CT pioneers spell out how to reduce patients’ anxiety over dose

By Philip Ward

Justification is radiology’s trump card in the increasingly tough battle to win back public confidence and reassure patients over the benefits of CT. That was certainly the strong impression given by two opinion leaders at yesterday’s Special Focus Session.

Make sure you minimise radiation exposure without compromising image quality or diagnostic performance, recommended Prof. Willi Kalender, from the Institute of Medical Physics at the University of Erlangen, Germany, who barely concealed his frustration and anger over how CT is being portrayed in some areas of the media. He referred to “the crazy debate” linking the use of CT directly to cancer deaths, which is “absolute nonsense”, and commented that “some things are really out of control.”

Don’t forget to estimate organ and effective dose and include them in your reports, and though it’s vital to keep the ALARA (as low as reasonably achievable) principle in mind, keep stressing the benefits of radiology, noted Kalender. “The benefit-to-risk ratio has to be as high as reasonably achievable,” he said. “ALARA is the goal!”

Specific dose estimates for a patient, scanner and protocol can now be provided with high accuracy, even in paediatric exams, but manufacturer cooperation is often required to obtain data on filtration and other relevant information. This is of great interest for research projects, but is not indicated for routine use, explained Kalender, who disclosed that he is a consultant to Siemens Healthcare and founder, shareholder and CEO of CT Imaging GmbH.

Focusing on clinical practice, Dr. Catherine Owens, cardiothoracic radiologist and reader in radiology at London’s Great Ormond Street Hospital (GOSH) said the key points are to set protocols according to individual needs, make sure images are fit-for-purpose, and strike a balance between optimal image quality and radiation dose. In cases of fluoroscopic intervention, it’s important to bear in mind that the radiologist achieving the lowest patient dose will receive the lowest professional dose. Aim for a short fluoroscopy time, use pulsed fluoroscopy, take a low number of high-quality exposures, ensure optimal parameter selection, and build up your knowledge of specific equipment, she advised.

Other factors to consider are the best position for workers inside the room, modifying the technical parameters and effects on exposure, and use of protective devices to minimise dose to critical organs.

To be justifiable, the benefit of an exam must always outweigh the risk, according to Owens. The decision about whether or not to proceed should be a strictly clinical one taken by a multidisciplinary team. Strict referral criteria must be followed, and in paediatric radiology, ultrasound is the first line of investigation and abdominal requests should be referred to MRI.

“Check the date of the patient’s last CT exam,” noted Owens. “It’s always very disappointing to see the level of repeat scans in some institutions.” It is widely accepted that the risks from ionising radiation are greater in children than in adults because their tissues are more radiosensitive, and the prospect of a longer life means they’re more likely to develop associated problems. Worryingly often, however, adult scanning parameters are used in paediatric imaging, and unlike plain films, CT images never look over-exposed.

Additionally, children receive a higher effective dose due to the distribution of absorbed energy over smaller area and organs. Furthermore, there is a lack of adequate guidelines and protocols from manufacturers, and patients with a wide age and weight range are being dealt with, she said.

At GOSH, CT optimisation is achieved by following the ALARA principle, establishing specific paediatric weight-based or diameter-based scanning protocols, limiting coverage to the area under investigation only, reducing kVp (e.g., 80-100), applying dose modulation, and ensuring the patient is in the isocentre, where dose and image quality are optimal.

Remember that prospective ECG-gated cardiac imaging provides similar radiation burden as non-gated studies but with improved image sharpness, she added. The advent of second generation dual-source CT and 320-detector CT has reduced the need for ECG triggering.

Kalender elaborated on the common approaches to assessing patient dose in clinical CT today: CTDI and DLP values, which are essential to set dose reference levels and of interest for comparison purposes, but they do not represent patient dose; DLP-to-E conversion, which is neither patient nor scanner-specific and does not provide organ dose values; and programmes based on pre-tabulated data, e.g. ImpactDose, ImPACT CT patient dose calculato in the U.K., and CT-Expo in Germany.

In patient-specific dose estimates based on the CT image data instead of solely phantoms, total scatter has to be accounted for (complete body representation is necessary), dose to organs has to be assessed (organs have to be identified and segmented), organ and effective dose values should be estimated for the patient, scanner and scan protocol should be listed, and results should be available without long waiting times and in a comprehensible format, he concluded.
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Filipe Caseiro-Alves from Coimbra, Portugal.

last decade, especially for cervical imaging in CT examinations in ER over the past decade. Studies show a dramatic increase and vascular imaging examinations. Neurological, abdominal examinations, for instance in C spine imaging, are equally important, especially considering the organisation of the ED to save as much time as possible. Thanks to this proximity, patients, Körner and his team compared the use of CT for selected organs and WBCT, and found better outcome with the latter. "We observed a significant decrease in mortality (p<0.001 in the group examined with WBCT). If we know how to apply selective CT or WBCT in these patients," he suggested.

