Controversy persists over implementing breast screening for the under 50s

By Philip Ward and Rebekah Moan

Screening is effective in reducing breast cancer mortality in women aged 40–49, but false positives remain a serious problem, ECR attendees were told at a special focus session on Friday.

"Should we screen women under 50? I think the answer is yes," noted Prof. Andy Evans, professor of radiology at the University of Dundee, U.K. "Attendance rates are good in younger women, and mammography is not dramatically less sensitive in pre-menopausal women. But the downside is that screening recalls and screening-provoked surgical biopsies are approximately 50% less specific."

The key questions concern the benefits in terms of mortality reduction and the possible harm in terms of false positive recalls and surgeries, over diagnosis, and radiation dose.

Randomised controlled trials (RCTs) have their weaknesses and are open to criticism, he said. For instance, two Swedish studies showing significant mortality reductions – Malmö and Gothenburg – used screening methodology more suited to this age group than some of the other RCTs, particularly multiple rounds, two views, short screening intervals, and modern mammography techniques.

"Womens in the control groups in the Malmö and Gothenburg studies were not screened at aged 50," Evans stated. "Could the benefits in women aged 40–49 at randomisation be due to screening episodes for those aged over 50?"

Furthermore, three studies – Kopparberg, Gothenburg and Health Insurance Plan, or HIP – evaluated data based on age at diagnosis rather than age at randomisation, and most of the mortality benefit was derived from cancers diagnosed while women were in their 40s.

During the panel discussion, Dr. Sophia Zackrisson, a radiologist from Skåne University Hospital Malmö, Sweden, asked if screening women from the age of 45 or 47 years would be a better solution because most deaths in that age bracket happen in the older women.

"We tend to look at 10-year groups, but you're absolutely right, cancer gets more common the older you get," replied Evans. "There is no reason we have to include 40-year-old women; it could be 45."

Another delegate asked whether it could be cost-effective to screen women under 50.

Evans noted that if you look at modelling papers, it matters whether you're looking at life years saved or mortality. If you're looking at mortality, then no, screening the under 50s is not cost-effective, but if you're looking at life years saved then yes, it's cost-effective, he said.

Session moderator Dr. Matthew Wallis, consultant radiologist and director of the Cambridge and Huntingdon Breast Screening Service in the U.K., urged radiologists to be more thoughtful and intelligent and not to forget the two golden rules: screening is never going to be perfect, and there is always a balance between benefit and harm.

"We rather overdo the positive because there are vested interests. We've got to be more careful about what we say and who we say it to," said Wallis, adding that it is very easy to accept all the sound bites and press comments. "Stop using relative risk and start using point risk."

Radiologists must accept that they will not find some cancers. MRI and ultrasound are very good at detection, but cost is also important. In the drive to find more cancers, we must reduce the harm, he pointed out. More clarity and better communication can help eliminate controversy, chaos, and confusion.

He quoted some examples of sound bites of dubious value:

- She packed your lunch. She tied your shoes. She helped you find your way in the world. Now it's your turn to help your Mom. Send Mom a mammogram reminder gift.
- If only women paid as much attention to their breast as men do.
- 1 in every 8 women will develop breast cancer.

Andy Evans from Dundee, U.K.
Matthew Wallis from Cambridge, U.K.
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Avoid malpractice claims by keeping aware of pulmonary nodules

By Philip Ward

CT plays a critical role as an imaging biomarker for pulmonary nodules, and can also help determine patient management, according to Dr. Cornelia Schaefer-Prokop, associate professor of radiology at Meander Medical Center, Amersfoort, the Netherlands.

Pulmonary nodules are very common, and represent an everyday challenge. New techniques are emerging to detect and display the real liver, and learning about liver biomarkers.

“Be aware of the limitations of diameter measurement,” she advised. “Use the same volumetry software for baseline/follow-up. The rule of thumb is that significant growth must be greater than 25%.”

Typical perifissural nodules represent benign lymph nodes, and a solid component in persistent sub-solid nodules can affect outcome. Morphology can predict likelihood of malignancy (lobulation, spiculation, non-spherical shape, no attachment), while growth rate predicts biologic behaviour.

For successful nodule management, do not follow perifissural nodules, and do not follow smooth small nodules (less than 4-5 mm), unless metastatic rate is accepted. Schaefer-Prokop pointed out. Follow indeterminate (5-10 mm) or sub-solid lesions, do not biopsy or use PET for sub-solid nodules, resect growing sub-solid lesions and biopsy/resect solid lesions.

Computer-aided detection and diagnosis will become indispensable for nodule identification, characterisation, and volumetry/growth assessment, she predicted.
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Each dose matters.
CT coronary angiography gets set to enter clinical mainstream

By Frances Rylands-Monk

The promise of 3-D CT has turned from myth to reality for diagnosis of coronary artery disease, but is screening CT coronary angiography ready for primetime? Can it ever be cost-effective, and more than just a pretty picture?

Those burning questions were addressed by Dr. Massimo Galia, a radiologist at the University Hospital of Palermo, during yesterday’s popular ‘ESR meets Italy’ session. His lecture about the outlook and clinical perspectives of multidetector CT coronary angiography (MDCT-CA) for diagnosis of coronary artery disease, highlighted the importance of non-invasive imaging of coronary plaques, and defined the current and future role of MDCT for coronary artery disease and cardiac functional assessment. He pointed to the improved spatial and temporal resolution and reduced radiation dose as the era of MDCT get underway in the 2000s, and encouraging trends in its cost-effectiveness.

“In terms of prognostic value of CT coronary angiography, in patients with known or suspected coronary artery disease, studies show no cardiac acute events in patients with normal coronary arteries at MDCT-CA,” noted Galia.

Cardiac CT has a 90% accuracy with sensitivity and negative predictive value close to 100% in the majority of trials, and is capable of visualising calcified and non calcified plaques, although one limitation is the possibility of false positives in stent assessment.

Galia pointed out the different strategies for diagnosing ischaemia versus atherosclerosis. Non invasive anatomical imaging would be normal or would reveal either obstructive or non obstructive atherosclerosis. In obstructive atherosclerosis, functional imaging would further reveal whether or not there was presence of ischaemia, necessitating invasive coronary angiography and revascularisation if needed.

CT-CA was not always the appropriate examination, however. In symptomatic patients with suspected acute coronary syn- drome, definite myocardial infarction, for example, made the study inappropriate, while there were still instances when its role is as yet unclear, such as in patients with normal or equivocal ECG or biomarkers but with a high pre-test probability.

The future outlook for coronary artery disease lay in CT functional assessment, as well as new software platforms, novel contrast agents and plaque regression/regression studies, he added.

A working group from the cardiac radiology section of the Italian Society for Medical Radiology (SIRM) has been compiling an official document for clinical indications for cardiac CT, and is due to be published later this year. “Cardiac imaging will soon be a part of daily routine practice. In a few years from now, a standard chest CT will probably include a report of the heart and coronary arteries,” Galia told delegates.

At the same session, Prof. Carlo Faletti, head of the imaging department and interventional radiology at Orthopaedic-Trauma Hospital and Sport Medicine Institute, Turin, talked about his experiences in 2006 as a polytechnic radiologist co-ordinator for the Winter Olympics. Other speakers included Prof. Roberto Grassi, professor of radiology at the Institute of Radiology, Second University, Naples, who outlined an experimental study with CT micro MRI in vivo rat model of intestinal infarction, and Prof. Andrea Gio- vagnoni, radiologist at Università Politecnica delle Marche Ancona, who covered contrast agents for liver imaging.

This session was the first ‘ESR meets’ of the congress, and according to ECR President and session chair Prof. Lorenzo Bonomo, the initiative continued to prove a brilliant idea, originally conceived by past ECR President (2005), the late Prof. Antonio Chiesa.

“These sessions strengthen co-operation and friendship with other countries. I am very happy to introduce the radiology of my beloved country, Italy,” said Bonomo, who shared yesterday’s chair with Prof. Antonio Rotondo, professor of radiology at Università degli Studi Federico II, Naples.

SIRM is one of the largest medical societies in Italy, with over 9,000 members. The society is organised in regional groups and study sections, the latter based either on clinical radiological subspecialty or on radiological modalities to promote radiological progress and also to organise continual medical education for members. The 45th SIRM national congress is taking place in Turin from 1 to 5 June 2012.

EPOS exhibition enters a new frontier

By Mélisande Rouger

Crowds of knowledge hungry delegates continued to pour into the EPOS’ electronic presentation online system) Lounge on Friday, as live discussions offered a fascinating outlook on iterative dose reduction and response evaluation in oncologic imaging.

Poster authors were able to personally introduce and comment on their own creations with the public in the relaxed atmosphere of the EPOS Lounge, where enhanced sound quality and a refined video system delighted everyone.

“We really worked on improving the quality of the live discussions this year by placing them in a dedicated corner of the lounge and employing a sound engineer to ensure good acoustics,” said Prof. Filipe Casete-Alves, chairman of the scientific exhibition.

Delegates unable to attend the packed sessions in Room Z were able to watch them thanks to a broadcast service available in the lounge.

This year, EPOS also introduced online poster submission of ongoing clinical trials, with extended deadlines. Authors could submit their work from early January until February 27.

“We use EPOS on a regular basis in my department, for instance during meetings with residents. If you are just looking for benign tumours of the liver you can find very specific information on the platform,” he said.

EPOS is one of the most popular and well-accepted feature of the congress, and according to ECR President and session chair Prof. Lorenzo Bonomo, the initiative continued to prove a brilliant idea, originally conceived by past ECR President (2005), the late Prof. Antonio Chiesa.

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EPOS Discussions drew a crowd yesterday afternoon and will continue today and tomorrow.

EPOS exhibition enters a new frontier
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When can you be sure you’re dealing with hepatocellular carcinoma?

By Rebekah Moan

Radiologists play a pivotal role in managing patients with hepatocellular carcinoma (HCC), but the tumour is a challenging one due to its variegated imaging appearance. Knowledge and recognition of the stepwise carcinogenetic process in the context of liver cirrhosis is of paramount importance for tumour detection and characterisation, according to Prof. Filipe Caseiro-Alves, who will moderate today’s special focus session about HCC.

The global incidence and prevalence of HCC is rising sharply, mostly due to an increasing number of hepatitis B and C chronic carriers at special risk of developing HCC.

“All radiologists are faced today with the need to image these patients correctly and to draw conclusions about detection, tumour aggressiveness, intra-hepatic staging recognising treatment options, and prognostic implications,” said Caseiro-Alves, head of the imaging department at the University of Coimbra in Portugal.

Not surprisingly, treatment decisions for HCC are heavily based on imaging. MRI seems to be the most comprehensive technique for at-risk patients, or those with a non-characterised liver nodule in the context of chronic liver disease. It can explore tumours at several levels, provide information about microstructure, angiogenesis, cellular components, and functional events using hepatobiliary dedicated contrast agents.

“The main factors radiology must address are unequivocal detection and characterisation, lesion counting, and location,” he noted. Without this information, treatment planning is difficult to perform because guidelines incorporate treatment choices that range from elective surgery, transplantation, or ablative percutaneous techniques.

The information from the radiologist makes their role essential, according to Dr. Carmen Ayuso, from the radiology department at the University of Barcelona, and one of the presenters at the session.

“We contribute to determine the prognosis of the disease by defining the tumoural extension of the disease, in parallel to the liver function and the clinical condition of the patients. Thus, we have a pivotal role for the staging of the disease. Indeed, we apply some of the treatments demonstrated to be effective in patients with HCC, and we also evaluate the response to treatment,” she added.

The leading signs of HCC are hypervascularity and washout, which can only be correctly interpreted if the radiologist is able to set up the proper imaging technique in a multimodality perspective, stated Caseiro-Alves. Imaging criteria for HCC diagnosis incorporate revealing tumour angiogenesis, which means being able to detect transitory hypervascularity of tumours and contrast washout on later phases of enhancement.

“If an examination is poorly conducted, for instance omitting a late arterial phase of the dynamic study (CT or MR), it will compromise lesion detection and proper characterisation,” he added. “This may, in turn, result in a poorly addressed treatment of the patient.”

Radiologists are at the forefront of HCC research involving new MR sequences, contrast agents, and functional imaging. During her presentation today, Ayuso plans to discuss the Barcelona Clinic Liver Cancer (BCLC) approach to HCC management, which aims to establish the application of scientific data in the clinical decision-making process in patients with liver cancer.

“It defines the daily clinical practice in a structured manner following protocols that are agreed among all the specialties involved,” she said. “In addition, well-designed clinical research studies are inserted in daily practice, so that specific aspects related to the diagnosis and treatment of this disease are properly investigated by using confident gold standards.”

The BCLC classification is an example of the result of the scientific rigour applied in the clinical decision-making process. It has been demonstrated to be the most effective system to define the prognosis of the disease, and at the same time allows the radiologist to provide a therapeutic approach, she commented.

Speakers at the ECR session will also review and explain the major pathophysiological events occurring in the transformation of a hepatocellular nodule, which is initially benign, to overt HCC. Modern imaging techniques can follow the stepwise process of carcinogenesis, which results in an earlier diagnosis and consequently better monitoring of patients, according to Caseiro-Alves. Finally, the session will provide an overview of current treatment options using mostly interventional radiology and/or combined therapies.

“Go to the session, it will be fun and for sure informative,” he said. “The great skill and experience of the speakers will undoubtedly create a very positive and refreshing learning experience.”
The standard field strength of clinical MR units is still 1.5 Tesla, but the past five years have seen a tremendous increase in the number of devices operating at 3.0 Tesla. Those high field systems operating at 3.0 Tesla are especially helpful in the examination of the head, spine and musculoskeletal system. When it comes to imaging of the body, the results of trunk examinations at 3.0 Tesla or above are often inferior to those gained from operating at 1.5 Tesla, due to the fact that shorter wavelength leads to artificial and inhomogeneous signal intensity and possible contrast weighting in the thorax, abdomen, and pelvis.

