assessment modules with feedback suitable for examination preparation. During ECR 2017 new lectures on basic science, radiation protection, and hybrid imaging are going to be recorded and implemented in the platform.

Ultimately our goal is to have modules on all aspects of the European Training Curriculum for Radiology.

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Ultimately our goal is to have modules on all aspects of the European Training Curriculum for Radiology.
How to submit successfully to EURORAD: an interview with authors of 2016

EURORAD has seen a substantial rise in submissions during 2016, again confirming its relevance for junior and senior authors alike. We spoke to three of the top authors with the highest number of accepted cases in 2016 – Massimo Tonolini from Milan, Italy, Joan Albert Prat-Matifoll from Barcelona, Spain, and Dyan Christine Flores from Makati City, the Philippines – to highlight their perspectives and communicate their tips for fellow authors on a successful submission.

Massimo Tonolini is a radiologist at the Luigi Sacco University Hospital in Milan, Italy.

Dyan Christine Flores is a diagnostic radiologist presently working as a CT/MR fellow in a private, tertiary hospital in Makati City, the Philippines.

Joan Albert Prat-Matifoll is a third-year radiology resident at Vall Hebron Hospital in Barcelona, Spain.

**ECR Today: Please describe yourself briefly, your background and current working field.**

**Massimo Tonolini:** I graduated in Medicine in 1995 and have been working at the Luigi Sacco University Hospital in Milan for eleven years. During my career I have practiced in most fields of diagnostic imaging with the exception of breast studies. Currently I spend most of my daily work doing emergency radiology body and neuro MRI. I also have a special focus on elucidating postoperative complications.

**Joan Albert Prat-Matifoll:** I am currently in my third year of residency in Vall Hebron Hospital in Barcelona. Last year I was invited to present a quiz case at the ECR 2016 Junior Image Interpretation Quiz and I am glad to keep collaborating with the European Society of Radiology by sharing case reports on EURORAD.

**Dyan Christine Flores:** I am a diagnostic radiologist presently working as a CT/MR fellow in a private, tertiary hospital in the Philippines. I specialize in MSK imaging. I have a great interest in writing and clinical research and I hope to work in academia once I am finished with the fellowship.

**ECRT: What are your experiences with the teaching case platform EURORAD? What do you like about it?**

**Massimo Tonolini:** During the last decade I have increasingly appreciated EURORAD because of the practical, problem-oriented value of most cases. Since 2010 I have published more than two hundred cases, often with the help of my younger fellows and residents.

**J.A. Prat-Matifoll:** I came across EURORAD during my second year of residency and saw it as an interesting way of sharing the most striking radiological cases seen in my hospital. I found the EURORAD submission system so simple and straightforward that I was motivated to upload more and more cases.

**D.C. Flores:** I have had an incredible experience with EURORAD. I see that it is very simple, very easy to read, and yet the cases are relevant. I also like that it does not put too much emphasis on new diagnoses, as even though they can be interesting, they are not often seen in daily practice.

**Additional:** The reviewers provide very helpful suggestions and insights. I also like that I have not experienced delays in this platform; the longest time it took for my case to be reviewed was only six weeks.

**ECRT: How do you select cases for submission?**

**Massimo Tonolini:** I have always been a hospital-based radiologist, and interesting cases present themselves nearly every day at my hospital, which mainly focuses on care of HIV infectious and tropical illnesses, and chronic inflammatory bowel disorders.

**J.A. Prat-Matifoll:** I try to select two types of cases: the basic ones, which I report on a daily basis and the difficult or striking ones, which I enjoy the most. Above all, the main goal of submitting EURORAD cases is learning, so I select them in order to improve my knowledge about interesting topics.

**D.C. Flores:** It is often tempting to submit rare cases, or diseases endemic to a specific country. Most of the cases I have chosen for submission have teaching value, especially for medical students and for radiologists who are just beginning their careers. There might already be a similar case somewhere in the database, but I make sure to emphasize unique points that have not been previously stated.

**ECRT: How do you search for related studies and prepare the discussion to interpret your findings?**

**M. Tonolini:** In most situations, a case report is born when you become aware of the final diagnosis made by pathology, surgery or follow-up of a challenging CT or MRI study. The other requisite for a thorough discussion and differential diagnosis is a literature search through Medline.