Equipment is crucial when considering the organisation of the emergency department (ED). Four-row CT is basic and effective in most situations. Körner recommended using at least 16+ rows ideally 64+ rows for vascular examinations, and 64+ rows and dual-energy for cardiac examinations. For other cases, 16+ rows can be used.

Logistically, CT needs to be close to the ED to save as much time as possible. Thanks to this proximity, Körner and his team are able to perform examinations without life-threatening effects in less than 30 minutes after patient arrival in 75% of cases. Ideally, conventional radiology equipment along with angiography and MR suites should also be located close to the ED. An optimal solution is to install the CT suite next to the resuscitation bay. This also offers a ‘parking option’ if the scanner is already in use. But one needs to consider this idea before building the ED. "It’s quite hard to put a CT scanner if there’s no room for it and it might result in a certain time loss due to patient relocation / repositioning," he said.

A gantry-mounted fixed table is also quite useful in many applications, for instance in C spine imaging, where structure reformattting usually takes up to 20 minutes. Furthermore, it takes only eleven minutes in Germany to WBCT is used almost as much as CT, but much less in basic hospitals than in specialised institutions. On the bright side, the proximity of CT to the ED has increased and CT is now located in the trauma bay or less than one minute away in most hospitals. "This wasn't the case ten years ago, so it shows at a microscopic level that it's worth moving the equipment closer to the ED to save time," Körner commented.

CT enables radiologists to acquire images quickly, but image reconstruction takes another 30 minutes. "In Germany, WBCT is used almost as much as CT, but much less in basic hospitals than in specialised institutions. On the bright side, the proximity of CT to the ED has increased and CT is now located in the trauma bay or less than one minute away in most hospitals. "This wasn't the case ten years ago, so it shows at a microscopic level that it's worth moving the equipment closer to the ED to save time," Körner commented.

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New clinical applications help boost appeal of MR-guided focused ultrasound

By Philip Ward

Now it is starting to show promise in the treatment of diseases other than uterine fibroids. MR-guided focused ultrasound is fast becoming a new string to the radiologist’s bow, a leading Italian specialist told ECR delegates during Friday’s Josef Liebowitz Memorial Lecture in Rome.

Fifteen years ago, Carlo Catalano was a panel member at the ECR junior imaging interview quiz, noted ECR 2013 President Prof. José I. Bilbao in his introduction. “Remember that day, Carlo?” he remarked, with a twinkle in his eye. “Now you are head of radiology at ‘La Sapienza’ University in Rome!”

High-intensity focused ultrasound under MRI guidance has become a frequently applied means of treating non-invasive tumours – for example in the treatment of fibroadenomas of the breast and bone metastases – but treating tumours in the abdomen is somewhat off the beaten track of mainstream radiology, by discussing the parallels between biomarkers and Spanish wine.

So why choose to focus on wine when the country has magnificent oranges, cultural icons and sporting legends? Prof. Luis Martí-Bonmatí, from the hospital La Fe de Valencia, Spain told us why. In the interlude slot between the country’s medical research and wine-related production process that could be objectively quantified and spatially represented was a unique wine that could influence the vine and ultimately the proper ties of its product. Prof. Martí-Bonmatí explained that Spain was a peninsula and as such had a wide variety of climates and many rivers: Atlantic, continental, mountain, Mediterranean and arid central zones. The soil pH is also of particular importance to the growth of vines, with around half the country acidic at a pH of less than 5.5, and other areas up to pH 8. A large part of the soil is silicious with the remainder a mixture of limestone and clay. Altitudes can reach 2,000 m in places.

Processes affecting the outcome of focused ultrasound therapy range from the movement of the target, the physiology of the organs down to the energy disposition in the tissue and the heat transfer within the body. To empower the physician to perform safe, effective and efficient ablation of tumours in moving organs requires technical support, he says on Fusim’s website.

The project is funded under the European Union’s Seventh Framework Programme for Research and Technological Development. Along with former ECR President Prof. Roberto Passariello, Catalano organised the First European Focused Ultrasound Symposium, which was held in Rome in September 2011 and was devoted to discussions of clinical results in the field. Global researchers gave over 40 lectures on a wide range of topics including brain disorders, prostate cancer, breast cancer, bone metastases, lower back pain, and uterine fibroids, as well as the quality of life of patients.

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It aims to contribute to further progress by developing a model for focused ultrasound surgery in moving organs, such as the liver. Focused ultrasound can become a safe and successful non-invasive procedure for tissue ablation in moving abdominal organs, helping to support the planning of an intervention, monitor the treatment progress, and assess the therapy outcome, according to the scheme’s coordinator, Prof. Dr. Tobias Preusser, head of modelling and simulation at Fraunhofer MEVIS, Bremen, Germany. “Processes affecting the outcome of focused ultrasound therapy range from the movement of the target, the physiology of the organs down to the energy disposition in the tissue and the heat transfer within the body. To empower the physician to perform safe, effective and efficient ablation of tumours in moving organs requires technical support,” he says on Fusim’s website.