Besides the clinical field, whole body systems up to 9.4 Tesla have become available in experimental settings and have already proven to be significantly beneficial in special purpose examinations. Professor Fritz Schick, Head of the Department of Experimental Radiology in Tübingen, Germany, gives some examples: “One interesting field is highly resolved anatomic MRI of the brain or joints. Some contrast mechanisms are clearly more effective at higher field strength. Susceptibility-based imaging (SWI, BOLD or T2* imaging) significantly benefits from the ultra-high field (7.0 Tesla).” Recent research has shown that functional MRI at 7.0 Tesla provided better results compared to 3.0T in the pre-surgical evaluation of patients with tumours located close to the sensor-motor area in the brain. In patients with Multiple Sclerosis, susceptibility-weighted imaging (SWI) at 7.0T reveals vein density and focal iron accumulations in MS plaques, which gives insight into the pathophysiology of this disease in vivo for the first time.

High field MR systems at 7.0 Tesla, with their higher signal-to-noise ratio (SNR) also make nuclei other than protein, such as sodium (23Na), phosphorus (31P), carbon (13C) and others visible. This is especially the case for sodium imaging, due to its rather low sensitivity, which is limited at 3.0 Tesla and below, and it has proven to be very valuable in the aftercare of cartilage repair surgery. Sodium imaging correlates with the proteoglycan content of cartilage, which is a significant measure of tissue quality due to its important role in the biomechanical functions of the cartilage. Higher SNR and spectral resolution at 7.0 Tesla are also responsible for a significant improvement in phosphorus spectroscopy, which allows for quantification of the energy metabolism of muscle in significantly reduced examination times in comparison with 3.0 Tesla, making it a highly attractive application to be introduced to clinical use.

But just as every coin has two sides, there are also drawbacks and technical difficulties to overcome when operating MR systems at high field strength. Some are closely connected to the very high SNR, which is normally a welcome effect that can either allow an increase in the spatial resolution within the same examination time or a reduction in the examination time while maintaining spatial resolution. However, it also comes with some unwelcome side effects. Spatially inhomogeneous RF excitation and signal yield are to be expected when RF wavelength (which is 52cm at 1.5 Tesla, 26cm at 3.0 Tesla, and 11cm at 7.0 Tesla in water) is about the size of the body part under investigation.

Specific absorption rate (SAR) on the other hand, which measures the amount of energy absorbed by the human body or a specific amount of tissue, increases with the square of the field strength. “This means that the same sequence would involve a four-times-higher SAR at 3.0 Tesla and 22 times higher at 7.0 Tesla when compared to 1.5 Tesla. On the other hand, legal restrictions of SAR are not field-dependent. For this reason, there are obstacles to the use of common RF pulses, sequence types and imaging parameters at higher field strengths. Therefore, with certain MR techniques, novel sequence programming is necessary to reduce SAR exposure in the human body at 7.0 Tesla, which then allows the coverage of larger volumes during examination with consecutive reduction in scan times,” said Professor Siegfried Trattnig, Head of the Excellence Centre of High Field MRI in Vienna, explaining the difficulties of clinical integration of high field imaging.

A major effort has to be made to adapt RF pulses and sequences to the higher field strength before imaging beyond 3.0 Tesla can be made available in clinical routine. Furthermore multi-transmitter RF systems will be necessary in order to overcome the problems of RF inhomogeneity in extended body parts beyond 3.0 Tesla. Eventually individual adjustment of intensity and a phase of several transmitter coils could help cope with the problem.

While an increased signal-to-noise ratio is welcome, the effect of the acoustic noise originating from strong mechanical forces on the gradient coils is an issue that has to be dealt with by constructing additional noise protection systems, which will also increase the weight of MR devices. Apart from technical difficulties and adaptations that still need to be carried out before high field imaging beyond 3.0 Tesla becomes available for clinical use, both professors pointed out that there are already fields where the irrelevant benefits can be seen, but that it will still take time before patients can experience them first hand: “Imaging of smaller human body parts (leg, wrist, ankle, knee or brain) is already possible on high field MR systems with extraordinarily high image quality. I would expect clinical application of 7T systems for special purposes (especially brain and joints) in the near future. But I am not sure, whether high field systems will replace standard imaging at 1.5 to 3.0 Tesla within the next ten years.”

The session will feature talks by Dr. Susanne Francis, who will give further insights into the challenges of high field MR systems, and Prof. Mark Ladd, who will explain how to cope with the control radio-frequency fields and SAR limits.
Failure who at present cannot undergo conventional contrast-enhanced examinations. In CT, the development of software platforms capable of differentiating the various components of plaque should assist in analysing the risk of embolic events. Atherosclerotic disease of carotid arteries represents the third highest cause of death and the main cause of disability in western countries, and cerebrovascular ischaemic events leave 20 million survivors with a permanent disability every year, according to Prof. Carlo Catalano, from the department of radiology at La Sapienza University in Rome. In around 25% of these cases, extracranial calf stenosis can be identified as the main cause of stroke. CT and MR angiography are fundamental tools for the diagnosis of carotid disease and for the clinical and surgical management of these patients, and he thinks vascular and general radiologists should become more familiar with these techniques for the diagnosis of carotid atherosclerosis.

"From a technical point of view, the commonest pitfalls are represented by the poor opacification of the arterial vessels, or conversely the superimposition of the venous structures that can cause problems," he noted. "Thus, it’s mandatory to use a correct strategy of contrast medium administration that can provide an adequate timing of injection and dose of contrast agent. Moreover, in MR studies, it’s important to reach a balance between spatial resolution and acquisition time.”

Time-resolved sequences allow the real-time visualisation of the contrast medium, which is very useful in diagnosing vascular malformations and fistulas, especially for the analysis of haemodynamic characteristics (feeding arteries and draining vessels) in order to plan the optimal endovascular treatment, commented Catalano. In addition, dynamic sequences may be useful in the evaluation of carotid dissection, and make it possible to visualise abnormal flow dynamics in the false lumen of the affected vessel. Dynamic CT studies are also feasible, and can represent a useful addition to stroke imaging, but these protocols are rarely used in clinical practice because of the high radiation dose, especially if combined with perfusion studies.

"In our hospital, we have introduced new CT and MR scanners that feature state-of-the-art angiographic application and sequences, allowing us to perform dynamic and high-resolution studies more easily," he remarked.

Moreover, the recent introduction of high relaxivity and intravascular contrast agents has allowed us to obtain high-resolution images acquired in the equilibrium phase of an intravascular contrast agent (C) allowed the visualisation of the surface irregularities of the soft component of the plaque (arrows). These findings were confirmed by conventional angiographic study (D). (Provided by Prof. Carlo Catalano and Dr. Beatrice Cavalla Marincola)

Patient with transient ischaemic attack. A: CT angiography depicted a large plaque involving the internal carotid artery, first-pass (B) and high spatial resolution images acquired during the equilibrium phase of an intravascular contrast agent (C) allowed the visualisation of the surface irregularities of the soft component of the plaque (arrows). These findings were confirmed by conventional angiographic study (D). (Provided by Prof. Carlo Catalano and Dr. Beatrice Cavalla Marincola)

MRI and CT provide substantial boost to ischaemic stroke care

By Philip Ward

Vascular imaging in ischaemic stroke looks poised to enter an exciting phase. The optimisation of new and more accurate flow-sensitive MR sequences offers the prospect of performing routine high-quality angiographic studies without contrast agents, particularly in patients with chronic renal failure who at present cannot undergo conventional contrast-enhanced examinations. In CT, the development of software platforms capable of differentiating the various components of plaque should assist in analysing the risk of embolic events. Atherosclerotic disease of carotid arteries represents the third highest cause of death and the main cause of disability in western countries, and cerebrovascular ischaemic events leave 20 million survivors with a permanent disability every year, according to Prof. Carlo Catalano, from the department of radiology at La Sapienza University in Rome. In around 25% of these cases, extracranial calf stenosis can be identified as the main cause of stroke. CT and MR angiography are fundamental tools for the diagnosis of carotid disease and for the clinical and surgical management of these patients, and he thinks vascular and general radiologists should become more familiar with these techniques for the diagnosis of carotid atherosclerosis.

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Experts highlight major challenges and practical solutions for MRI radiographers

By Simon Lee

The ECR’s long-running and popular series of Refresher Courses for radiographers will continue on Saturday morning, with a session on two challenging issues that are relevant to all members of the MR imaging team: imaging at high field strength and under patient motion. Focusing on these areas of regular MRI practice, the course will aim to underline the central role of the radiographer in successfully addressing the practical challenges of imaging.

Advances in high field imaging have provided substantial benefits, mainly due to the improvement of signal-to-noise ratio (SNR), but safe MR imaging at high field strength also requires meticulous attention to MR safety. Radiographers have a vital role as gatekeepers and guardians of patient safety, and must have expertise in sequence optimisation to ensure that high quality examinations are performed with the shortest possible scan time, while obtaining the full benefits of high field imaging, explained Dr. Laurence Abernethy, Consultant Paediatric Radiologist at Alder Hey Children’s NHS Foundation Trust, U.K.

Radiographers should also know how to use high field imaging in order to gain the best results possible and be well prepared for the associated technical challenges. The higher signal-to-noise ratio provided by high field MR obviously means clearer images, easier reading and therefore more confident diagnosis, but it also affords the opportunity to exchange that benefit for better spatial resolution or shorter scanning times.

The advantages of 3T MR in imaging the brain, for instance, are already well established, but it has also recently become clear that high field body and cardiac imaging, combined with parallel techniques, can decrease scan time and motion artefacts, resulting in higher image quality compared to low field.

‘Higher field strength means that SNR will be improved. However, it also means that heart motion and acoustic noise will be increased, and that some artefacts may also become more prominent. High field MRI scanners make advanced MRI techniques possible, such as diffusion tensor imaging, perfusion imaging, MR spectroscopy and functional MRI, but all of these techniques are highly sensitive to motion artefacts. In paediatric imaging, the child may have to lie completely still for 30 minutes or more to complete a satisfactory examination. Techniques to compensate for patient movement can help to obtain a diagnostic examination and also to make the procedure more acceptable for the patient, sometimes avoiding the need for sedation or general anaesthesia,” said Abernethy.

Patient motion has been a challenge in MRI since its inception, and the session will focus on the most challenging kind, that which is encountered in paediatric and foetal imaging. Dr. Christina Malamateniou from Hammersmith Hospital, Imperial College London, will propose ways through which radiographers can compensate for motion artefacts and help produce high quality imaging examinations: techniques that involve adequate patient preparation and positioning, as well as knowledge and implementation of advanced imaging techniques.

Twenty years of development have made foetal MRI a useful alternative to ultrasound, providing an increased field of view and better spatial resolution, which can potentially offer additional diagnostic information. The introduction of MRI scanners functioning at very high static magnetic field strengths and of phased array surface coils has significantly increased the SNR of these examinations, as has the implementation of fast MRI techniques such as single-shot fast spin echo and echo planar imaging (EPI) techniques, which significantly decrease scanning time and can ‘freeze’ foetal motion, leading to a decrease in motion artefacts.

‘Foetal motion is the most extreme case in the range of paediatric patient motion. It is unique in the sense that it is totally unpredictable, can be three-dimensional, and the scale of the motion is greater than the dimensions of the anatomy of interest. Radiographers have a very central role in compensating for motion artefacts in foetal MRI. There are many different ways to compensate from a patient preparation and protocol planning point-of-view, such as sequence optimisation, scanning time minimisation, and motion-resistant MRI protocols. The radiographer’s knowledge and contribution are essential to this end,” said Dr. Malamateniou.

“This will be both an exciting and a useful examination for radiologists, radiographers and medical physicists alike,” noted Dr. Abernethy. “Exciting because it involves the most advanced MRI imaging techniques using state-of-the-art imaging equipment, and useful because it will elaborate on everyday issues that are completely new to many radiographers, and focus on the most challenging kind; that is, foetal imaging under motion.”

Dr. Christina Malamateniou from Hammersmith Hospital, Imperial College London, will propose ways through which radiographers can compensate for motion artefacts and help produce high quality imaging examinations: techniques that involve adequate patient preparation and positioning, as well as knowledge and implementation of advanced imaging techniques. Twenty years of development have made foetal MRI a useful alternative to ultrasound, providing an increased field of view and better spatial resolution, which can potentially offer additional diagnostic information. The introduction of MRI scanners functioning at very high static magnetic field strengths and of phased array surface coils has significantly increased the SNR of these examinations, as has the implementation of fast MRI techniques such as single-shot fast spin echo and echo planar imaging (EPI) techniques, which significantly decrease scanning time and can ‘freeze’ foetal motion, leading to a decrease in motion artefacts.

A foetal 12 week-old image of twin pregnancy. The foetus sitting in the lower position (normal foetus) has higher signal-to-noise ratio compared to the foetus in the higher position (growth restricted foetus). This is because the normal foetus is closer to the MRI signal receiving imaging coil. Therefore, coil positioning is essential to maximise image quality.

Good quality, high signal-to-noise ratio, axial T2-weighted foetal brain MR images, free of motion artefacts, acquired using a single-shot Fast Spin Echo technique during early (left) and late gestation (right).

A sagittal T2-weighted image of twin pregnancy. The foetus in the higher position (growth restricted foetus) has higher signal-to-noise ratio compared to the foetus sitting in the lower position (normal foetus) as it is closer to the MRI signal receiving imaging coil. Therefore, coil positioning is essential to maximise image quality.


A: mild foetal head motion resulting in mild image blurring; different anatomical structures can be depicted.
B: moderate foetal head motion resulting in increased image blurring; conspicuity of the lower contrast anatomical structures decreases. C: extreme foetal head motion resulting in severe motion artefacts; very difficult to depict distinct anatomical structures.


Satellite Courses March 24–25, 2012
Nuclear Medicine “Diamond" Pediatric Radiology “Kangaroo” Breast Imaging

2nd IDKD Intensive Course in Hong Kong Diseases of the Abdomen and Pelvis June 16 – 19, 2012

5th IDKD Intensive Course in Greece Diseases of the Heart and Chest September 27 – 30, 2012
Mykonos, Greece

2012

45th IDKD Davos Musculoskeletal Diseases April 2 – 7, 2013
Nuclear Medicine “Diamond” Pediatric Radiology “Kangaroo”

2013

www.idkd.org – info@idkd.org
Eminent radiologists encourage peers to tell patients when they have made a mistake

By Mélisande Rotaer

Errare humanum est. Errors are part of human nature, common in every day life and sometimes without consequences. But in medicine, they can have a serious impact on all those involved. Medical malpractice can cost hospitals a lot of money; physicians their jobs, and in the worst case can cost patients their lives.

To behave appropriately when an error is made, one needs to understand what is at stake. This is what a panel of experts will explain during a dedicated Professional Challenges Session on medico-legal issues at ECR 2012.