**J.A. Prat-Matifoll:** I really like using reference books, scientific articles and previous electronic posters in the EPOS database to learn how to describe and pinpoint the key findings of every case.

**D.C. Flores:** I use PubMed to look for similar cases. I also like using Radiographics for inspiration in constructing the flow of my discussion because I find their articles very organised. I use Merckel to organise my references.

**ECRT: What is your advice for young colleagues who would like to get a case report accepted?**

**M. Tonolini:** Always remain curious about the fate of interesting patients you encounter in your everyday practice, which often provokes reawakening of the learning viewpoint. In your field of interest, stay up-to-date with the pertinent literature, and seek close cooperation with clinicians.

**J.A. Prat-Matifoll:** My advice would be to provide a concise list of findings for each case as well as key images with their explanatory captions. I think most radiologists seek fact answers and key findings when they browse cases on EURORAD.

**D.C. Flores:** Select excellent, high quality images and if need be, draw your own schematic diagrams. Read a lot of journal articles to help you in constructing your sentences and always begin with an outline for better organisation.

**ECRT: Do you use EURORAD cases for teaching in your institution?**

**M. Tonolini:** No, I don't routinely use EURORAD cases for institutional teaching but I have used several of them in comprehensive pictorial reviews, such as those on post-surgical complications which appeared in Insights into Imaging.

**J.A. Prat-Matifoll:** Not yet, but it could be a compelling option to explore in the near future. I think that e-learning is rapidly evolving and radiologists should be aware of its possibilities. I strongly believe that EURORAD could play a critical role in the future training of radiologist residents across Europe.

**D.C. Flores:** Definitely, I think the cases are very interesting, but simple, not too overwhelming for young radiologists.
The European School of Radiology (ESOR) celebrates 10th anniversary

The European School of Radiology (ESOR) has completed ten years in action. Ten challenging and rewarding years of unfailing commitment and continuous investment in radiological education in Europe. Ten years of envisioning, engaging, delivering, teaching, tutoring, nurturing and adding value to radiology.

We proudly present the scholars and fellows of 2016

Scholarship Programme in Europe

Daniel Andreu, Castelló/Patagonia
Alexandr Adamievitch, Novy/Nowysibirsk
Giuseppe Cerino, Messina/Italy
Somalee Cuiok, Chai Naopak/Romania
Milosza Maria Coza, Campina Turza/Romania
Marvin Carpman, Warsaw/Poland
Rok Durnan, Ljubljana/Slovenia
Orla Drummond, Dublin/Ireland
Miha Enrici, Bruxelles/Brussels
Francesca Fanti, Pisa/Italy
Marco Gatti, Turin/Italy
Pradyumna Gopalan, Calcutta/India
Laura Ludwight Crammas, Bologna/Italy
Sya Lenuvidich Gubsky, Moscow/Russian Federation
Moe Valavazoo Shah Mohammadi, Iran/Iran
Kenzo Gazzaniga, Genzona/Italy
Sara Maria Mbonbola, Valencia/Spain
Cyprian Michael Gochowy, Zawierch/Poland
Piero Gogali, Ljubljana/Nowy
Marek Goli, Poznan/Poznan
Antonio Gori, Poznan/Poznan
Anastasios Gourtsoyiannis, Athens/GR

Scholarship Programme in USA

Ulrika Aasenbaum, Vienna/Austria
Fareh Golechs, Moscow/Russian Federation
Adriana M. Hoffer, Hanover/Germany
Justyna Paulina Jalinski, Ren/Italy
Navid Kazemi, Case Western/USA
Teresa Gonzalez De La Huesba Laborde, Madrid/Spain
Elena Pavlov, Zagreb/Croatia
Ramin Pourghorban, Tehran/Iran
Simon Rauch, Winterthur/Switzerland
Ulf Mattsson, Uppsala/Sweden
Elena Pivato, Utrecht/Netherlands

ESOR Session (European School of Radiology)

Thursday, March 2, 14.00–15.30, Room M 3

How to gain and maintain quality education in radiology

Moderators: N. Gourtsoyiannis; Athens/GR

» Introductions: PM. Parnell; Antwerp/BE

» ESOR in action 2017: N. Gourtsoyiannis; Athens/GR

» How to improve education in radiology: S.J. Gilling, Oxford/UK

» Feeling confident? Evaluating competencies: O. Kitzkythas, Seattle/WA/US

» Lifelong learning: stay sharp in the field of radiology: B. Ertl-Wagner, Munich/DE

» Find your mentor and stick together: C.A. Minouz, Bucharest/RO

» Awards

Nicholas Gourtsoyiannis is the Educational & Scientific Director of the European School of Radiology (ESOR) and chairman of the ESOR Committee.