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It was not entirely predictable, but of a tissue that can be objectively imaging biomarker: a characteristic are also a few, “ he jested.

Clinical trials involving patients results from locally advanced pancreatic cancer started at La Sapienza last month, and Catalano is optimistic about the prospects for the future. Most patients with unresectable pancreatic cancer is largely unnecessarily, so the team wants to investigate the feasibility and clinical performance of the technique. The two main end-points are pain palliation and local tumour control.

Other clinical trials looking at post MR-guided focused ultrasound pregnancies are ongoing, and the results are eagerly anticipated, said Catalano.

He thinks another exciting project to keep a close eye on is Fusim’s...
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Intrahepatic cholangiocarcinoma grows from the bile ducts, specifically from the intrahepatic part of the biliary tree. When choosing the most appropriate image-guided therapy, a number of factors must be taken into consideration, including size of tumours (greater than or less than 5 cm), location or disseminated disease, and whether other nearby structures are at risk of metastasis. Dr. Bernhard Gebauer, an interventional radiologist from Berlin’s Charité Universitätsmedizin, noted that the use of CT and MRI as diagnostic tools is likely to return to another part of the patient’s liver capacity, he explained. If the treatment is successful, the patient will not need to increase their liver capacity to compensate for the therapy.

Data published last year in the British Journal of Radiology showed that survival rates in patients treated with thermal ablation (radiofrequency and microwave) for primary tumours were better than those for brachytherapy or radiofrequency ablation.

In patients with limited intrahepatic cholangiocarcinoma, and with a tumour of less than 5 cm diameter, and up to five lesions, radiofrequency ablation can easily provide therapy with minimal adverse impact on the patient. But he warned that underlying disease is likely to return to another part of the liver, although this is a common problem with cholangiocarcinoma, regardless of the treatment modality. He insists it is a safe technique if conducted by an experienced practitioner.

Intrahepatic cholangiocarcinoma can grow from the bile ducts and vessels, and the efficacy of brachytherapy is unaltered by cooling vessels, like in thermal ablation. This heat-sink effect is responsible for incomplete ablations in thermal ablation.

In his presentation, Gebauer will also refer to data from two studies conducted at his own institution. One referred to interstitial brachytherapy in primary unresectable tumour and the other involved patients with recurrent intrahepatic cholangiocarcinomas. The median survival after brachytherapy for primary cholangiocarcinoma was 14 months, and 38 months for recurrent disease. In total, both studies treated 25 patients, 12 of whom are still alive.

As a further alternative therapy, radioembolisation might be used to treat either localised intrahepatic cholangiocarcinoma or disseminated disease with tumour nodules throughout the liver but only limited disease outside the liver. Surviving in such a complex anatomical region, extrapancreatic cholangiocarcinoma arise from the bile duct bifurcation or more distally at the choledochal duct. As such, they might involve hilar structures of the liver or the pancreatic region. The main symptom is the painless jaundice with dilated intrahepatic bile ducts, which should trigger be taken into account to make the diagnosis as reliable as possible, because the resection is going to be an en-bloc resection of the tumour without prior sampling," he said. MRI and CT can be used to determine the appropriate surgical procedure regarding left or right liver resection, portal vein and arterial involvement, or pancreatic resection, according to Denecke. He provided an example of extended right hepatectomy, which requires additional portal vein embolisation in many cases for patient safety. With a note of caution, he added that imaging should also predict and check liver function pre- and post-surgery. Volumeetry in conjunction with liver function tests help predict the function of future liver remnant. After portal vein embolisation, again volumeetry based on CT or MRI ensure that there will be enough liver tissue with sufficient functional reserve left after the resection to ensure a safe recovery of the patient’s liver capacity, he concluded.

During the same session, Dr. Timm Denecke, another radiologist at the Charité, will speak about hilar and extrahepatic cholangiocarcinomas.

**Clinical Corner**

Intrahepatic cholangiocarcinoma at the resection margin in liver MRI with liver specific contrast. (Provided by Prof. Bernhard Gebauer)

Single-shot thick slab MR cholangiopancreatography shows hilar biliary duct strictures due to hilar cholangiocarcinoma (Platzer tumour) (Provided by Dr. Timm Denecke)

্ময়ের প্রদত্ত টেক্সট যেমন পাঠ করুন এবং তা ফলস্বরূপে লেখাটির ভিত্তিতে প্রকাশ করুন।
Debate intensifies over precise remit of catheter angiography in neuroimaging

By Frances Rylands-Moork

CT and MR angiography and ultrasound have replaced catheter angiography (CA) diagnosis for many indications, due to improvements in spatial and temporal resolution, but CA role in interventional radiology remains important. Neuroimaging specialists agree CA will be used increasingly to confirm a diagnosis in pre-treatment work up, and in therapeutic procedures such as stent and coil placement, chemo placement before embolisation, tumour therapies, ablation techniques, and other combination therapies, yet the discussion remains heated over its exact role in interventional neuroimaging.