Research studies conducted worldwide have found that when radiologists are blindly shown a series of chest films, CTs, and MRIs which all harbour significant abnormal findings, they miss 30% of the abnormalities. Similar studies also reveal that clinicians such as interns miss up to 30% of abnormalities during physical examination of patients. Fortunately, in real life, mistakes do not happen that often. In everyday practice, in which the majority of exams are normal, the average error rate among radiologists lies in the 3 to 4% range.

What might also come as a relief is that most of these mistakes are not significant, as many may be corrected quickly before they become harmful to patients. For instance, if a radiologist misses a tumour in the lung on a chest x-ray film the first time, they will likely notice and report it a week later when the patient comes back to the hospital. In this case, the mistake does not have any clinical effect.

“There are some errors when we do interventional biopsies or arteriographies but most of the mistakes we are talking about are not procedural, they are about interpretation,” said Dr. Leonard Berlin, professor of radiology at Rush University and the University of Illinois in Chicago, Illinois, U.S.

Missed diagnosis is the most frequent reason for malpractice litigation in general radiology. The most common missed diagnosis is cancer, with mistakes being made mainly on chest x-rays and mammograms. Sources of error in the radiographical diagnosis of lung cancer include failure to detect lesions, attributing the wrong diagnosis to a finding, and failure to communicate the radiological finding – especially if it is significant but not urgent – to the referring physician. But errors are particularly prone to happen in complex settings like trauma care.

“The emergency room setting creates a ‘perfect storm’ for diagnostic errors: unstable patients with whom we have had no previous contact, and who, quite often, may be uncooperative and/or under the influence of alcohol or drugs, time-critical decisions, involvement of many disciplines, and often junior radiologists working after-hours in busy emergency departments,” said Dr. Antídio Pinto, a radiologist working at the Cardarelli Hospital in Naples, Italy.

As reported in the literature, ankle distortions are quite common in trauma radiology: 39% of ankle and mid-foot fractures may be missed during initial evaluation in the emergency department because of inadequate clinical and radiological evaluation over a limited time.

Failure to identify fractures is the most common diagnostic error in the emergency department. Consequences of missed diagnosis may delay the appropriate treatment and lead to a more complex clinical picture. Fractures in some anatomical locations can be difficult to detect on plain radiographs, which are still the main imaging tool in the emergency department for detecting occult fractures in patients sustaining trauma, Pinto explains.

Other factors may also affect the accuracy of diagnosing fractures, such as imaging quality, insufficient clinical information and fracture type.

These days, medical mistakes often lead to malpractice litigation. Legal action against doctors has become a hot topic for radiologists in Europe. Most conferences offer at least one session on medico-legal challenges. In Italy, an increasing number of articles deal with radiological malpractice. In a paper recently published in the American Journal of Roentgenology, Dr. Adriano Fileni, President of the Ethics and Forensic Radiology Section of the Italian Society of Medical Radiology, underlined, for his colleagues, the high risk of Italian radiologists being sued for malpractice.

With this trend growing around them, many radiologists are left wondering how, or even if, they should tell the truth to their patients. This dilemma can prove quite difficult, for instance in the case of a patient whose cancer was not spotted at the time of the initial examination and whose chances of survival have significantly decreased.

When asked if they would tell the truth in studies, radiologists almost unanimously said yes. But when actually confronted with the situation, an overwhelming majority chose to remain silent.

“Many surveys asked doctors ‘when you make an error, do you inform your patient?’,” said Dr. Pinto. “In all of those, 80 to 90% answered ‘yes, we should inform the patient’. Then the next question was ‘do you tell the patient’ and here the figures drop to less than 25%. So we know what we should do, and most of us say that we would do it, but we don’t always do it,” Berlin said.

The legal risks may be a reason to hold back information but it is not the only one, the expert believes.

“Most doctors don’t like to admit that they did something wrong. They feel that they lose prestige in front of their patients and colleagues. They are afraid their hospital privileges will be curtailed and, of course, they are afraid of getting sued. So there are many reasons why doctors are reluctant to admit errors,” he said.

However there is only one course of action once an error has been made.

“Patients have the right to know about errors that have adversely affected the management of their care. That’s also important in the emergency setting, as I can confirm from experience. Disclosure of diagnostic errors creates an opportunity for patients to become part of quality improvement efforts and can lead to improved patient outcome,” Pinto said.

“From an ethical point of view, doctors have to be honest with their patients. From the moral standpoint we should disclose every error to every patient. There is no debate about that,” Berlin agreed.

Interestingly enough, as malpractice litigation is increasing in Europe, it seems to be dropping in the U.S. Conversely, another trend is slowly appearing: making apologies and offering monetary compensation. A number of institutions have started doing so quite successfully, including the University of Michigan, Stanford University in California, and now the University of Illinois in Chicago. About 60% of all the academic institutions are joining this effort, according to Berlin.

“Apologies do work. You don’t always get sued. Sometimes it makes the patient and the doctor feel better. Often, if some money has been paid out, everybody walks out much happier,” he said.

This should encourage radiologists to own up to their mistakes.
by Frances Rylands-Monk

Whole body PET/CT for peritoneal carcinomatosis can help to rule out extra-abdominal metastases when selecting patients for curative-intent treatments. Protocols of PET/CT scans can also further increase detection rates of this disease. Patients with peritoneal carcinomatosis may be candidates for cytoreductive surgery, a procedure in which doctors remove all the tumour that can be seen in combination with hyperthermic intraperitoneal chemotherapy (HIPEC) during the surgery. Receiving such treatment improves prognosis considerably compared to the prognosis after intravenous chemotherapy.

"What determines patients getting this treatment is the absence of extra-peritoneal disease. PET/CT has the highest detection rate for body metastases and a whole body scan with FDG will accurately reveal whether or not this is the case," Antoch noted. "Therefore, PET/CT is crucial in deciding for or against an extraperitoneal-surgery approach."

In the oncology department at the University Hospital of Düsseldorf, contrast-enhanced CT detects and stages tumours. If peritoneal carcinomatosis is detected and agement of childhood imaging and surgical therapy and intraperitoneal chemotherapy, a whole-body PET/CT scan is conducted to assess the presence or absence of extra-abdominal metastases.

Another indication for PET/CT is for patients with inconclusive CT results. In rare cases, the PET component may give extra information, added Antoch. However, a key advantage of PET/CT is the possibility to provide better diagnostic information in diffuse small disease where CT and PET yield negative studies. If peritoneal carcinomatosis is diagnosed, CT is used to stage the tumour, and PET/CT is used to assess the presence of extra-abdominal metastases.

The ESPR's 2011 Annual Meeting took place in London in October. It gathered in London to enjoy lectures, debates, sunrise sessions, posters, and state-of-the-art mini-symphosia. This global unity in the multidisciplinary approach of peritoneal carcinomatosis was celebrated with the launch of the WPFP.

In 2012, the ESPR's 49th Annual Meeting and 35th Postgraduate course will be held in Athens, presided by Professor Maria Argyropoulou. The programme includes task force sessions, a focus on tuberculous and state-of- the-art imaging of the brain and spine. The top ten lessons from my life, which will focus on gastrointestinal and urogenital oncology, will be held in Jena, Germany, on October 2–5, 2012. The ESPR also presents its guidelines and expertises in multi-centre projects, cooperation with global institutions and joint ventures conducted with industry: The European Excellence Network on Paediatric Radiology Research, ran by Prof. Erich Sorantin, was set up for this purpose, and some five research projects are currently underway. The ESPR became a shareholder of EIBIR in 2011.

In 2011, the ESPR united with its sister societies to launch the World Federation of Paediatric Imaging (WFPI), a global initiative aiming to address global barriers to paediatric imaging care and promote education, best practices and appropriate imaging guidelines for the benefit of children worldwide, particularly those in developing or war-torn regions.

Paediatric Radiology, our journal, informs readers of all issues in paediatric imaging and related fields through a combination of original papers and reviews. It presents knowledge within particular subspecialties and summarises specific topics. Advances in technology, methodology, apparatus and auxiliary equipment are also covered. The journal is a collaborative venture, with the ESPR's regional sister societies, the SPR, the AOSPR and SLARP.

The ESPR website, www.espr.org, offers access to the official journal along with news and updates on forthcoming events, task forces, external ties and membership directories.

Annual Meetings: the ESPR's 2011 Annual Meeting was truly international: 12,300 paediatric radiologists from research groups throughout Europe gathered in London to enjoy lectures, debates, sunrise sessions, posters, and state-of-the-art

Special Focus Session Saturday, March 3, 9:00–10:30, Room B
SF 8a: Peritoneal carcinomatosis

▶ Chairman's introduction
Prof. Hans-Joachim Cabona, Chair, European Society of Paediatric Radiology

▶ What does the surgeon want to know?
E. de Bree, Iraklion/GR

▶ MDCT vs MRI: advantages and drawbacks
F. Licate, Roma/IT

▶ What is the added value of PET/CT?
B. Antoch, Düsseldorf/DE

Panel discussion
Optimised imaging algorithms in peritoneal carcinomatosis

PET/CT can improve patient outcome in peritoneal carcinomatosis

By Frances Rylands-Monk

The ESPR is a non-profit, secular, apolitical and non-discrimination society consisting of academic and community radiologists, whose main area of work is paediatric imaging, image-guided intervention, or who have a particular interest therein. In 2011, the ESPR had a total of 571 members. The ESPR aims to:

- Foster excellence in paediatric imaging and image-guided intervention
- Initiate, support, and create excellence in paediatric imaging, image guided intervention and radiation protection research
- Ensure the best practice of radiation protection for children, based on the principles of justification and optimisation
- Enhance ties with other radiological and paediatric societies, organisations and global institutions whose goals reflect those of the ESPR
- Allow medical practitioners to observe developments within the field
- Bring together committed individuals to create a dynamic and convivial paediatric radiology community.

The ESPR’s three main strategic forces:

- Child abuse: founded by Drs. Rick Van Rijn and Amaka Offiah, addresses the current need in low- and middle-income countries and expertise in this high pressure and difficult medical and social issue.

CT & dose: led by Prof. Erich Sorantin and Dr. Bruce Parker, addresses the topical and complex issues related to CT radiation protection and dose measurements. It aims to promote good medical practice and improve availability and measurements within paediatric CT, whilst reaching out to international societies.

Uroradiology: led by Prof. Michael Riccabona, liaises with ESUR to produce guideline lines and numerical publications on best practice in paediatric GU imaging.

Neonatal hips: led by Prof. Karen Rosendahl and Paolo Toma, addresses and standardises the value of screening DDH and assesses long-term outcomes.

Neuroradiology: initiated by Prof. Maria Argyropoulou for the ESPR, coordinates and encourages joint efforts with the ESNR to develop guidelines and plans for a future European neuroimaging diploma.

The purpose of the conference is to harmonise the European paediatric imaging diploma and develops the curriculum for the Society’s educational platform, the European Course on Paediatric Radiology. These small and didactic courses offer young radiologists the opportunity to mix with top-class teachers in a congenial learning environment. The 19th EPCR, organised by Dr. Hans-Joachim Cabona, which will focus on gastrointestinal and urogenital oncology, will be held in Jena, Germany, on October 2–5, 2012. The ESPR will release its guidelines and expertises in multi-centre projects, cooperation with global institutions and joint ventures conducted with industry: The European Excellence Network on Paediatric Radiology Research, led by Prof. Erich Sorantin, was set up for this purpose, and some five research projects are currently underway. The ESPR became a shareholder of EIBIR in 2011.

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Clinical Corner

MR and CT develop central role in imaging of smaller joint structures

By Frances Rylande-Morck

To get the best out of advanced imaging technology, a structured approach to the treatment of orthopaedic and rheumatological joint disorders must be developed. However, higher spatial and contrast resolution mean that any defects will be spotted, and radiologists must guard against over-diagnosing clinically relevant anatomic structures and the curved shape of the articular surfaces. However, CT and MRI arthrography is the best way to undertake each clinical scenario.

“At the end of the session, delegates will know the technical prerequisites for achieving a high quality examination, as well as the pitfalls and variants that might simulate disease. In addition, they will be able to apply the appropriate imaging technique in common clinical scenarios,” said Dr. Apostolos Karantanas, chair of the department of medical imaging at Iraklion University Hospital. He is the course moderator, and notes that there would be 15 to 16 minutes for panel discussion and presentation of real-life scenarios and common clinical examples.

Diagnosis using intra-articular imaging is challenging because of the small size of the relevant anatomic structures and the curved shape of the articular surfaces. However, technological advances in MRI systems and multidetector CT (MDCT) during the past two decades have improved capacity to image the joints with clear depiction of the structures involved.

The advantages of high-field MRI are related to their ability to produce thin-slice thickness images due to the high signal-to-noise ratio of tissues. Multplanar reconstruction is also possible with newer 3D MR sequences. MDCT technology allows for multiplanar reconstruction in combination with CT arthrography, whereas MRI may be used with arthrography or without.

“Early findings with MRI or ultrasound may present as early as two years before rheumatological disease is demonstrated on plain x-ray, with such early and accurate diagnosis facilitating prompt treatment. Depiction of early signs of disease activity or recurrence improves the efficiency of newer treatments, such as anti-tumour necrosis factor (TNF) drugs,” Karantanas noted.

Although MDCT without arthrography is a good method for imaging trauma, it remains difficult to obtain a good depiction of the joint without intra-articular contrast.

“Knee joint abnormalities can be adequately studied with MRI, both in trauma and age-related degeneration. In other joints however, such as the hip or the wrist, the articular surfaces are so close that you can’t separate structures even with very high-field scanners. Intra-articular contrast is needed to visualise very small pathologies such as a labral tear,” he explained.

Standard MR techniques will be discussed by Prof. Carlo Faletti, head of imaging and interventional radiology at the Orthopaedic Hospital and Trauma Centre, Turin, Italy. Speaking specifically about MR arthrography, Prof. Josef Kramer, director of the Institute for CT & MRI Diagnostics, Linz, Austria, includes among its advantages delineation of the joint space and better delineation of all intra-articular structures. This enables visualisation of even subtle lesions of the labrum, which may be obscured by MRI only.