The certificates will be awarded during the ESOR session.
Does the European Diploma in Radiology (EDiR) really help you in your professional career?

Every year more candidates decide to take the EDiR examination. Candidates who pass the examination and become EDiR holders prove that their knowledge is appropriate for independent practice in general radiology, according to the standards set by the European Society of Radiology in the European Training Curriculum for Radiology.

Despite this fact, many EDiR applicants still wonder whether this certificate can help them to achieve their professional goals. Below, you will find four testimonials from successful EDiR candidates that may shed some light on this particular issue.

First we spoke to Adelard De Backer, MD, PhD, Chairman of the Department of Radiology at General Hospital Sint-Lucia in Ghent, Belgium, and an EDiR holder since 2013 when he took the examination at ECR 2013 in Vienna.

ECR Today: What were your main reasons for taking the EDiR examination?
Adelard De Backer: First of all, I was curious to find out at what level my current knowledge of general radiology was. Being an EDiR candidate was an excellent opportunity to compare my knowledge with other radiologists and final-year residents. Working in a large public hospital in Ghent (Belgium), I am specialised in abdominal radiology. We have also first and second-year residents at the hospital. In most private hospitals, knowledge of most fields of radiology is important in order to participate in the on-call service. For that reason I follow congresses and postgraduate courses, and read the current literature in the field of radiology. To prepare for the EDiR, I was motivated to perform an additional exercise to improve my knowledge. I was excited to know whether this would be sufficient to pass the EDI exam.

Moreover, I was interested to see how the European Training Curriculum for Radiology was reflected in the EDI exam and how difficult it would be to pass the exam for a young radiologist or resident in his first or second year. It was an opportunity to talk with a lot of young radiologists and residents from different countries before the exam started, after the first day (most passed the first day, some did not) and also the second day. This offered me a better insight into the motivation of those who participated in the exam (some radiologists and residents decide to participate, others do not). I was impressed with the training programme most of the residents followed.

ECRT: Do you think that the EDI adds value to a radiologist’s career?
ADB: I believe in its benefit for young radiologists and residents in their last year. Because the training programme and the content of the EDI examination covers all fields of radiology, passing the EDI is the final proof to certify whether a candidate has a good knowledge of most areas of radiology.

But also for older radiologists most of them are specialised in one or two topics of radiology I see added value: passing the EDI proves that their knowledge in most fields is still up to date.

For a head of a radiology department, it gives you some authority to participate in the audit process, in order to further improve the quality of the radiology department.

ECRT: Can it be a decisive factor when hiring a radiologist?
ADB: This question would also be interpreted as: if you have the choice between two radiologists with a comparable curriculum for one place in your department, one of whom has passed the national exam, and the other of whom has passed the EDI exam, which one should you choose?

EDI certification provides additional proof of the holder’s level of knowledge of all aspects of radiology. Following the training programme for EDI, shown the candidate to be more motivated to perform additional exercises to improve their skills and to understand continuous education, which will also be necessary in the future.

ECRT: Would you recommend the exam to your colleagues?
ADB: Yes. For residents in their final year and young radiologists I think following the training programme and participating in the EDI exam is valuable. When they later specialise in one or two areas of radiology this will improve their long-term knowledge of the other parts of radiology.

EDI certification could also be announced on radiology department websites.

I think it will be difficult to motivate veteran radiologists with sub-specialisation in only a few areas of radiology.

Next we spoke to Joanna Szyrko, a certified radiologist and EDiR Holder from Warsaw, Poland.

ECRT: How has your career improved since taking the EDI examination?
Joanna Szyrko: After taking the EDI examination there was a huge speed-up in my career. I began to be recognised as a professional (although I still had about eight months to finish my training) and received many job offers from public and private institutions, not only in my country, but also overseas. This means I have even more opportunities to gain a lot of new experience and knowledge, as well as further sub-specialty training.