Radiologists now encounter fewer occasions for training in CA diagnosis due to decrease in daily practice, according to Prof. Marco Essig, from the department of neuroradiology at the University Hospital of Erlangen, Germany, who is chairman at today’s special focus session about the utility of CA in neuroimaging.

“There is still a need for training in interventional CA procedures which will include diagnostic work up, pre-intervention, but we can’t dose our eyes to non-invasive procedures which are improving due to advances in technology and technique,” he said. “Procedure must be decided on an individual basis and on the question of risk management for the patient and cost management for the hospital.”

Today’s session will provide an overview of when CA should be performed for both diagnosis and treatment, such as in acute stroke cases, where speed is vital. It can diagnose ischaemic stroke, intracranial bleeding, ruptured arteriovenous malformation or aneurysm, and then it can be used to immediately treat with minimal invasion, according to Essig. However, for patients presenting with symptoms but without the need for acute work up or treatment, other methods such as CT or MRA should be considered to decide on appropriate management and interventional treatment.

Contrast media is needed in CT and MR angiography (CTA and MRA), but catheter and wires are not necessary, so patients don’t run the risk of arterial puncture. In addition, CTA and MRA procedures can be standardised, meaning shorter hospital stays for patients. Finally, while CA costs are comparable to those of MRA, CT is usually cheaper.

At today’s session, expectations from vascular procedures in diagnostic work-up, therapy planning and follow-up assessment will be dealt with in more detail by Prof. Roger Siemund, neuroradiologist at Lund University Hospital, Sweden. At the University Hospital of Erlangen, diagnostic work up is initially undertaken with less invasive CT or MR techniques to decide on treatment, even in the case of stroke, before moving to catheter angiography, if the results are unclear. For intracranial aneurysms, a CT can visualise subarachnoid haemorrhage (SAH), with angiography usually capable of depicting the ruptured aneurysm. However, CA is needed to see if the aneurysm can be treated surgically or by an endovascular procedure through dedicated examined in the arteries, the aneurysm size and shape and vessel conditions. Similarly, for intracranial AVMs, MRA can show its size and location, but angiography is needed to understand angiographic architecture and potential vascular complications in the lesion such as aneurysms and stenoses. With radiotherapy treatment, AVMs become smaller, but the clinical risk of rupture remains the same or even increases, according to Essig.

“After radiotherapy treatment, non-invasive MRA follow up has temporal and spatial limitations. Similarly, with CT, residual malformation can only be depicted at a certain size, so after a negative finding on a diagnostic CTA, CA should be used to find residual malformation,” he commented. “If it’s negative on CA, it really is negative.”

The panel discussion will attempt to clarify current debate as to whether CA remains the gold standard in diagnostic work-up of AVMs and other vascular pathologies. Essig anticipates that delegates will be keen to know about the availability of alternative techniques because not all centres have high-end modalities with CTA and MRA capabilities. How CTA/MRA techniques fit into the clinical work-flow, as well as the costs and risk issues surrounding each of them, will be discussed by Dr. Luc Van den Haue, neuroangiologist consultant at the Antwerp University Hospital (UZA), Belgium. His talk will aim to highlight the current role of CTA, particularly in the detection of cerebral aneurysms, and how MRA can be used for screening patients with a family history of cerebral aneurysms, and for follow-up of coiled cerebral aneurysms and diagnosis of vascular malformations in more complex and rare cases of bleeding such as vasculitis.

Van den Haue also works as a neuroradiologist in a regional hospital (AZ KLINA) in the north of Antwerp, so he has experience with both CA and CTA/MRA. His presentation will focus on the three main groups of vascular disease that may result in intracerebral haemorrhage and may require further CA, cerebral aneurysms, AVMS, and vasculitis.

Cases of incidental unruptured aneurysms found by MRA at AZ KLINA are referred for further consideration. Pre-treatment CA imaging is necessary to decide whether a patient will undergo clipping or coiling because MRA’s spatial resolution is too low for detailed analysis of the aneurysm.

Meanwhile a ‘thunderclap’ headache patient sent to CT to rule out SAH will have immediate CTA, Van den Haue explained. If CTA demonstrates an aneurysm, 3D reconstructions are made to analyse its morphology enabling interventional neuroradiologists to treat the patient. However, CA will rule out a small aneurysm that might have been missed in a negative CTA.

“In the Netherlands, guidelines stipulate that if CT shows a ‘non-aneurysmal pattern’ of SAH, as in patients with a benign perimesencephalic SAH, and a normal CTA of good quality, aneurysms are probably not the cause of the bleeding and catheter angiography is not indicated,” he said. Furthermore CA is not the first diagnostic tool in patients with isolated cortical SAH, because less invasive techniques such as CT and MRI (including angiographic sequences) can establish the correct diagnosis.”

Large multicentre studies comparing 3D time-of-flight (TOF) MRA with CA in follow-up of coiled cerebral aneurysms, have demonstrated MRA is the technique of choice, so MRA can therefore be used for follow-up that is real-time for such patients, according to Van den Haue.