“Because it is still an invasive procedure, even if minimally so, MR arthrograms target specific clinical questions such as shoulder instability and hip impingement, according to Kramer, who noted that in his own depart- ment, half of all MR studies are joint-related. Indications for MR arthrography will be listed during his talk, so if practical pointers about how to perform it. “MR arthrography should be a procedure every radiologist can do without any hesitation,” he said. "Don’t forget, orthopedic colleagues are puncturing joints routinely, even without fluoroscopy or ultrasound. All radiologists have to be trained to do arthrograms. Otherwise orthopedic surgeons will just do it by themselves and pass radiology by.”

CT arthrography tends to have the edge over MR arthrography with regard to previously operated patients and eliminating or reducing metal artefacts, particularly if parameters are adjusted. Junior doctors may not be aware of the advantages of CT arthrography, which picks up small osseous fragments missed by MRI and MR arthrography in operated patients, and can be used on patients who cannot undergo MRI for reasons such as pacemakers, metallic implants and even claustrophobia, according to Karantanas. CT arthrography will be covered in more detail in a presentation by Prof. Chris- tian Pfirrmann, director of radiology at the Hospital Balgrist, Zurich.

“Another consideration is that high spatial and contrast resolution facilitated by both MRI and CT can highlight clinically irrelevant findings. CT arthrography in the ankle or knee, for example, can pick up small defects of the articular cartilage when there are no clinical symptoms of pain or limited function.”

In the department of medical imaging at Iraklion University Hospital, regular meet- ings with clinicians ensure an efficient working strategy.

“A diagnosis of early osteo-arthritis might influence the clinician’s treatment in the wrong direction,” Karantanas said. “Over-diagnosis can be avoided if radiologists are aware of individual clinical indications through knowledge of history and most importantly, direct contact with the patient and clinician.”

RC 1110. Intra-articular imaging

Chairman’s introduction

A.H. Karantanas; Iraklion/GR

A. A. Standard MR techniques
  C. Faletti, Turin/IT

B. B. CT arthrography
  W.A. Pfirrmann, Zurich/CH

C. C. MR arthrography
  J. Kramer, Linz/AT

Panel discussion:
What imaging technique is best in which clinical scenario?
Emergency radiologists rise to meet growing challenges

By Simon Lee

Based on the low average age of trauma patients, more years of lifespan are lost due to trauma than to cardiovascular diseases, the leading global cause of death. Prompt medical treatment in the emergency department during the so-called golden hour can be a key factor in minimising this loss of life, and the selection of that treatment often relies on a speedy and accurate diagnosis from the emergency radiologist, whose skills are in increasing demand.

The rapid rise of emergency radiology has not been overlooked by the ECR programme planning committee, who have seen fit to introduce it as a new category at ECR 2012, with two brand new refresher courses and a state of the art session dedicated to it. The latter will take a close look at the challenging nature of the emergency radiologist’s role as an important part of the trauma team that handles trauma cases in most institutions. Readily accessible equipment, robust diagnostic protocols and quick decision making are all essential to a successful outcome, and with emergency radiology a subspecialty in its own right, emergency room visits that include CT examinations, effective management of polytrauma patients is a major task for radiologists.

“There has been a tremendous increase in the use of radiological methods in every emergency department in the developed world over the last decade,” explained session Chairman Dr Ulrich Linsenmaier, from Ludwig Maximilian University in Munich, Germany. “In a 15-year period we have seen an annual growth rate of 16% in the number of emergency department visits with CT, an exponential increase with a doubling time of only four and a half years. This has presented radiologists with a great challenge, because we need to deliver a constant high quality of service with very demanding high-end, technical equipment.”

“Indeed the emergency radiologist’s ability to manipulate machines and read images should be augmented by flawless collaboration with other emergency doctors for successful patient management, especially when time is of the essence. Good communication skills and understanding of clinical background to the medical cases they deal with are also indispensable.”

Despite its growing significance as a sub-speciality, European emergency radiology has lacked its own society until recently. The European Society of Emergency Radiology (ESER) was officially founded on October 1, 2011 and will be the first European professional and scientific group in this particular field, which will hopefully lead to even further advances.

Interventional radiology: growth of a global movement

By Michael J. Lee

The last century of medicine has been led by advances in radiology and imaging – and nowhere can this be more clearly seen than in the subspecialty of interventional radiology (IR). The Cardiovascular and Interventional Radiological Society of Europe (CIRSE) has taken on global significance, with over 5,000 members from around the world supporting the IR cause. This has been further bolstered by the Global Statement defining IR, a document produced in collaboration with our American brethren, the Society of Interventional Radiology (SIR), and endorsed by 40 other national and international scientific societies.

CIRSE Annual Congress
Our annual congress is also experiencing continual growth, with over 6,000 delegates having attended CIRSE 2011 in Munich. The attenders, who came from all over the world, gave the congress a truly international flavour. The contents of the congress was split into the usual portfolios of IR procedures available, offering many lectures, discussions, workshops and presentations on subjects of interest.

Peripheral interventions were an important focal point of the congress, with multiple sessions addressing the imaging and revascularisation of below-knee disease. However, this was far from the only topic addressed, and other noteworthy topics included the up-and-coming areas of oncological intervention and renal denervation – a novel new therapy for the management of hypertension.

European Conference on Interventional Oncology
In response to the growing role of IR in cancer treatment, CIRSE is once again hosting the European Conference on Interventional Oncology (ECIO). This conference has so far beenorganised on a biennial basis: the third such conference will take place in Florence this year on April 25–28. The programme will cover the many therapies available, advances in imaging, the latest research, and patient selection.

The field of oncology is one that requires significant collaboration between all the specialties involved, and to this end, we are delighted to once again extend an invitation to oncologists, hepatologists, and nephrologists, and encourage our diagnostic colleagues to attend and share their expertise with us. This will hopefully increase awareness of IR techniques and thus, referral leading to improved patient care. Combined therapies, such as chemo- and radioembolisation and ablative/surgical combinations, will be the focus of much discussion, as will advances in imaging such as MDCT and fusion imaging.

Educating IRs of the future
Education and patient safety are central to our specialty, and CIRSE supports this through not just through its educational congresses, but also through an examination of competence: the endorse the ESR and the European Union of Medical Specialists (UEMS) IR division, will hopefully standardise training and competence in IR across Europe and provide better care for our patients.

CIRSE also promotes IR education through our European School of Interventional Radiology, which provides both local training courses and online learning materials. Prospective EBIR candidates can use this material to prepare for their exams – the latest round of which is taking place during the ECR.

On the horizon …
IRs unstoppable development over the last few years has seen the establishment of many new procedures, educational meetings, and patient safety guidelines, as well as the specialty’s incorporation into a number of multidisciplinary boards across Europe, and much more is on the horizon. It is an exciting time for IR, and we hope you will join us at ECIO and CIRSE 2012 to experience more advances first hand.

More information on the society can be found at www.cirse.org

EBIR candidates can use this material to prepare for their exams – the latest round of which is taking place during the ECR.

Professor Michael J. Lee from Dublin/IE is the current CIRSE President.
ECR exhibitors unveil latest innovations and upgrades in MRI

By John Bonner

Developers of MRI systems are working hard to find new features that will convince customers to look twice at their products when considering investing in their technologies. A wide variety of developments designed to improve productivity and enhance patient care is on show at this year’s ECR technical exhibition.

Siemens believes that time and effort is often wasted when carrying out advanced imaging procedures by looking at parts of the body that generate no interest or do not concern the referring physician as they are irrelevant to the condition under investigation. That is because a traditional MRI unit will collect data in a slice through the whole human body when the reason for the examination is to look at a single organ or tissue.

The company’s solution to this problem is an innovation that is being shown for the first time in Europe here in Vienna. It aims to be available for its top-of-the-range Magnetom Skyra 3T system before the end of the year.

The TimTX TrueShape is a system architecture for parallel transmit (pTX) technology that is being introduced to complement its TimTX TrueForm magnet and gradient design, according to Christof Zindel, head of product design and marketing for Siemens MRI business. TimTX TrueForm made its debut at ECR in 2007 as a system designed to optimise the signals received and minimise distortion at the edge of the field-of-view. TimTX TrueShape focuses on an earlier stage of the process by controlling the nature of the signals produced. Instead of a single radiofrequency pulse at a fixed amplitude, as in conventional MRI, the system produces multiple signals shaped to the specific needs of a particular clinical application.

At ECR, Siemens is unveiling the first application of this parallel transmission technology, which it is calling syngo ZOOMit. It is capable of selective excitation to allow the radiographer to shape the image produced and focus attention on a particular region of the body, organ or even a single anatomical feature.

“It is all about selective excitation. We can create the signal to produce excitation in the protons within a specific tissue, such as the prostate or heart without involving the surrounding tissue. That is important because the surrounding tissues can often be the source of infolding and other artefacts in the image that is produced,” Zindel explained. “By limiting the excitation lines and the read-out to the specific organ rather than the whole field-of-view, you can reduce the scan time by up to 45%, which will further improve the image quality by minimising motion artefacts.”

Cutting down on unnecessary data acquisition because the surrounding tissue. That is important as the prostate or heart without involving the surrounding tissue.

In designing the new system, Hitachi has also aimed to improve the technology’s performance. The company’s recently introduced Workflow Integrated Technology (WIT) system helps technologists overcome the inconvenience of removing and selecting coils so that more of their time is spent on scanning and looking after their patients. Another advantage is magnet management.

The technologist can input patient data and check ECG and respiratory sensing without having to move across to the control workstation, which reduces procedure time and has a positive impact on workflow. The new unit also has a number of other advanced features, such as the AutoPose Brain application for automatic slice selection, which reduces the number of steps needed by the technologist and increases the consistency of slice placement.

Improved patient comfort was a key priority for GE Healthcare in designing the latest version of its flagship 3T MRI unit, the Discovery MR750w. The 70 cm bore unit features a compact superconducting magnet and delivers a full 50x50x50 cm field-of-view (FOV), well suited for large FOV imaging and off-centre imaging. It also features the GE geometry enabling method (GEM) suite of lightweight flexible coils with anatomy-optimised element geometry; so that it can accommodate patients of different size and shape, and providing excellent RF and signal homogeneity to make the best use of the available FOV, according to GE.

The GEM system is designed to reduce coil handling and simplify patient set-up, while adapting to the patient’s contours so that the coil elements are optimally positioned relative to the shape of the individual. The system has 160 coil mode configurations and can automatically select the coil elements best suited to image the prescribed FOV for that particular clinical indication. GE estimates that the GEM suite can be deployed in up to 98% of exam types. Other features include a total 2,056 cm scanning range, feet-first scanning for nearly all exams and improved padding on the patient table to help minimise pressure points and discomfort.

A highlight at last year’s ECR exhibition was the Philips Ingenia 1.5T and 3T MRI systems, described as the first ever digital broadband MRI technology. The signal is digitised in the coil immediately adjacent to the patient, delivering gains in both signal-to-noise ratio (SNR) and imaging acceleration.

The company returns this year with various updates to this core technology, developed in collaboration with some of the growing band of hospital centres that have installed the system.

“Ingenia delivers up to 40% more SNR, and has the largest field-of-view in the industry, and this is relevant in the light of the diversification of MRI from the traditional applications in neurology towards whole-body oncology and cardiology scans,” said Jurnjan van den Bremer, international business manager for Philips’ MR activities. “Ingenia accelerates patient management, through advanced coil solutions and smart assist features, with 30% increase in throughput. Ingenia includes a flex coverage anterior coil, hidden in the table, requiring virtually no coil handling in about 60% of cases.”

The new features on display at ECR 2012 include an application that enables the time needed for whole body imaging studies to be reduced from around one hour down to 10 minutes using the coronal diffusion-weighted whole-body imaging with background body signal suppression technology. The latest Philips technology also includes the IntelliSpace portal, allowing the user to gain access to images anywhere for advanced visualisation of the data.
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SEE YOU IN LISBON ...
Advanced eLearning at ECR 2012 with ePACS

By Peter Pokieser & Alexander Hirsch

For its sixth year, ePACS is again encouraging ECR participants to expand and deepen their radiological knowledge, by providing case collections and expert reports for self-directed learning, directly at the meeting. As is customary, the cases are presented via a web-based platform using an electronic patient record (Unified Patient) and a Java®-based DICOM viewer (by Tiani-Spirit). For 2012, new cases have been added and a whole new collection will be introduced: ‘Paediatric Urouradiology’. The case collections will provide an opportunity to see some very instructive original cases, their clinical background and the reports – the bulk of our daily requirements.

Last year, a new technology was added to the ePACS system allowing it to take a leap forward. Interactive three-dimensional visualisation over the web provides ubiquitous access to imaging data (see figures). The functionality is directly integrated into ePACS bringing it even closer to the daily radiology workflow. This tool can help understand the topographic relations of pathologi- cal conditions, additional to axial, sagittal, and coronal series. The feature is web based, allowing every browser, even on handheld devices to display the results, without prior software installation. You can experience this new feature live at the ePACS booth on the second level! Another new initiative taken by the ESR is the European Diploma in Radiology (EDiR). One vital area of these exams is the face to face oral exams with dedicated expert-exam- iners who test the knowledge of the candidate in a real working environment, using real DICOM cases on dedicated workstations. But what is the difference between an eLearning case and a case used for an exam? In learn- ing the focus lies on presenting extraordinary cases with multiple, sometimes very extensive studies. Also follow ups are often presented to show the progress of a patient. Here lies one significant difference to examine cases: they try to stay on a daily-routine layout, meaning that these cases can be tagged pictures to show the pathology, but one tries to keep the extent of images to a minimum and thus similar to a clinical-standard situation, where time is often a limiting factor. This fact also guarantees quick image handling and helps to set the right difficulty level for the candidates.

Every case used for the exams is carefully edited and evaluated by experts consider- ing certain qualities regarding quality, image quantity, difficulty as well as technical specifi- cations before it is released into the case pool. The ESR considers the EDiR to be a high- quality examination using up-to-date standards and technology, therefore the use of DICOM in the oral is essential. The very committed team of the ESR and the team of ePACS have been working together closely to uphold the standards established by the first, very successful EDiR examination at ECR 2011. The good results of this cooperation were again demonstrated at the ‘Journées Françaises de Radiologie’ (JFR) in Paris in October 2011. The ePACS team is also trying to promote further use of routine cases and their struc- tured reports in radiological eLearning and will be happy to welcome you to the ePACS booth next to the EPOAS Area & Lounge on the second level!