ECRT: How did EDI help in this improvement?
JS: EDI helped a lot in having my professional qualifications and knowledge recognised overseas, serving as a document of international importance. Passing it in a foreign language (English) gave it additional value in my language skills.

ECRT: Would you recommend the exam to your colleagues?
JS: I would recommend the EDI exam to my colleagues without hesitation.

It is an unmisible opportunity to summarise one’s knowledge, to prepare one’s own learning professional challenges and after all – it is definitely a great confidence booster. Also, the feedback provided after the exam helps you to judge your level of knowledge in every field of radiology. I found the rules of the exam fully transparent and clear. Also, the logistics issues were very well solved – things moving smoothly with absolutely no rush.

There are many possibilities to improve one’s preparations as a rich, up-to-date and diverse, dedicated e-learning platform exists.

Last but not least, for those who dare to take their examination in Vienna, the exciting addition of ECR participation awaits – I believe this point needs no further discussion!

ECRT Today asked Conal Corbally, certified radiologist from Ireland and EDiR Holder since he took the exam in Barcelona in December 2016.

ECRT: How has your career improved since taking the EDI examination?
Conal Corbally: Studying for the EDI exam gave me a wide breadth of knowledge over general radiology. For the last two years of my training I have been specialising in neuro-radiology and was out of practice with several of the other radiology fields, like cardiac and musculoskeletal. I feel a lot more confident now in discussing general radiology topics, when asked by clinicians at multidisciplinary team meetings or if there is an unexpected finding on one of my neuro cases for example.

ECRT: How did EDI help in this improvement?
CC: The EDI was helpful because you not only have to prepare for the multiple choice questions, but also have to know what all the different pathologies can look like. While I think reading for MCQs helps by giving you an understanding of a subject, the image interpretation is what helps you the most in your day to day work, so an exam that included that was better in my opinion.

ECRT: Would you recommend the exam to your colleagues?
CC: Yes I would recommend this exam to my colleagues.

ECRT: How has your career improved since taking the EDI examination?
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Michał Wyczynkowski, certified radiologist from Poznań, Poland and EDiR Holder since December 2016 (EDI exam in Barcelona) was next to share his thoughts.

ECRT: How has your career improved since taking the EDI examination?
Michał Wyczynkowski: The most important thing for me is the fact that, after receiving the results of the EDI exam I had three new offers of work. These new places are developing professional challenges and after all – it is definitely a great confidence booster. Also, the feedback provided after the exam helps you to judge your level of knowledge in every field of radiology. I found the rules of the exam fully transparent and clear. Also, the logistics issues were very well solved – things moving smoothly with absolutely no rush.

There are many possibilities to improve ones preparations as a rich, up-to-date and diverse, dedicated e-learning platform exists.

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Unfortunately, none of our interviewees (other than Michał Wyczynkowski and Joanna Szyrko) were able to mention a big salary increase as the reason for taking the exam. Michał Wyczynkowski was the only one to mention possible career advancement as one of the advantages of the EDI exam.

Our final interview partner was Çağatay Topel, a last year resident from Ankara, Turkey and EDiR Holder, who took the EDI exam in October 2016 in Istanbul.

ECRT: How has your career improved since taking the EDI examination? How did EDI help in this improvement?
ÇT: Since I am still in my fifth year of radiology residency, my radiology career hasn’t changed notably yet. I believe EDI has definitively increased the validity of my CV to some degree when applying for a job or fellowship, since EDI is endorsed by the ESR, one of the most respected and recognised bodies in the field of radiology.

ECRT: Would you recommend the exam to your colleagues?
ÇT: Absolutely. Since the examination provided an objective test of knowledge, I would recommend the EDI exam to others. Besides, the preparation period gave me the chance to review the basics and standards of radiological knowledge.
The motto of the congress is not an expression of smug self-satisfaction. It communicates the level-headed insight that, due to their qualification and the very rapid developments in medical imaging, radiologists have a particular role and responsibility in interdisciplinary treatment processes. We see the big picture to serve the patients in the best possible way.

In 2017, a diverse and exciting conference programme awaits the participants once again, offering a broad spectrum of information for all areas of the profession. Formats and tools such as eBSN Diagnosis Live™ or the online teaching and learning platform of the DRG, with its digital case study collections (both launched successfully in 2016), will be developed and extended further, as well as the Röko International programme.