Meanwhile, although vascular malformations can be diagnosed and classified reliably with the use of time-resolved MRA (tMRA or TRICKS MRA) and 4D CTA or time-resolved CTA (tCTA), these promising techniques are not widely available and are not cost effective. Given that most general hospitals see less than five cases of vascular malformation a year and the price of these dedicated packages is significant, their main current role remains research-oriented, he noted.

“Generally, CA is still considered the gold standard to show typical vascular abnormalities, but one should bear in mind that it may cause more complications in patients, and hospitals are increasingly switching from invasives towards non-invasive angiographic techniques for the detection of vascular lesions,” Van den Haue concluded. “Future developments should be aimed at better imaging solutions that are real-time comparable to CA and to dynamic imaging for depiction of lesion hemodynamics.”

Special Focus Session Thursday, March 7, 10:00-11:00, Room B
SF 8a: Is diagnostic catheter angiography still useful in neuroimaging?
Chairman’s introduction
L. Van den Hauwe, Brasschaat/BE
What can we expect from vascular diagnostic procedures?
R. Siemund; Lund/SE
Can non-invasive techniques as CTA and MRA replace catheter angiography for diagnostic work-up?
L. Van den Haue, Brasschaat/BE
Diagnostic catheter angiography is not dead: current indications and advantages over the non-invasive techniques
T. Essig, Erlangen/DE
Panel discussion: The pros and cons of diagnostic catheter angiography in neuroimaging
MRI and PET-CT can assist in assessing treatment response in haematological malignancies

By Becky McCall

Use of MRI for disease assessment in myeloma, and PET-CT for therapy response evaluation in lymphomas, can lead to better patient outcomes, expert speakers will reveal during today’s state of the art symposium on the evaluation of response in haematological malignancies.

“MRI gives us more information and is probably the most important imaging technique in assessing disease activity in myeloma,” stated Dr. Jens Hillengass, physicist scientist from the German Cancer Research Centre, Heidelberg, Germany. He noted that current guidelines for the assessment of treatment response do not mention imaging other than for large soft tissue tumours, which should be monitored using CT and MRI. “Current guidelines are mainly based on serological markers. We think there should be more use of imaging in the guidelines, in some patients at least. MRI helps to distinguish between bone and bone marrow in myeloma patients, many of whom show changes on MRI but reveal nothing on a skeletal survey. He explained that MRI has higher sensitivity for imaging of bone marrow effects in total, and shows the first infiltration of plasma cells before over-stimulation of osteoclasts and the resulting bone destruction.

Myeloma is associated with four main changes, known as the CRAB criteria (hypercalcaemia, renal insufficiency, anaemia, and bone lesions). Skeletal surveys using x-rays assess the degree of bone destruction, as per the guidelines of the International Myeloma Working Group (IMWG). However, Hillengass pointed out that x-rays have low sensitivity in myeloma due to the nature of the disease. Myeloma is a bone marrow disease, and x-rays image bone and bone destruction, which is actually a secondary event, if you only image the bone, you only measure the secondary effects and not the tumour mass, he remarked.

Furthermore, recent research suggests that patients show differences in infiltration of bone marrow with malignant plasma cells, some showing diffuse infiltration and others focal infiltration. Reliable data exist, and several studies have looked at the prognostic significance of findings from MRI and PET, suggesting a higher number of focal lesions is associated with a worse prognosis according to Hillengass. In particular, two separate studies from the U.S. and Italy show the prognostic significance of the initial number of focal lesions detected by MRI and PET imaging.

His own group has found that if focal lesions in bone marrow disappear upon MRI, then the patient outcome is better than if remission is defined according to serological markers. If patients still have lesions, then this could be the source of relapse, and most patients do relapse. These findings beg the question about whether MRI could be used to help formulate treatment strategies. Current guidelines recommend waiting for bone destruction to start and then for treatment to begin, but some experts question why it is necessary to wait until the patient is really sick. If further evidence suggests that MRI can be used to assess disease activity and extent of bone marrow infiltration with plasma cells prior to bone destruction, then there might be a stronger case for earlier treatment.

“There are good data to say that if lesions persist, then treatment should continue; these data are on high-risk disease based on cytogenetics, and suggest treating patients for a long time is beneficial,” Hillengass said.

At the same session, Dr. Sally Barrington, consultant physician in nuclear medicine at London’s St. Thomas’ PET Imaging Centre, will discuss the importance of interim PET and its potential application for response-adapted therapy in Hodgkin lymphoma and aggressive non-Hodgkin lymphoma. PET was added to new response criteria for lymphoma in 2007 for evaluation of the end of treatment response. She explained that adding PET to CT response criteria improved the accuracy of measurement of treatment response after chemotherapy.

“Reduction in FDG [18F fluoro-deoxyglucose or glucose metabolism] is measured on the PET component and the reduction in tumour size is measured on the CT component,” she commented.