Opening hours of the ePACS booth:
8:30–18:00
Friday, March 2 to
Monday, March 5
08:00–18:00

For 2012, new cases have been added and more efficient MRI machines, with a lower price tag, the longer term lack of development can lead to market stagnation and falling clinical use. Some recent research advances in the MRI field may buck this trend. Investigating the potential applications of 7 Tesla MRI, and probing further into the use of MRI with contrast agents, are both important to keep MRI at the cutting-edge of imaging technol- ogy. Yet, the current economic climate will prevent widespread use of such technology; many radiologists feel such technology will be out of reach for the many years. So what is the solution?

In the short- and mid-term, optimisation and differentiation of current MRI technol- ogy is the smart plan, and could lead to sig- nificant benefits in patient accessibility and lowering hospital expenditure. Improving magnet technology can assist in speeding effi- ciency of exams, reducing cost and increas- ing scan volumes. The recent growth of the ‘extremity’ MRI market is a successful example of how to increase MRI use, while reducing cost. MRI can also benefit from concerns around sur- rounding high radiation dose administered by modalities such as CT, fluoroscopy and angiography x-ray. Low-dose alternatives for many procedures and scans are already being sought, with some in advanced stages of clini- cal trial or already cleared for use. MRI can play a major role here, such as being used in ‘fusion’ with ultrasound for interventional procedures. The greater challenge will be con- vincing radiologists to adapt and use these new procedures over old practices.

The Eurozone economic crisis may have taken its toll on the European MRI market, but it has also brought a refreshing, and much needed, change in attitude to advanced imag- ing use. Limited budgets and tightening reim- bursement has led to stringent questioning of over-use, and highlighted where other less- expensive and safer procedures would suffice. Continual development of next-generation MRI, optimisation and differentiation of cur- rent MRI technology, and greater physicians education in new, safer procedures, are the three biggest needs of today’s MRI field. Over- coming these could lead to safer and more accessible patient care, and reduce the burden of healthcare expenditure. The resources to overcoming these challenges, both for health- care providers and manufacturers may be sig- nificant, but a long-term future without an evolving MRI market could be far more costly.

Images of an interactive 3D visualisation over the web. (Provided by Dr. Peter Pokieser)
Cuts in healthcare expenditure pose a challenge and may restrict the use of sophisticated imaging technology. In the light of this situation, cost-effectiveness considerations are playing an increasing role when evaluating the benefits of new imaging technologies. However, selecting the right imaging procedure can be decisive in achieving a high standard of care, despite the increasing pressure for greater operational efficiency. This can be concluded from new results of the VALUE study. VALUE, sponsored by Bayer HealthCare AG, was set up to investigate outcomes and resource needs in the imaging and treatment of metastatic liver lesions in the context of colorectal cancer. The study compared three imaging methods: Gd-EOB-DTPA-enhanced MRI, MRI with extracellular contrast (ECCM) and contrast-enhanced liver CT.

Various clinical studies have already shown the beneficial effects of Gd-EOB-DTPA, a hepatocyte-specific contrast agent designed for liver MRI. Using Gd-EOB-DTPA definitely improves the accuracy of lesion detection, classification and characterisation compared to spiral CT.1

Above all, VALUE was set up to find out how often physicians may need a second imaging procedure in addition to the initial one in order to feel confident about their treatment decision,” explains Dr. Christoph Zech, study investigator at the Ludwig Maximilians University in Munich, Germany. An interim analysis presented in spring 2011 already revealed a statistically significant trend indicating that initial use of a Gd-EOB-MRI makes further imaging to explore the local situation in the liver unnecessary. CT use has dropped in this analysis, and the results for MRI using extracellular contrast were between the other two. The final evaluation of data from 342 patients at 35 liver centres in Europe and Asia clearly confirmed these results. In fact, none of the patients receiving initial Gd-EOB-MRI needed additional imaging of the liver in this study, versus 17% for ECCM-MRI and 39.3% for liver CT.

“In addition, VALUE gave us further evidence of the advantages of Gd-EOB-MRI,” says Christoph Zech, as the investigators looked at the number of patients where the initial imaging results were verified during subsequent tumour screening. In colorectal cancer patients, surgical resection is the treatment of choice for liver metastases. Usually the surgeon performs an intraoperative ultrasound before starting to remove the affected tissue. Relatively small liver lesions can be detected using this method, it is therefore the accepted standard of reference in these studies. MRI with Gd-EOB-DTPA resulted in a perfect match in 88.1% of patients, while imaging results derived from ECCM-MRI and liver CT were in accordance with intraoperative ultrasound in 73.5% and 62.1% of patients, respectively.

The differences in confidence of diagnosis and treatment plans assessed on-site by responsible radiologists and liver surgeons (Table 1) can have considerable implications.

If the surgeon finds conditions different from those he initially planned for, he has to overcome his surgical strategy and develop a new one at short notice. On one hand, this may result in prolonged exposure of the patient to anaesthesia, with uncertain medical implications. On the other hand, operating theatre times may be extended, thereby increasing costs and reducing efficiency. Again, the results of the VALUE study were more favourable to Gd-EOB-DTPA. In the case of liver CT, surgeons had to revise their strategy in nearly half of all the cases examined (47.1%), while with Gd-EOB-MRI, changes were seen significantly less frequently (27.7%).

Extended operating theatre times were also more common with liver CT compared to Gd-EOB-MRI and ECCM-MRI.2

Does Gd-EOB-MRI also help to overcome cost constraints in patient care? Based on the estimates of an expert panel, a health-economic model was prepared before the VALUE study started. According to the experts’ forecast, using Gd-EOB-MRI would clearly reduce costs because it helps avoid cost-intensive additional imaging procedures and longer operating times. Costs result from factors: inpatient hospital days were not even included in this model. To make an exact calculation of costs based on the available study data, study-specific differences – e.g. in reimbursement and diagnostic or clinical workflows – would need to be considered. "We are currently in the process of evaluating the costs and will soon come back with a detailed health-economic analysis,” says Christoph Zech.

Dr. Christoph Zech is study investigator at the Ludwig Maximilians University in Munich, Germany.

References

Table 1. Confidence in diagnosis and therapy decisions

<table>
<thead>
<tr>
<th>Method</th>
<th>(% of patients with the rating of ‘high’ and ‘very high’)</th>
</tr>
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<tbody>
<tr>
<td>EOB-MRI (n=118)</td>
<td>98%</td>
</tr>
<tr>
<td>ECCM-MRI (n=112)</td>
<td>86%</td>
</tr>
<tr>
<td>CE-CT (n=112)</td>
<td>65%</td>
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</tbody>
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Fig. 1: Transverse sections of a 43-year-old male patient with rectal cancer by CT and MRI taken in 4-day-intervals. (A) MCT in portovenous phase shows a liver metastasis centrally located with involvement of the left liver vein (arrow). No other lesions can be identified in the CT image. The hepatobiliary phase of an hepatobiliary MRI (B) clearly depicts an additional, 7mm-diameter subcapsular metastasis in segment 8 (small arrow). This metastasis is only vaguely depicted in the T2w sequence (C) and in the portovenous phase (D). Note also the much better conspicuity and delineation of the centrally located metastasis in the hepatobiliary phase.

The Georgian Association of Radiology was founded in 1995. Georgia was the first of the post-Soviet countries to become a member of the European Association of Radiologists. The Association holds its congress every five years, during which the President of the Association is elected. I was the first president and since then I have been elected twice more. During the third International Congress in 2002,post-Soviet countries to become a member of the European Association of Radiologists.

Scientific research takes priority in the activities of the Georgian Association of Radiology. The Research Institute of Clinical Medicine that is the main scientific base of the Association is equipped with two E.Cam Systems. Medicine is the only institution today that is equipped with two E.Cam Systems. It is equipped with two E.Cam Systems. Research Institute of Clinical Medicine is the main scientific base of the Association.

In Georgia a physician-radiologist must be trained in leading European clinics. More than 1000 Georgian radiologists were trained.

There are also training courses for young specialists, which are dedicated to the various fields of radiology. The Association publishes the scientific journal Georgian Journal of Radiology in which the scientific works of Georgian and foreign radiologists are published. Some prominent European radiologists are members of the editorial board. The editor is the President of the GAR.

The Georgian Association of Radiology contributes a great deal to the development of radiology in Georgia. Due to its endeavours in the fields of radiology and therapy such as CT, MRI, US diagnostics, nuclear medicine and radiotherapy they have been brought together as one discipline – medical radiology.

Scientific research takes priority in the activities of the Georgian Association of Radiology. The Research Institute of Clinical Medicine that is the main scientific base of the Association is equipped with MDCT and 320-Slice CT scanners as well. The 640-slice CT enables the radiologist to make a precise diagnosis of heart and brain pathologies; it is then possible to investigate pre-surgical diagnosis of the patients. There are 16, 128 and 640-slice CT scanners as well. In Georgia a physician-radiologist masters all areas of radiology. We have a three-year residency programme and doctorate in radiology. In the first term of residency they study roentgeno-anatomy. After residency young specialists perform postgraduate studies, that is, a subspecialisation of their choice. We consider the post-doctoral period of teaching to be our greatest achievement in getting the diploma the young doctors must pass tests, and after passing the tests they receive a licence which meets European standards. During this period, along with their radiology training, they attend lectures and courses in different subjects such as surgery, neurology, etc. Neuroradiology is a separate field. During this period young specialists work in hospitals alongside doctors and participate in surgical operations. As a result we have achieved our main goal which is important to us as clinically oriented radiologists.

One of the major targets of our Association is the development of radiology through the unification of the medical, scientific and technical resources of our country. We welcome the ESR's initiative to establish the European Day of Radiology, which will be celebrated as International Day of Radiology on Saturday 3 March 2012, as we hope that this will promote the further development and popularity of radiology.

Fridon Todua from Tbilisi/GE is President of the Georgian Association of Radiologists.
The ESFRI (European Strategy Forum on Research Infrastructures) roadmap project, Euro-BioImaging, Europe’s Research Infrastructure for Imaging Technologies in Biological and biomedical Sciences, is coordinated scientifically by the European Institute for Biomedical Imaging Research, EIBIR, and the European Molecular Biology Laboratory, EMBL, aims to establish a pan-European research infrastructure for biomedical imaging. Its three-year Preparatory Phase (2010–2013) is funded under the 7th Framework Programme of the European Union.

In 2011 the 39 members of the Euro-BioImaging preparatory phase consortium made good progress in developing the overall research infrastructure framework. The consortium truly believes that for this, a bottom-up approach is the way forward, and in this respect the project efforts in 2011 focused on consultation with the scientific community, users, and providers of European biomedical imaging facilities. The results will provide clear indications to Euro-BioImaging stakeholders, governments, and funders of the needs, demand, and supply for imaging facilities in the biomedical community of Europe.

The Euro-BioImaging Survey, the proof-of-concept studies, and national initiatives are the measures, which will lead to the elaboration of the eligibility criteria for the future Euro-BioImaging nodes.

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**Euro-BioImaging prepares eligibility criteria for future infrastructure nodes**

By Pamela Zolda

The ESFRI (European Strategy Forum on Research Infrastructures) roadmap project, Euro-BioImaging, Europe’s Research Infrastructure for Imaging Technologies in Biological and biomedical Sciences, is coordinated scientifically by the European Institute for Biomedical Imaging Research, EIBIR, and the European Molecular Biology Laboratory, EMBL, aims to establish a pan-European research infrastructure for biomedical imaging. Its three-year Preparatory Phase (2010–2013) is funded under the 7th Framework Programme of the European Union.

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**Euro-BioImaging Survey: a success beyond expectations**

During summer 2011 Euro-BioImaging conducted a detailed online European-wide survey of the imaging infrastructure landscape. The survey aimed to identify the needs and expectations of the potential users and to produce an inventory of the existing imaging facilities, their research, and training activities. Facility providers and users, as well as funding agencies, were asked what they expect from a research infrastructure, thereby helping to define the requirements and properties of the potential node-facilities under the Euro-BioImaging umbrella.

More than 660 participants, from 26 countries, participated in the survey, a remarkable number considering the effort required to answer the large number of questions (over 50). This clearly indicates the interest the growing European imaging community has in the European imaging research infrastructure concept proposed by Euro-BioImaging.

First major results

- Many imaging technologies will be requested by European scientists in the future
- Users and providers identify the same technologies
- Most imaging facilities do not provide external access above 10% of their capacity
- Cost models for access: there is a gap between, what users can afford and what facilities need to request. This gap has to be filled by new funding models for infrastructure usage
- There is a significant demand for training activities on an advanced level

More detailed results will be published on the project website www.eurobioimaging.eu in early 2012.

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**Euro-BioImaging Proof-of-Concept Studies (PCS): 63 imaging facilities open their doors to European scientists**

From January to July 2012 Euro-BioImaging will conduct a series of proof-of-concept studies to provide scientifically, technologically, and geographically rich sampling of running sites and projects. The PCS will be key to testing and refining the standardised execution and access protocols for Euro-BioImaging imaging facilities, to assess potential pitfalls on running these resources, and will be useful for identifying current community needs for access to different biomedical imaging technologies.

The call for users was open from October 1 to November 30, 2011. During this time, 228 proposals from all over Europe were submitted and evaluated by a panel of experts. The selected researchers will have the opportunity to carry out their project at one of the 63 different imaging facilities located across 17 different countries, which will contribute to the Euro-BioImaging Preparatory Phase. Learn more about this and the participating facilities on our website www.eurobioimaging.eu

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**Your invitation to attend the Euro-BioImaging Session ‘Support of translational imaging research by pan European research infrastructures’ on Sunday, March 4, 16:00–17:30 (Room Z).**

All ECR delegates and interested institutions are invited to visit the EIBIR booth at the entrance hall of the congress, where further information on Euro-BioImaging will be available.

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**Euro-BioImaging – Support of translational imaging research by pan-European research infrastructures**

**Programme**

**Sunday, March 4, 16:00–17:30, Room Z**

**ECRIN: clinical studies involving imaging for outcome-oriented research**

S. Schönberg; EIBIR, Vienna/AT and Mannheim/DE

**Infrafrontier: providing large-scale infrastructure for animal models**

M. Raess; Infrafrontier, Munich/DE

**EIBIR/EuroAIM Session**

Evidence-based radiology: ongoing projects and perspectives

**Programme**

**Saturday, March 3, 16:00–17:30, Room Z**

Evidence for the rational use of imaging technology is lacking. The European Network for the Assessment of Imaging in Medicine (EuroAIM) is carrying out multiple projects in order to:

- promote research projects on evidence-based controversies in radiology
- make the retrieval of secondary literature easier through a web-based system
- promote research projects on evidence-based controversies in radiology
- carry out a survey of the imaging infrastructure landscape. The survey aimed to identify the needs and expectations of the potential users and to produce an inventory of the existing imaging facilities, their research, and training activities. Facility providers and users, as well as funding agencies, were asked what they expect from a research infrastructure, thereby helping to define the requirements and properties of the potential node-facilities under the Euro-BioImaging umbrella.