Digitalisation and networking are also topics that affect the very foundations of radiology and its underlying processes. As a medical discipline with a tradition of interdisciplinary treatment processes, radiology offers the best conditions for a platform where different players from the fields of medical care and research, including entities that bear the costs, industry, society and politics, can meet to find and exchange information. With the Forum IT, we will enable key stakeholders in healthcare, politics and administration to get together for the first time at the 98th German Radiology Congress and the 8th joint congress of the DRG and the ÖRG, to work on relevant themes such as value creation through digitalisation, the development of products that are in line with demand, security and interoperability.

Finally, we would like to point out two very special highlights. Cancer centres in Germany will be the subject of a highlight talk given by Professor Omar D. Wiestler at the opening event. Since September 2015, Professor Wiestler has been the President of the German Radiological Society (DRG) and the Austrian Roentgen Society (ÖRG).

For the 2017 radiology lecture, we proudly present Professor Hedwig Hricak, Chair of the Department of Radiology at the Memorial Sloan Kettering Cancer Center in New York and a distinguished expert in the field of oncologic imaging. The pioneer in using MRI to diagnose prostate cancer and gynaecologic cancers will provide us with an exciting insight into the future of oncologic imaging.

To learn more about the congress please take a look at www.roentgenkongress.de. We look forward to welcoming you to Leipzig in May 2017 at the 98th German Radiology Congress and the 8th joint Congress of the DRG and the ÖRG.
Radiological educational system in Kazakhstan transitions to European standards

By Tairkhan Dautov MD, Ph.D.

The Radiological Society of Kazakhstan (RSK) was founded in 1996, and the Radiological Association of Kosovo (RAK) was founded in 2000.

The educational programme of residency includes theoretical training including learning cycles, an obligatory component of basic training in radiological disciplines and an optional component of clinical training for student residents. During these two years, residents pass four examinations, including midterm and final examinations. The curriculum of the courses includes such cycles as a radiology ultrasound, CT and MR diagnostics and nuclear medicine, which do not feature in the material during the shortening of time in the residency programme.

In Europe, radiology is a part of the medical education. In some countries, subjects such as cross-sectional anatomy, radiology, radiation biology, radiation protection and haematology are studied at undergraduate levels. Level 1 training includes nuclear medicine, radiation protection training, the principles of diagnostic technology. Molecular diagnostics and evidence-based medicine are covered at this level. Level 2 training includes subspecialty subjects with a duration of two years. Level 3 training begins after five years of education and includes further training.

As the first step towards changing our system of training radiologists, the RSK plans to involve experts from the ESRs European Training Assessment Programme to conduct an audit and evaluation of the educational system in radiological departments in all medical universities in Kazakhstan. According to the recommendations received from the results of the audit, we would like then to send an appeal to the Ministry of Education and Science and the Ministry of Healthcare. Subsequently, the RSK plans to prepare a sample training programme for radiologists, extending the duration of training from two to four years, thus bringing it closer to international standards and improving the training of young radiologists.

Challenges for the Radiologists Association of Kosovo

Even though radiological services have been available for more than four decades, the results of today’s Radiologists Association of Kosovo (RAK) can be traced back to 1996, when the first professional alliance of radiologists of Kosovo was founded as one of the sections that were part of the General Association of Medical Doctors of Kosovo.

The post-war period in Kosovo (years after 1999) started with very few qualified radiologists (probably less than 15), who worked with equipment consisting of simple diagnostic array units (just few of them with fluoroscopy), a few ultrasound units, two CT scanners units in the public University Clinical Centre of Kosovo, and two other CT scanners in private clinics. All this equipment was supposed to serve a population of nearly two million. The registration and listing of available medical personnel (including radiological technicians) and equipment was the first task and activity of the Radiologists Association of Kosovo (RAK), which was founded in 2000.

The challenges that were faced by leading healthcare institutions (including the radiological ones) were very complicated and not an easy task to solve at that time. The RAK itself as an institution did not have formal and legal tools to manage significant funds and to orient them toward goals that looked most appropriate. The president of the RAK decided to focus activities in an alternative direction, sending the Ministry of Health, Regional Hospitals and Faculty of Medicine information regarding the need for radiology equipment, the need for training students and radiology residents and the need for continuing medical education. At the same time we started organizing professional conferences, seminars and short daily training for members of the association.