However, to improve treatment and consequently patient outcomes, earlier assessment of response is needed during the course of therapy. “After only 1–2 cycles of chemotherapy, interim PET can accurately predict response by monitoring the reduction in FDG uptake, even before there is a change in tumour size.”

This can be done using a simple scoring system called the five-point scale (0–5), sometimes referred to as the Deauville criteria. A grade of between one and five is obtained by comparing the uptake in sites of initial lymphoma involvement with the uptake in normal ‘reference’ organs/areas of the body. The 0–5 PS has been used in trials to score response on early PET scans, and treatment is adapted accordingly. The result. Barrington highlighted that several trials (including the UK RAPID study, EORTC H10 study, and the GHSG HD16) in early Hodgkin lymphoma were investigating if it is safe to reduce treatment in patients with good response on interim PET and consequently reduce treatment-related toxicity.

She explained that other studies in advanced Hodgkin lymphoma were testing if it was safe to de-escalate therapy in patients who are good responders. Conversely, researchers are investigating whether survival will improve if therapy is escalated in poor responders. Also, in aggressive non-Hodgkin lymphoma, trials are testing whether outcomes are improved by escalating therapy in poor responders on interim PET with high-dose chemotherapy and/or early stem cell transplant.
Role extension for radiographers becomes reality in research and education

By Edna Astbury-Ward

Radiographers can play an essential role in research projects, given their technical knowledge and professional expertise, and can help to obtain results of optimum quality, thereby assisting in the collaborative process. That’s likely to be the central message at this afternoon’s European Federation of Radiographer Societies (EFRS) meets Spain session.

“Little by little, we are seeing radiographers becoming involved in more research projects, thanks to the fact that MRI is a technique with so much future and such a presence in medicine,” said Ms. Eva Alfayate Sáez, technical coordinator for neuroimaging at the Research Centre for Neurological Diseases Foundation (CIEN Foundation), Ministry of Economy and Competitiveness, Madrid. “We have to remember that as a research and diagnostic tool, it is an innocuous technique and many research projects use it to obtain very conclusive results. Other techniques, such as ultrasound, CT, PET and conventionalradiology may have less presence in the research field, but the radiographer continues to be an important element in research with these tools.”

Discussion at today’s session will focus on the extended roles of radiographers in research, and how they act as the interface between patient and technology, especially in the promotion of radiation safety and protection. Attendees will learn about research in action and the importance of dealing with image acquisition and protocol design.

To kick off the session, Ms. Sáez will outline the importance of radiographers understanding the hypothesis and the basis of the research project as a whole, and the importance of dealing with image acquisition and protocol design.

In MRI examinations, radiographers at the CIEN Foundation ask a series of questions that ensure the volunteer does not take any unnecessary risks while the test is being carried out. For instance, they ensure that the volunteer does not have any metallic objects that are not compatible with MRI on their body. During the issuing of this document, they answer any of the volunteer’s doubts about the procedure and give them pertinent information that they may need. Such personal contact helps them to connect with the volunteer, making them feel at ease during the procedure, which in turn increases cooperation during the test and helps achieve better results, according to Alfayate Sáez.

The new horizons and rapid advances of techniques in new sequences, new hardware, etc., require a thorough experience and knowledge of the area. This creates the necessity for radiographers to be constantly informed and updated on new techniques and findings in the field. Radiographers provide technical information that is useful, not only while the MRI is being carried out, but also during the protocol design, she remarked.

“I’d like to encourage other radiographers to have more involvement in printed publications, symposiums, conferences, etc., demonstrating their work and their research projects to the rest of the world, either as principal researchers or collaborating with other projects,” she said. “It is so important that we collaborate and cooperate more with other colleagues and centres in our field, creating multi-centre and multidisciplinary teams. Working together optimises our processes and unites our knowledge to create even more advanced techniques in our field.”

In Spain, radiology and nuclear medicine technologists share a common title of TSID (Tecnico Superior en Imagen para el Diagnostico, or superior technologist in diagnostic imaging). Training can be undertaken after completion of secondary school. Until 1995, nuclear medicine technologist training was a two year course, but today it is conducted together with radiologists on a three-year basis.

The curriculum is about 2,000 hours long and comprises at least one clinical practice, with a major part devoted to radiology and about 30% to nuclear medicine.

Although radiographers and other professionals are involved in imaging at a high level of expertise and competence, degree programmes for radiographers and other health professionals are not yet universal in Europe. “Spanish technologists are not happy with this situation, but efforts to change it have so far been unsuccessful. Radiographers must not be forced to undertake their duties only in Spain in comparison with the EU spirit and the right of free circulation of citizens,” said Ms. Marta Raquel Soto García, of the CDI Clinic, Calabria, Barcelona, adding that the European Qualifications Framework (EQF) will help to improve this situation.