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EIBIR presents IMAGINE

After last year’s success, EIBIR is again hosting the IMAGINE Workshop this year under the heading ‘Novel technology that shapes radiology’. The sessions will feature research institutes, university groups and research departments of industrial companies presenting novel and exciting technological developments in the field of diagnostic and interventional radiology. The presenters of the workshops were invited to introduce their work in ECR Today.

Beyond CAD in Computational Radiology

By Georg Langs and René Donner

Pattern recognition and machine learning methods allow for the computational exploration of medical image data beyond established diagnostic scores. Early evidence suggests that they lead to novel markers and foster insights that are bound to reshape radiology workflows.

Computational approaches which aid radiologists have lead to astonishing results, improving the sensitivity and efficiency of diagnosis. They make ever more complex medical image information accessible through accurate quantitative measurements. Traditionally, such approaches rely on a carefully supervised learning stage, during which algorithms learn from expert annotations of exemplary data. During computer aided diagnosis (CAD) the algorithms then automatically score or measure new data based on this knowledge.

Although highly successful this purely supervised paradigm suffers from the need for large numbers of expert annotations, such as voxel-wise labelling of anatomical structures, to represent the variability of disease. Typically, it is limited by design to replicate established diagnostic scores.

Recently, advances in machine learning have made the learning of patterns from large but only partially annotated data sets, and the detection of structure in non-annotated data possible. This could have implications for computer aided diagnosis, the search for relevant image data, and research in fields like neuroscience. Let us illustrate this with three examples:

1. For the diagnosis of diseases such as pneumonia or osteoporosis which affect the three dimensional structure of tissue, the accurate identification of the relationship between disease progression and overall tissue change is crucial. Computational approaches can identify tissue patterns that occur frequently in large image data sets, even without expert annotations of examples. We can learn about the relationships among their distribution and disease progression, and can thereby obtain multivariate markers, that might even be predictive for the disease and outcome.

2. Neurological disorders such as mild cognitive impairment can correlate with subtle changes in brain morphometry, or functional structures. Markers can only be learned from large populations of individuals, and typically consist of parameters that describe complex shape and appearance changes across the entire brain. Both the identification of relevant patterns and their precise predictive power with regard to disease is challenging, and necessitates computational approaches to relate the observations.

3. Finally, image retrieval is emerging as an alternative to traditional CAD approaches. Instead of providing automated assessment of image data, retrieval searches vast repositories of images and reports data and provides the user with the most similar cases to a given query case. The European Union funded project KHRESMOI (www.khresmoi.eu) aims at developing image based searches that will afford radiologists efficient access to cases in a hospital system, that are relevant to a case being assessed. Based on image similarity and textual cues, an entire hospital PACS could be searched for data that exhibits similar anomalies, and the corresponding reports could be provided in an anonymised manner. This goes beyond the current use of image based retrieval, and makes the learning and comparison of subtle and infrequent image characteristics necessary. It taps into the above mentioned developments in machine learning, and the initial results are promising. They show how local search disease patterns can be detected quickly within large amounts of heterogeneous imaging data.

All of the examples have three features in common: first, disease markers are not obvious, but are identified computationally from image data; second, they involve multivariate diagnostic features that can only be learned from very large numbers of examples; and third they are the subject of highly active research efforts across computer science and the medical communities.

At the CIR lab at the Department of Radiology of the Medical University of Vienna (www.cir.meduniwien.ac.at) researchers from radiology, computer science, and mathematics are collaborating to solve some of these questions. Through close interaction between basic research and clinical applications the group aims at tackling fundamental problems which allow for scientific insight, and could change the way we use medical imaging.

www.cir.meduniwien.ac.at, www.khresmoi.eu

The project will be showcased on Saturday, March 3, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

Georg Langs and René Donner work at the Computational Image Analysis and Radiology Lab at the Department of Radiology, Medical University of Vienna AT.
Quantitative neuroimaging advances

By Jan Klein, Florian Wollen, Sebastiano Barbieri, Jochen G. Hirsch, Benjamin Geisler, Horst K. Hahn

Fraunhofer MEVIS, Institute for Medical Image Computing, in Bremen/Germany, is presenting its software assistant NeuroQLab for performing neuroimaging studies and planning neurosurgical interventions at this year's ECR. NeuroQLab supports structural and functional quantification and a comprehensive visual summary of the results. In addition, NeuroQLab has been updated with respect to its functionality and features. Recently, MRI analysis, cortical thickness measurement, and a white matter atlas have been incorporated.

Handling neuroimaging data

Quantitative neuroimaging studies allow for comparisons between subjects over time. Neurodegenerative diseases like multiple sclerosis or Alzheimer's, cerebrovascular diseases, epilepsy, psychiatric diseases, and paediatric diseases are only a small example of where quantitative neuroimaging techniques have already proven useful. Besides the different natures of these medical fields, the required tools for image analysis and data visualisation techniques for the underlying data are often similar. Common processing tasks include the registration of different modalities or imaging sequences to a reference image and segmentation of prominent structures such as the brain, the ventricular system or the vascular system from different datasets.

NeuroQLab offers all the basic tools typically required for processing and working with magnetic resonance images, as well as a number of quantification tools specifically targeted at certain neurological diseases.

Quantification tools

Our toolkit for the analysis of diffusion-weighted images allows for the reconstruction of white matter fibre tracts using deterministic or probabilistic algorithms. Fibres can be clustered to create anatomically related bundles. Diffusion-derived parameters can be measured along extracted tracts or within user-defined regions of interest including consideration of partial volume effects. Additionally, uncertainty in the diffusion-weighted images is taken into account and confidence around the bundles can be displayed. Activated fMRI areas can be visualised and used as regions of interest.

Another area of focus is volumetric brain analysis which is useful for measuring brain atrophy. NeuroQLab offers modules for determining whole brain volumetry, as well as ventricle, temporal horn, and spinal cord volumetry. A tissue mixture model with dedicated partial volume modelling is used, that allows for both the reduction and assessment of the volumetric error at the same time.

Additionally, we have created a technique to estimate the volume of manually segmented MS lesions while taking account of the distribution of grey-values in the underlying tissue and, therefore, accounting for the contribution of partial volume voxels to the lesion volume. It is especially useful for small lesions consisting almost exclusively of partial volume voxels where it can significantly increase the accuracy of lesion volume measurement and detect volumetric changes at an earlier stage.

Furthermore, a module for cortical thickness measurement is used to allow for the assessment of local brain atrophy. In contrast to other existing approaches, the pre-processing time is very low and, thus, this application can easily be used in clinical settings.

Rapid prototyping of new features

The software assistant NeuroQLab was designed from an established platform for rapid prototyping, called MeVisLab, which facilitates fast integration of new features by user request as well as the adaption of the features to concrete clinical problems.

Our software is currently used by about 30 clinical research partners of our institute in the context of a variety of clinical problems. Furthermore, it has been used as the technical basis for numerous studies resulting in a variety of clinically driven scientific publications covering diseases like multiple sclerosis, schizophrenia, dementia, and epilepsy.

The project will be showcased on Saturday, March 3, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

Robust automated hippocampus segmentation enables detection of Alzheimer's disease

By Marc Modat

Alzheimer's disease (AD) is the most common cause of dementia and as the population ages, the number of patients rises. Today in the United Kingdom (U.K.) one person in three over 65 years old is likely to develop dementia. The number of subjects diagnosed with dementia is estimated to reach 1,000,000 in the U.K. by 2025. The actual cost to the healthcare system is £23 billion (approximately $27 billion euro) per year in the U.K. which is more than for cancer and heart disease combined. There is currently no therapy that affects the course of the disease. There are, however, treatments that delay the progression of clinical symptoms such as memory loss and improve the patients' quality of life. There have been some estimates that if the onset of the disease is slowed down by five years, then the prevalence of AD will be halved. For this reason, early detection of the disease is crucial.

Researchers are currently working to develop biomarkers that could help to detect the early onset of the disease. Changes occur in the brain years before any clinical diagnosis can be made. Hippocampal atrophy measurement using magnetic resonance imaging has been shown to be an early marker of AD. Pathological measurements are even more sensitive when they include longitudinal information from multiple time-points (i.e. a rate of tissue loss over time) rather than a cross-sectional measurement performed on a single time-point. Hippocampal volume change is also used to monitor disease progression.

The localisation and segmentation of the hippocampus is thus a key task. However, this structure is difficult to delineate as the boundaries can be quite indistinct and subject to partial volume effects and in addition this area of the brain is often susceptible to imaging artefacts. The structure also quite often varies in size and shape across the population. Currently, the most reliable methods to delineate the hippocampus involve manual raters going through extensive training and quality control, followed by slow detailed segmentations on a slice by slice basis. Several automated methods for region of interest delineation have been proposed but the best method is still manual segmentation performed by a well-trained expert.

We will present, at the EIBIR presents IMAGINE workshop, an automatic method that efficiently reproduces inter-rater variability results when compared to manual segmentation. This method, developed at the University College London, U.K., is based on open-source software (NiftyReg and NiftySeg). It takes advantage of a library of brain images where the hippocampi have already been manually segmented by an expert. All images in the brain library are then automatically compared to the image to be segmented in order to find the hippocampi that look the most similar. The selected images and their associated segmentation are then used as example regions to guide the new segmentation. The method has been extensively validated against manual segmentations on control subjects, subjects diagnosed with AD, and those with the classification of ‘mild cognitive impairment’, a group of subjects that have memory complaints and are much more at risk of developing AD. It has been assessed not only on large clinical cohorts using cross-sectional images but also on longitudinal data using multiple time-points in order to determine rates of hippocampal volume change over time. This method showed great robustness and accuracy and is currently being used in phase two and three clinical trials.

The project will be showcased on Saturday, March 3, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

Marc Modat is a research student at the Centre for Medical Image Computing, University College London, London UK.
Fusion of CTCA and perfusion MR offers valuable new options for the diagnosis of coronary artery disease

By Hortense A. Kirişli

Many tests are available for detecting and diagnosing coronary artery disease (CAD), and each of them have their own specific advantages. In clinical practice, information about both coronary anatomy and myocardial perfusion are needed in order to assess CAD. Computed tomography coronary angiography (CTCA) is used to determine the extent and severity of coronary stenoses, while myocardial perfusion imaging, such as perfusion magnetic resonance imaging (PMRI), is used to identify the presence and extent of ischaemia. The culprit artery inducing a perfusion defect in a specific myocardial region is then identified by experts, based on assumptions about the coronary perfusion territories. Nevertheless, the high variability of patient coronary artery anatomies, as well as the uncertain relation between perfusion territories and the supply to coronary arteries, increases the need for patient-specific systems.

This year at the Novel technology that shapes radiology: EBIR presents IMAGINE’ workshop, the Synchronized Multimodal heART Visualization (SMARTVis) experimental system will be presented; the system combines information extracted from multiple cardiac modalities into one single patient-specific model, thus creating a ‘one-stop-shop’ in cardiac imaging data for the assessment of coronary artery disease. The SMARTVis system offers the following comprehensive visualisations for relating coronary stenoses to specific regions with perfusion defects: 1) projection of the coronary artery tree onto a 2D bull’s-eye plot (BEP), 2) integration of perfusion information into a 3D cardiac model, 3) automatic detection and quantification of stenoses, and 4) estimation of patient-specific coronary perfusion territories.

The added diagnostic value of the SMARTVis system in assessing CAD was investigated through a comparative study (i.e., side-by-side analysis of images versus analysis with the SMARTVis system) performed at the Radiology Department of the Erasmus MC (Rotterdam, the Netherlands). Four cases of patients with suspected multivessel CAD were analysed by two independent experts, blinded to one another’s results. The study1 was published in the International Journal of Computer Assisted Radiology and Surgery in September 2011 and demonstrated that, when using the SMARTVis system, the assignment of a perfusion deficit to a specific culprit artery was estimated more accurately. The analysis led to a more accurate diagnosis, as well as to a better inter-observer diagnosis agreement.

Certainly, the tool would not be expected to improve diagnosis in low-risk patients with single vessel disease, as only one culprit artery can be assigned to the perfusion defect. But visualisations derived from the SMARTVis system can be included in all patient reports, to provide a quick overview of the patient’s disease state. The SMARTVis computer-aided diagnosis system may offer valuable new options for the diagnosis and management of patients suffering from (multivessel) CAD.

The accompanying poster to this presentation is published in EPOS® and can be accessed online at myESR.org/EPOS. The poster (C-1141) is titled ‘SMARTVis: a computer-aided diagnosis system for comprehensive visualization and analysis of multimodal cardiac imaging data for the assessment of coronary artery disease.’

Hortense A. Kirişli is part of the Biomedical Imaging Group Rotterdam, Dept. of Medical Informatics and Radiology, Erasmus University Medical Centre, Rotterdam/NL.

Industry should be more aware of the benefits of cooperating with ESOR

By Mélisande Rouger

A special anniversary brochure was created to celebrate the fifth anniversary of the European School of Radiology (ESOR). A number of key people involved with ESOR were interviewed about its effect on the past, present and future of radiological education. This is the second interview in the series.

In its five years of existence, ESOR has proven to be a very successful enterprise due to the dedication of all the people involved in its educational programmes, including the industry partners who helped support their realisation. We spoke with Professor Gabriel Krestin, incoming ESR President, to learn more about the role of the industry and how it could develop further…

ESOR has done a lot to harmonise education in Europe, and recently between Europe and the United States. Where do you see the programme going in the next five years?

Gabriel Krestin: In my opinion the schoolar-ship and mini-fellowship programmes of ESOR were the most successful endeav-ours. They not only fulfilled a need in the training curriculum of many countries not yet engaged in subspecialisation but also helped to intensify exchange and cooperation between different institutions and countries. I can only encourage the ESOR leadership to further expand these programmes.

Do you think ESOR should continue expanding to other continents or rather focus on Europe in the future?