By the end of 2017, the situation had significantly changed. The University Clinical Centre of Kosovo and the regional hospitals were equipped with at least one MDCT CT scanner (six 3T and six 1T). MR scanners started working in both private and public sectors (mostly in private) and simple X-ray units (including fluoroscopy and angiography machines) are now fully digital or digitally differentiated. Different modalities of PACS are included with abovementioned digital systems.

And what are the challenges today in the radiological community of Kosovo, especially since the RAK joined the European Society of Radiology (ESR)?

The leaders and leading boards of different radiological institutional awareness are of the fact that even though Kosovo’s radios do not always meet the needs for a sustainable and qualified radiological service. This indirectly influences the quality of the radiologists’ contemporary education according to the ESR curricula. Speaking of scientific research demands, there is even more to be done. Qualitative peer-reviewed journals are still difficult to establish due to the level of radiology and costs for publication. EU and joint regional research projects would be an interesting field of cooperation in the coming years.

Regarding all these facts, and our aim that the RAK voice should be an obligatory component of the RAK’s contemporary education, according to the ESR curricula.

To achieve all these objectives, it is essential to ensure close collaboration and development of networks of cooperation with the ESR in general and other radiological institutions of the region and the World.

Arbian Bicaču, MD is a radiologist at the University Clinical Centre of Kosovo (UCC) in Pristina, Kosovo, and Secretary of the Radiologists Association of Kosovo (RAK).
Special Exhibition:
Georgia O’Keeffe

BANK AUSTRIA
KUNSTFORUM WIEN
1010 Vienna, Freyung 8
www.kunstforumwien.at
WHAT’S ON TODAY IN VIENNA?
THURSDAY, MARCH 2, 2017

THEATRE & DANCE

Das Konzert
by Hermann Bahr
AKADEMIETHEATER | 20:00
1030 Vienna, Lisztstraße 1
Phone: +43 1 51444 4145
www.burgtheater.at

Die Affäre Rue de Lourcine
by Eugène Labiche
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, Rotenturmstraße 20
Phone: +43 1 42 700 300
www.josefstadt.org

Diese Mauer fasst sich selbst zusammen und der Stern hat gesprochen, der Stern hat auch was gesagt
by Miroslava Svolikova
SCHAUSPIELHAUS | 20:00
1090 Vienna, Porzellangasse 19
Phone: +43 1 317 01 01
www.schauspielhaus.at

Sieben Sekunden Ewigkeit
by Peter Turrini
THEATER IN DER JOSEFSTADT | 19:30
1080 Vienna, Josefstadtstraße 26
Phone: +43 1 42 700 300
www.josefstadt.org

Klein Zaches – Operation Zinnober
based on a story by E.T.A. Hoffmann
VOLKSTHEATER | 19:30
1070 Vienna, Neustiftgasse 1
Phone: 43 1 5211 400
www.volkstheater.at

CONCERTS & SOUNDS

David Krakauer
The Big Picture (world music)
KONZERTHAUS | 19:30
1050 Vienna, Lothringerstraße 20
www.konzerthaus.at

Les Arts Florissants
Conductor Paul Agnew
C. Monteverdi: L’Orfeo
MUSIKVEREIN | 19:00
1010 Vienna, Bösendorferstraße 12
www.musikverein.at

Pasquale Stafano
PORGY & BESS (JAZZ) | 20:30
1010 Vienna, Riemergasse 11
www.porgy.at

OPEREA & MUSICAL

Heute im Foyer …
Music for two violins
VOLKSOPER | 19:30
1090 Vienna, Währingerstraße 78
www.volksoper.at

Don Giovanni
by Wolfgang Amadeus Mozart
Conducted by Adam Fischer
With Adam Plachetka, Albina Shagimuratova, Saimir Pirgu, Olga Bezmertna, Jongmin Park
WIENER STAATSSOPER | 19:00
1010 Vienna, Opernring 2
www.wiener-staatsoper.at

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

Don Camillo & Peppone
Musical by Michael Kunze & Dario Farina
RONACHER | 19:30
1010 Vienna, Seilerstätte 9
www.musicalvienna.at

Please note that all theatre performances are in German.