The EQF is a common European reference framework that links countries’ qualifications systems together, acting as a translation device to make qualifications more transferable across different countries and systems in Europe. It has two main aims: to promote citizens’ mobility between countries and to facilitate lifelong learning. European directives can have a strong influence on the education of radiographers, not least because directives are required to be adopted by the member states and implemented in their national legal framework, she commented.

The Bologna Process, leading to the creation of the European Higher Education Area, is designed to guarantee more comparable, comparable and coherent systems of higher education in Europe. It has three priorities: mobility, employability and quality. It emphasises the importance of higher education for Europe’s capacity to deal with the economic crisis and to contribute to growth and jobs.

EFRS meets Session Saturday, March 9, 14:00–15:30, Room B

EFRS meets Spain (European Federation of Radiographer Societies)

EM 5: Knowledge development as a tool for radiographers’ professional improvement

Presiding: E. Paulo, Coimbra/PT

P. Ruiz Blanco, Madrid/ES

The Spanish radiographer’s role in advanced MRI research

E. Alfayate Sáez, Madrid/ES

The radiographer’s specialisation in ultrasound: two decades of experience in a public hospital

M.P. Pons Ferrándiz, Madrid/ES

The radiographer as the interface between patient and technology in promoting safety in radiation protection

J.A. Sória Jerez, Madrid/ES

The radiographer as the interface between patient and technology in promoting safety in radiation protection

J.A. Sória Jerez, Madrid/ES

G. Paulo; Coimbra/PT

E. Paulo, Coimbra/PT

Moderator: Pablo Ros; Cleveland, OH/US

Sat, March 9, 15:30–16:00

Paediatric chest and heart: state-of-the-art imaging of the young patient

Moderator: Rick R. van Rijn, Amsterdam/NL

Sunday, March 10, 12:30–13:00

Vascular imaging: CT, MR – or something completely different?

Challenges in imaging peripheral artery occlusive disease

Moderator: Christian Lüscher, Vienna/AT

Saturday, March 9, 10:00–10:30

CT and MRI diagnosis of focal liver masses: when to use what?

Moderator: Fabio Rios, Davos/CH

Saturday, March 9, 15:30–16:00

Panfleidic chest and heart: state-of-the-art imaging of the young patient

Moderator: Rick R. van Rijn, Amsterdam/NL

Panel discussion: Could a transnational and multi-professional combined statement contribute to professional development?

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Vascular disease comes under growing scrutiny

By Milosz K. Roper

Imaging the arteries is a daily task for interventional radiologists like Joel Ignacio Bilbao, president of this year’s ECR, but other subspecialists should know about the main clinical problems associated with the blood vessels. The Clinical Lessons for Imagery: Never Knowledge (CLICK) courses, starting this Saturday and finishing Monday, will present delegates with a series of cases and state-of-the-art techniques for imaging vascular disease.

Cardiovascular disease accounts for the majority of deaths worldwide. Diabetes and hypertension are well-known risk factors that should be monitored and treated appropriately. But the combination of metabolic and cardiovascular disease should also be included in the equation, according to Lars Lönn, professor of vascular surgery at the National Hospital in Copenhagen. “Cardiovascular factors such as obesity are a major risk nowadays, for instance overweight people have a tendency to getting heart disease and therefore you have a risk for diabetes,” said Lönn, who will chair the course, “How are you in reality? Vascular age and clinical events,” today at the ECR. Considering these factors is fundamental since the incidence of obesity will continue to rise in the near future, and with it the number of potential cardiovascular complications.

Not only are more people becoming obese, they are also developing diseases that are associated with old age. In the past, vascular events occurred mainly in elderly patients. Today, however, more and young people are at risk of developing cardiovascular disease because they suffer from conditions such as type 2 diabetes. “Nowadays you see 12-year-old patients with diabetes type 2, whereas in the 1970s or 80s that would have only appeared in people aged 40 to 60. Metabolic risk factors are more widespread already,” said the hepatic.

In reality? Vascular age and clinical events will chair the course, “How old are you in reality? Vascular age and clinical events,” today at the ECR. Considering these factors is fundamental since the incidence of obesity will continue to rise in the near future, and with it the number of potential cardiovascular complications.

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Adults with congenital heart disease represent growing challenge for healthcare professionals

By Edna Astbury-Ward

The German Competence Network of Congenital Heart Defects estimates that one in every 100 babies is born with a heart defect (kompletterart-abh). The number of babies with congenital heart disease (CHD) each year remains constant across Europe, and around 6,000 babies are expected to have CHD each year, but thanks to progress in medicine, most of these babies now survive to adulthood.

In these patients, imaging can assist the cardiac surgeon in many ways, and it’s critically important for radiologists to become familiar with the most common surgical procedures of CHD, as well as the imaging aspects, believes Prof. Michael Hübler, chief physician in the department of paediatric cardiac surgery at Kinderspital, Zurich.

“We expect a considerable increase of such patients due to the fact that more than 90% now reach adulthood, and also because conventional x-ray, ultrasound, CT scanning and MRI remain principal investigational tools to diagnose congenital heart defects, as well as to diagnose consequent changes following a surgical or interventional repair,” said Hübler, who will elaborate on this topic during this afternoon’s special focus session.