GK: I think that activities in Europe should remain the main focus of ESOR in the coming years. This however, should not exclude additional efforts on other continents. The need for education in Europe, particularly in some Eastern countries is still apparent and the harmonisation of training is far from complete. ESOR therefore still has a major task to complete on its own continent. Engagement in other continents should be adjusted according to our resources, to ESR strategy, and with an eye to providing a return on investment.

What role has the industry taken in educating radiologists through ESOR? For instance which programmes do they support?

GK: The industry is very much interested in providing education in Europe. Many of the ESOR programmes would not be possible without industrial support. However, industry is still providing education outside the ESOR framework, sometimes of good quality but sometimes also less so. I would be happy if the industry would be even more aware of the benefits of cooperating with ESOR, for the provision of high quality education.

Which companies have become involved in ESOR programmes?

GK: Bracco and GE Healthcare have been the main partners from the beginning. Mean-while, further important players have come on board such as Coviden, Euroremed and Bayer Schering, the latter through the ESMRMB School of MRI, which is organised under the umbrella of ESOR. Agfa, Nycomed and Siemens have also supported some edu-ca- tional activities. There is still room for fur- ther companies and 2012 will certainly be an interesting year for them to provide education in partnership with ESOR.

Are you satisfied with these partnerships, and if not how could they become more fruitful?

GK: The already established partnerships are very fruitful. I am sure, however, that they could be extended further. The com-pa- nies supporting ESOR have additional educa-tional activities which have not yet been organised by ESOR. Moreover, there are still plenty of other industrial partners of ESR who could benefit substantially from collaborating with ESOR.

What would be your message to industry partners to encourage them to participate in ESOR programmes?

GK: Thanks to the engagement of the ESOR Director, Prof. Nicholas Gourtsoyiannis, ESOR activities have become a trademark of quality in radiology education. The collabora-tion with different subspecialty societies, the continuous critical appraisal of the format and the speakers’ contribution guarantee that ESOR activities are timely, address the needs of the community and have very high standards. New, interactive educational tools are tested and included in ESOR programmes. In this way, each company can benefit from cooperating with ESOR without losing their specific objectives. However, ESOR activities will always be free of commercial bias and therefore a lot more acceptable and attractive to the professional community.

Ethics is becoming a growing issue nowa-days and the lab AstraZeneca has recently decided to stop sponsoring doctors going to international congresses, a move that may pressure other companies to follow suit. Do you think this could have an influence on the industry’s participation in ESOR in the future?

GK: I do not think that real ethical issues play a role in the partnership between an apolitical and independent body like ESR and any industrial company. Legal burdens on com-panies have become really excessive recently, but cooperation with ESOR assures that the support given complies with regulations. By cooperating with many industrial partners, not engaging in any marketing activities, and possessing true and complete scientific freedom, ESOR is the best example of how industry can comply with ethical and legal requirements for sponsorship of educational activities.

Do you have a personal wish or message for ESOR on its fifth anniversary?

GK: I can only congratulate the founder and director of ESOR, Prof. Gourtsoyiannis for the results so far. Nobody could have anticipated that within only a couple of years ESOR would become the largest and best scheme in radiology education in the world. I hope that ESOR will continue to flourish and expand its very successful activities to the benefit of radiology education in Europe and the rest of the world.
Eminent head and neck radiologist pays tribute to his teacher with today’s Honorary Lecture

By Michael Ceen

In recognition of his outstanding career and his tremendous contributions to the study of otorhinolaryngology and oncology in the field of radiology, Professor Roberto Maroldi from Brescia, Italy, has been invited to present the Antonio Chiesa Honorary Lecture ‘Small is beautiful! The voyage of head and neck imaging into the future’ at ECR 2012.

Roberto Maroldi is currently Head of the Department of Radiology at the University of Brescia. He is Professor of Radiology at the Medical School and at the School of Dentistry of the University of Brescia. He is also Dean of the Radiography undergraduate course at the same University. His research interests are mainly in the areas of oncological aspects of head and neck lesions in several anatomical regions and the analysis and assessment of the diagnostic effectiveness of CT and MR.

Prof. Maroldi was born in Vicenza, Italy, but began his career in Verona where he studied at the Medical School of Verona, from which he graduated in 1979. In 1982 he moved to the Department of Radiology of the Medical School of Verona, which at that time had the late Prof. Antonio Chiesa as its director. In 1984, he received his accreditation as a radiologist from the same medical school. During this time, right up until 1986, he also edited the newsletter published by the informatics section of the Italian Society of Radiology, entitled Informa.

In 1987, he was Secretary-General of the Fifth International Symposium on the Planning of Radiological Departments (ISPRAD V) and once again worked alongside the late Prof. Chiesa in 1989, co-edited the proceedings book of the symposium, ‘Planning Considerations in Diagnostic Imaging and Radiation Protection’. In 1990 he was also appointed Secretary-General of the Italian Congress of Radiology, which was held in Milan, in 1994.

“My decision to become a doctor was based on more than one reason,” reflected Maroldi. “First, it was about the idea of helping people at a time when they were in great need. But it was also about the intellectual challenge of combining science with care. Then, there was my fascination with the new imaging techniques at that time, like CT and US. They promised a direct exploration, in vivo, of the changes caused by pathologic processes.”

A member of the board of the Italian Society of Radiology from 1994 to 1998, Dr. Maroldi was president of the head and neck radiology section of the same society from 1996 to 2000. He was also a member of the board of the European Society of Head and Neck Radiology from 1998 to 2008 and chaired the European Congresses of Head and Neck Radiology in 2001 and 2009. He co-founded and remains a member of the Italian Head and Neck Society, which was established in 2011. He co-edited a book entitled ‘Imaging in Treatment Planning for Sinosal Nasal Diseases’, which adds to his more than 140 publications. He continues to play an active role in education, both domestically and internationally. At the University of Brescia he has chaired the degree course in radiology since 2007, while abroad he has been the course organiser of the ESR’s ‘Advanced head and neck MR imaging’ course on several occasions, in various countries and in various capacities.

Maroldi explained what led him to the field of head and neck imaging: “Certainly, this choice was facilitated, if not even prompted, by my encounter with two leading and charismatic doctors. While I was working alongside Antonio Chiesa, a master of conventional head and neck radiology, I also met Antonio Antonellini, a very capable ENT surgeon. His intelligent questions concerning the imaging of head and neck lesions were what drove me to explore this field.”

As well as being an accomplished radiologist, Dr. Maroldi has also excelled outside of radiology and academia. From 1972 until 1976 he represented his country as a member of the Italian National Athletics Team. For those intrigued by the title of Maroldi’s lecture, he gave a brief insight into its content: ‘Imaging of head and neck structures means exploring those miniaturised systems through which we interact with the surrounding environment and other humans. That is, systems enabling senses, like sight, hearing, smell and taste, and functions like breathing and swallowing by larynx and pharynx coordination. It is a fascinating field, where a double T factor is the key: imaging tools and training, ‘tools’ to analyse miniaturised structures, ‘training’ to know precisely what is needed for medical decision making. The challenge is to transmit and share the enthusiasm to voyage into this small and beautiful inner space.”

The ESR supports the modernisation of the Professional Qualifications Directive

Increase efforts to ensure a harmonised training curriculum in radiology

By Javeni Henetbeizer

The Professional Qualifications Directive (Directive 2005/36/EC) mainly consolidated and simplified numerous previous Directives, some of which dated back to the 1960s. The ongoing modernisation of the Professional Qualifications Directive, with a view to facilitating mobility, is aimed at adapting it to the evolving labour market. The modernisation of the Directive covers the harmonisation of train-
European Radiology – Highlights 2011

In order to highlight for you, our readers and ECR participants, some of the most exciting articles published in European Radiology during 2011, we asked our section editors for their expert opinion by selecting what they believe to be the most groundbreaking developments in their field.

Mathias Langer is Professor of Radiology and Director of the Department of Diagnostic Radiology at the Albert-Ludwigs-University in Freiburg, Germany, and European Radiology section editor for computer applications. For ECR Today he chose the abstract below and briefly explains his reasons for doing so.

Unenhanced computed tomography plays a key role in the detection of obstructive uroteral calculi. Normally, the size of these stones is measured manually by the radiologist. Reliable, investigator-independent size estimation of an obstructing uroteral stone is important, and could facilitate treatment planning. In this context, Liden and colleagues recently presented a CT-based computer-assisted segmentation algorithm to reduce inter-observer variability, which has the potential to enable precise size estimation of uroteral calculi for accurate clinical decision-making.

Urinary stone size estimation: a new segmentation algorithm-based CT method
Abstract: Objectives: The size estimation in CT images of an obstructing uroteral calculus is important for the clinical management of a patient presenting with renal colic. The objective of the present study was to develop a reader independent uroteral calculus segmentation algorithm using well-known digital image processing steps and to validate the method against size estimations by several readers.
Methods: Fifty clinical CT examinations demonstrating urinary calculi were included. Each calculus was measured independently by 11 readers. The mean value of their size estimations was used as validation data for each calculus. The segmentation algorithm consisted of interpolated zoom, binary thresholding and morphological operations. Ten examinations were used for algorithm optimisation and 40 for validation. Based on the optimisation results three segmentation methods were candidates were identified.
Results: Between the primary segmentation and zoom step using cubic spline interpolation and the mean estimation by 11 readers, the bias was 0.0 mm, the standard deviation of the difference 0.26 mm and the Bland–Altman limits of agreement 0.0 ± 0.5 mm.
Conclusions: The validation showed good agreement between the suggested algorithm and the mean estimation by a large number of readers. The limit of agreement was narrower than the inter-reader limit of agreement previously reported for the same data.

Key Points
- The size of kidney stones is usually estimated manually by the radiologist.
- An algorithm for computer-aided size estimation is introduced.
- The variability between readers can be reduced.
- A reduced variability can give better information for treatment decisions.

A novel approach to digital breast tomosynthesis for simultaneous acquisition of 2D and 3D images
Abstract: Objective: The complexity of anatomical structure within the breast represents the ultimate limit to signal detection on a mammogram. To increase lesion conspicuity Digital Breast Tomosynthesis (DBT) is a modern technique of 3D imaging with the potential to improve the diagnostic value of screening and diagnostic mammography. Dr Sara Vecchio and colleagues have recently described how DBT, with variable dose distribution, allows for 3D imaging of the breast and a 2D projection with image quality similar to that of standard mammography.

Methods: To compare the performance of a commercial digital mammography unit and a DBT prototype, 2D and 3D images of the breast phantom were obtained at similar dose levels.
Results: As expected, DBT showed superior performance over digital mammography. Although certain details of interest are not detectable with digital mammography, DBT can reveal their signal by reducing the complexity of tissue structures. Additionally, the potential of the central projection in variable dose DBT is similar to the standard projection obtained with digital mammography. Finally, the uniform and variable dose approaches provided almost identical reconstructed slices.
Conclusion: This preliminary investigation demonstrates that breast tomosynthesis acquired with variable dose distribution exhibits inherent 3D reconstruction advantages for structure noise removal and provides a 2D projection with a physical image quality close to that of standard mammography.
The need to integrate specialists into medicine, in order to allow for more harmonious development, cannot be overestimated. Modern radiology is no exception to this.

The Belarusian Radiological Society (BRS), which is a non-profit, non-governmental public organisation, was established in 2005. It is the legally recognised successor to the Belarusian Society of Roentgenologists, which was founded in 1952 by Prof. Sosina. Since 2006 the BRS has been an institutional member of the European Society of Radiology. The BRS has more than 450 registered members. Seventy Belarusian radiologists are also full members of the ESR and every year around twenty-five of them participate in the ECR.

The main aims and objectives of the BRS are the development and improvement of radiology in Belarus; the education and training of its members; legislation and radiation protection; cooperation with other national radiological societies; and further integration into European radiology.

Every year we hold a national scientific meeting, which is also attended by specialists from radiotherapy, on the most urgent issues in x-ray, CT, MRI, US diagnostics, nuclear medicine and interventional radiology. The congress of the BRS, with the participation of leading authorities in radiology from other countries, is held once every five years and it consists of three stages:

1. Undergraduate preparation (medical university, 80 hours of diagnostic radiology).
2. Postgraduate preparation (internship or specialisation). The internship programme lasts for one year and specialisation takes four months.
3. The next phase of training takes place every five years for advanced academic accreditation and every two weeks to a month for special training. Radiology residency training programmes are under the legal authority of the Ministry of Health.

The training period is three years. There are some solutions to the problems facing radiology in Belarus. The system of undergraduate and postgraduate training in radiology must be radically changed and brought closer to the standards accepted in Western countries. But the extension of training is unreasonable without an adequate financial base. All radiological centres must have access to modern diagnostic and information modalities and technologies.

Radiology in Belarus consists of diagnostic roentgenology, ultrasound, interventional radiology and nuclear medicine.

More than 1,800 radiologists, including specialists in x-ray, CT, MRI, US diagnostics, intervention radiology and nuclear medicine work in the field of radiodiagnostics in the different medical institutions of Belarus. With a population of 9.4 million there is only one radiologist for every 5,000 people. In diagnostic radiology there are 950 roentgenologists, 750 sonographers, 60 interventional radiologists and 70 nuclear medicine physicians.

There are 2,190 x-ray machines throughout various medical institutions in Belarus. Thirty-five percent have been in use for more than ten years and are outdated, only 450 machines are digital. There are 1,400 ultrasound machines, 65 CT, 32 MRI, 24 angiography units, 30 mammography units and 26 gamma cameras. Unfortunately, there are no SPECT-CT or PET-CT scanners. Belarus has an industrial base for manufacturing modern diagnostic imaging units and a wide spectrum of conventional and digital x-ray equipment is currently being manufactured by the firms Adani and Drive.

Xeradiology presents us with many opportunities to improve quality and access to radiological imaging. In Belarus this trend is also promising and in Minsk it has led, over the last two years, to a common electronic network system for the screening of tuberculosis and lung cancer, as well as the facilitation of long-distance diagnostic image consultation. Currently, more than five large hospitals operate with radiology departments based on the PACS system.

In 2011, there were over 14 million diagnostic x-ray imaging examinations in Belarus. The most frequent x-ray examinations were of the skeletal joint system (60%) and the chest (30%). Unfortunately, Belarus has not organised a mammography screening system yet, so a small number of diagnostic mammograms (60,000) has not helped to reduce the incidence of breast cancer below the level of 77 per 100,000 of the female population.

At the same time, CT and MRI studies were carried out. The most popular imaging examinations in Belarus are in the following spectrum of conventional and digital x-ray imaging examinations:

- Musculoskeletal (37%);
- Cardiovascular (25%);
- Skull (15%);
- Thoracic (11%);
- Abdominal (10%).

Further information can be found on the society’s website www.brs.by or via e-mail: org@brs.by

By Yury Polosko

Professor Yury Polosko from Minsk/BY is President of the Belarusian Radiological Society.

Further information can be found on the society’s website www.brs.by or via e-mail: org@brs.by
Emergency medicine demands expertly trained radiologists

By Gerd Schueller

Today, we, as radiologists, work in a time where rapid emergency radiology (ER) is vital to the proper management of serious emergencies. Since thorough and rapid diagnostic radiological imaging has become widely available, the radiologist has gained a central role in patient management in many emergency medical departments.

Indeed, the demand for diagnostic imaging in ER departments has risen dramatically over the last decade, with an exponential increase in the use of multi-detector computed tomography (MDCT), up to 22% per year. For example, in the U.S., between 1996 and 2007, MDCT use during ER department visits grew by 38%, with the largest increase in older patients and for the diagnosis of abdominal or chest pain. These rates are a direct result of the technical and methodological improvements in the use of MDCT.

Moreover, diagnostic imaging has, at least in part, virtually replaced physical examination for many emergency patients. Particularly in severely injured or critically ill patients referred to an emergency unit, immediate cross-sectional imaging is used as an adjunct to the primary patient survey (APS) and has proven to be of substantial benefit in establishing an adequate, timely, and individual therapy. Emergency radiologists must not only acquire a full understanding of the imaging modalities and technical requirements, but they should also have appropriate clinical knowledge of the various disorders in order to become valuable contributors to the therapy decision-making process.

All these data suggest that European radiologists require dedicated subspecialty training in ER. It is a fact that over the last few decades, training has shifted from an organ-based approach to a modality-based approach, and ultimately, to a process-based approach. Not only has this development been recognized at a European level, with the foundation of the European Society of Emergency Radiology (ESER), but also at an international level. Radiological expertise in traumatic, as well as non-traumatic acute disorders, must also be delivered on a national basis.

In Austria, in 2010 the working group on ER was founded under the auspices of the president of the Austrian Roentgen Society (ÖRG), Prof. Dimiter Tscholakoff. The group’s aim is to function as a contact organization for doctors, technicians, and companies working in the field of emergency medicine, all over the country.

However, hospital-based radiology is not the only primary target. Since private practice has become more and more involved in ER, extramural radiologists are also encouraged to stay in touch with the working group. The working group is structured according to particular fields of interest.

Contact persons are Gerd Schueller, MD, MBA (head of the working group, traumatic disorders), Michael Rieger, MD (deputy head), Manfred Cejna, MD (non-traumatic emergencies), Gerald Partan, MD (paediatric emergencies), Martin Breitenseher, MD (trauma of the joints), and Johannes Trenkler, MD (stroke).

In 2012, the working group will offer its first dedicated educational course on trauma and non-traumatic emergency. It will be held in Vienna on June 22–23. For further information, please visit www.traumaimaging.at.

In addition, both close cooperation with companies and a multi-disciplinary scientific approach are vital to the establishment of extensive and well-informed ER on a national level. This Austrian working group has announced its goals of promoting technical developments and coordinating the scientific and professional activities of ER.

The Austrian Roentgen Society prepares for its Annual Meeting in Graz

By ÖRG Press Office

The time since ECR 2011 has been a very successful time for the ÖRG. Since its establishment in 1934, the Austrian Roentgen Society has made great efforts to improve medical and advanced training for Austrian radiologists and residents, and to promote the benefits of radiological imaging to the general public.

The 92nd German Congress of Radiology, the sixth DGRöÖRG Congress

Last year the 92nd German Congress of Radiology took place in Hamburg/Germany and for the sixth time the Austrian Roentgen Society acted as joint organiser.

Under the motto ‘The diversity of radiology’ major topics such as oncologic, sports, joint, and breast imaging were discussed by Austrian and international experts in front of a large audience.

Last year’s congress was not only the first congress in the history of the German congress of radiology to carry a motto, but it also set a new record for participation, with 7,400 attendees. The congress also showed an all-time high for Austrian participation, with over 380 radiologists. Among them were 23 students who made their way through a tough assessment to receive free accommodation and free admission to the congress.

ÖRG Press event: ‘Programmes in Austria’

In January 2012 the ÖRG held a press event to raise awareness of the practicability and feasibility of screening programmes in Austria, with a special emphasis on lung cancer screening.

According to the USA’s National Lung Screening Trial (NLST) low dose CT screening of the lung in heavy smokers can help detect lung cancer and lower mortality rates. Since the beginning of the trial in 2002, 54,000 heavy smokers aged 55 and 74 were examined with either low dose CT or normal chest x-ray. The results showed a higher detection rate of lung cancer in patients scanned with low dose CT and a 20% lower mortality rate in comparison to those patients who underwent normal x-ray screening.

At the event, leading Austrian radiologists agreed that nationwide screening in Austria, as shown in the study, is not feasible at the moment.

Other topics, such as the possibility of a 4P (personalised, predictive, preventive, and participatory) approach, to put the main emphasis on early diagnosis and to decrease costs of chronic diseases, were also discussed. At the moment those costs take up 75% of all Austrian health expenditure and could easily be lowered through thorough early detection rates.

To provide an understanding of the value of radiological methods to patients and the general public is one of the main ambitions of the Austrian Radiological Society.

Upcoming ÖRG Congress 2012

At the moment, the ÖRG is preparing for their major event of the year, the ÖRG Congress which will take place in Graz from September 13–15.

The MUMUTH (House of Music & Musical Theatre), which is one of the architectural jewels of Graz, has been chosen as the congress venue.

Following the congress motto ‘Future trends in inter- and multidisciplinary radiology’ the focus will be on topics such as oncologic radiology, hybrid imaging, paediatric radiology and many more. Abstract submission will open on March 1, 2012.

If you would like more information regarding the congress programme or registration for the ÖRG Congress 2012, then come and visit us at our booth at ECR 2012 or find out more at www.örg.at/örg2012.

More information on the society can be found at www.oerg.at
Indulge yourself in Vienna's musical treasures

By Michael Crean

Ask anyone what they associate with the city of Vienna and the likely response will be music. A city famous for hosting and nurturing some of the greatest names in classical music, Vienna was the birthplace of Schubert, Strauss, Schönberg and Berg while Mozart, Beethoven, Brahms, Haydn and Mahler all came to make their name in, what was then, the city of music. No other city can claim to have been home to so many renowned and timeless composers, and as the birthplace of the operetta and the Waltz it has gained a worldwide reputation as a city of culture.

The Vienna Philharmonic is among the best orchestras in the world, and the city boasts many other major ensembles, including the well-known Vienna Symphony Orchestra. With such an impressive musical heritage and array of ensembles, you will not be surprised to learn that the city possesses some of the most elegant and ornate classical concert halls in the world. The Vienna Konzerthaus and the Musikverein are, with little doubt, the two most prominent classical music venues in Vienna, and indeed the world. Millions of tourists are attracted to these venues each year. The Musikverein is familiar to many people around the world as its 'Golden Hall' is host to a special New Year's Eve concert, which is broadcast around the world each year. The Art Nouveau architectural style of the Konzerthaus reflects its vibrant programme, as it hosts not just classical music concerts but a variety of contemporary music concerts from many different genres.

For a newcomer to Vienna, the number of concerts, as well as the variety of venues can be a little overwhelming. During ECR 2012 there are a number of musical events worth visiting and doing so will allow you to enjoy wonderful music in some truly stunning surroundings.

If you would like the chance to hear the Vienna Symphony Orchestra play, then you are in luck, as on February 29 and March 1 they will be playing some of the works of Joseph Haydn, Igor Stravinsky and Richard Strauss at the Konzerthaus. Just to admire this stunning building is reason enough to visit. The Konzerthaus opened in 1913, in the Vienna of the belle époque, and its décor and architecture reflect the optimism of the era. Today, it remains an institution of music and one of the most important in Europe. The Konzerthaus's eclectic programme, ranging from classical to contemporary, means that it's a venue which everyone should visit.

Those that consider themselves to be true lovers of classical music will have their sights set on the Musikverein. The German term 'Wiener Musikverein' translates as Vienna Music Association, which indicates the purpose of this great concert hall, as a home for great music. Opened in 1870, before the advent of acoustic science, the Musikverein is still considered to be one of the finest concert halls in the world and is home to the Vienna Philharmonic. During ECR 2012, the Musikverein will play host to an international and local programme of concerts, including the marvellous pianist sisters Katia & Marielle Labèque on March 1, the Tonkünstler-Orchester Niederösterreich on March 2, the Wiener Symphony Orchestra from Japan, on March 3, and the Kammerakademie Potsdam with the famous flutist Emmanuel Pahud on March 5.

Visiting Vienna does not mean simply listening to music; it also means learning about music. The city's illustrious musical history has created many places of interest for music lovers all over the city.

The Arnold Schönberg Center, founded in 1998, serves as an archive of the composer's work as well as an educational centre. The centre hosts many exhibitions, such as the paintings of Schönberg himself, as well as lectures, seminars and concerts.

If you would like to gain a deeper insight into the creative and technical aspects of music and sound, then you should visit the Haus der Musik (house of music). This museum of sound and music opened in 2000 and is dedicated to informing the public about music and the science behind sound. The former palace which houses the museum was once the home of Otto Nicolai, founder of the Vienna Philharmonic. Also, if you miss your piano during your stay there is a grand piano in the lobby which is available for anyone to play.

Many famous composers lived and performed in Vienna throughout its history; however, none are more famous than Wolfgang Amadeus Mozart. Visitors to the city can visit a former residence of the great composer, an apartment in the centre of the city, right beside St. Stephen's Cathedral. The Mozarthaus Vienna, as it is known today, was Mozart's home from 1784 to 1787, before times got tough and he moved to the suburbs. The building has become a museum spread over four floors, with the actual apartment situated on the first floor. This museum is a must for Mozart fans who want to learn as much as they can about the legendary composer.

Visitors to Vienna will find that it remains a city of music and a city where one can not only enjoy some of the best classical music concerts, but discover and learn about the history and science of music itself. Anyone who enjoys music will enjoy their stay in Vienna.

For more details on the venues and their programmes pick up your personal copy of the Arts & Culture Brochure at the Arts & Culture Booth in the entrance hall or search the dedicated website www.myESR.org/arts_culture.
What’s on today in Vienna?

Theatre & Dance
Please note that all performances, except at Vienna’s English Theatre, are in German!

Akademietheater
1030 Vienna, Lietzestraße 1
phone: +43 1 51444 4145
www.burgtheater.at
18:00 Platonov
by Anton Cechov

Burgtheater
1010 Vienna, Dr. Karl-Lueger-Ring 2
phone: +43 1 51444 4145
www.burgtheater.at
19:30 Es ist immer jetzt
An evening of chansons with Michael Hetlau

Museumsquartier – Halle E+G
1030 Vienna, Museumsplatz 1
www.hallege.at
16:00 The Bar at Buena Vista
Legendary Cuban music & dance show
20:00 The Bar at Buena Vista
Legendary Cuban music & dance show

Rabenhof
1030 Vienna, Rabengasse 3
phone: +43 1 712 82 82
www.rabenhof.at
20:00 Feier Abend
Famous Austrian actor Erwin Steinhauer & his band newly interpret old and new hit songs

Schauspielhaus
1090 Vienna, Porzellangasse 19
phone: +43 1 317 01 01
www.schauspielhaus.at
20:00 Waisen
by Dennis Kelly

Theater in der Josefstadt
1080 Vienna, Josefstädter Straße 26
phone: +43 1 42 700 300
www.josefstadt.org
19:30 John Gabriel Borkman
by Henrik Ibsen

Volksoper
1090 Vienna, Währingerstraße 78
phone: +43 1 402 12 60 0
www.volksoper.at
19:00 La Traviata
by Giuseppe Verdi

Konzerthaus (Classical Music)
1030 Vienna, Lothringerstraße 20
www.konzerthaus.at
19:30 Les Mousiciens du Louvre – Grenoble, conductor Marc Minkowski, F. Schubert

Musikverein (Classical Music)
1010 Vienna, Rennweg/Herrengasse 12
www.musikverein.at
19:30 Waseda Symphony Orchestra Tokyo, conductor Masahiko Tanaka, R. Strauss, P. Kubelik

Arena (Alternative Music)
1030 Vienna, Baumgasse 80
www.arena.co.at
22:00 Mainframe feat. DC Breaks

Szene Wien (Alternative Music)
1110 Vienna, Hafthaus 26
www.szenevienna.com
22:00 Fard – ‘Invictus’ Tour

Volksoper
1090 Vienna, Währingerstraße 78
phone: +43 1 402 12 60 0
www.volksoper.at
19:00 La Traviata
by Giuseppe Verdi

Wiener Staatsoper – Vienna State Opera
1010 Vienna, Schwedenringe 2
www.wiener-staatsoper.at
19:30 Masterpieces of the 20th century, conducted by Markus Lehtinen
Ballet by Sarpe Lilar, Nils Christie, Roland Petit

Raimundtheater
1080 Vienna, Wažemstraße 18–20
www.raimundtheater.at
19:30 Ich war noch niemals in New York
by Billy Joseph & Gabriel Buryfil

Ronacher
1010 Vienna, Selerbräu 9
www.musikverein.at
19:30 Sister Act by Alan Menken, Dormis, Daniel Chien & Bül Steinlechner

Wiener Stadthalle
1150 Vienna, Volksgartenplatz 14
www.stadthalle.com
20:00 Das Phantom der Oper
Musical with new music and lyrics

Porgy & Bess (Jazz)
1010 Vienna, Neuebgasse 11
www.porgy.at
20:30 David Murray Quartet
23:00 Eamonn McCormack Trio

Arena (Alternative Music)
1030 Vienna, Baumgasse 80
www.arena.co.at
22:00 Mainframe feat. DC Breaks

Szene Wien (Alternative Music)
1110 Vienna, Hafthaus 26
www.szenevienna.com
22:00 Fard – ‘Invictus’ Tour

Concerts & Sounds