Examples of ways in which imaging can assist these patients are by quantifying atrial and ventricular volumes consequent to pulmonary regurgitation, defining the extent and site of stenosis of the aorta or the pulmonary arteries, and determining the extent of pulmonary vein stenosis or anomalous insertion of the pulmonary vein. It can also help with the cine angiography of the coronary arteries in patients who have undergone an arterial switch operation, Ross procedure or Tetralogy of Fallot correction. Yet until fairly recently, there has been little structured, advanced training for non-specialist doctors who look after grown-up congenital heart (GUCH) patients. The number of patients remains relatively low, so this type of training has only been possible at a few institutions, he explained.

Because some GUCH patients have post-operative difficulties that require imaging, Hübler thinks it is important for radiologists to be able to identify and assess complications of typical problems such as dilatation of the right ventricle due to severe pulmonary regurgitation, residual or recurrent stenosis in the aortic arch and sublunaris (coarctation), and dilatation of the previously operated aortic root (post Ross procedure). A cardiac emergency may occur in an imaging suite, and radiologists and radiographers need to be aware of such events.

“If a patient with an uncorrected cardiac defect, a palliated congenital heart defect, or severely decreased cardiac function attends for an MRI examination, the patient may become decompensated after only administration of anaesthesia or injection of radio-opaque fluid,” he noted. “A cyanotic patient with significant residual defects may also decompenstate both haemodynamically and in terms of oxygen saturation and CO2 washout as a result of anaesthesia.”

Despite these concerns, the future of imaging in GUCH looks set to rapidly evolve, and the use of MRI for diagnostic purposes is likely to increase. Also, MRI may be used as a screening tool to examine the status of relocated coronaries (e.g., after arterial switch or the Ross procedure), and it may replace some invasive catheter-based diagnostic investigations. The use of MRI to document the effects of congenital cardiac diseases and the therapeutic manoeuvres on development of the brain is poised for growth, according to Hübler. It will be interesting to see if MR-based interventional procedures can be developed further, particularly to see if flow phenomenon and compartmentalised models can be developed to achieve the best haemodynamic results, he added.

“The very often quite complex anatomy, imaging is a crucial part of these follow-up examinations. Invasive procedures and radiation exposure in young patients should be avoided whenever possible,” commented Prof. Matthias Gutberlet, professor of cardiac imaging at the University of Leipzig, Germany. “Usually in children, non-invasive imaging is done by Doppler echocardiography, but when children become older and reach adulthood, the access to visualise especially the right ventricle and right ventricular outflow tract becomes increasingly difficult due to a limited acoustic window or changed anatomy. Therefore, cross-sectional imaging, mainly cardiac MRI (CMR), but also and more also cardiac multidetector CT, comes into the game.”

Most GUCH defects can be corrected by interventional or surgical procedures, which are usually performed as early as possible during childhood or infancy. The goal of these procedures is to reconstruct normal physiology and anatomy, if possible. Very often, the reconstruction of normal anatomy and physiology cannot be achieved or only palliative surgical procedures can be performed and therefore the effects (i.e., volume and/or pressure overload, etc.) of that pathologic physiology and anatomy require lifelong follow-up examinations.

“Besides depicting the underlying pathology in CHD, CMR is capable of assessing more than simple anatomy; it can assess ventricular function, muscle mass, scar detection and even flow velocity and shunt quantification. This is especially important for patients with congenital heart disease, who can benefit from the evaluation with newer MR sequences and post-processing tools like 4D flow assessment,” he noted. “It is anticipated that the number of patients for whom these methods are beneficial is continuously increasing due to the progress in treatment and diagnosis.”
Radiologists need to be aware of the limited sensitivity of chest x-ray for imaging pneumonia in immuno-compromised hosts and the danger of it being left untreated. ECR delegates will hear at this afternoon’s refresher course on pulmonary infections. More sensitive modalities should be their second line of imaging if nothing is revealed on x-rays. In addition, specialists need the relevant clinical information to interpret images for high-risk patients, through interdisciplinary teamwork, as well as sound knowledge of differential diagnoses of non-infectious disease, according to speakers at the course.

For non-immuno-compromised patients presenting with small pneumonias that can’t be seen on a chest x-ray, doctors can wait until imaging pneumonia in immuno-compromised patients, particularly for lung infection, is greatly reduced, necessitating the use of sensitive techniques such as thin section CT. Thin section multislice CT of the lung does not necessarily need contrast and scanning is possible even with low radiation dose. However, given the most common risk of the suspected infection versus the benefit of diagnostic radiation dose, the risk of, for instance, 5 mSv of radiation exposure is not a key issue in many immuno-compromised patients, particularly considering that some have already been significantly irradiated by up to 20,000 mSv due to treat or for conditioning therapy, he explained. Radiologists who deal with this complex topic must remain aware of the susceptibility and disposition of such patients when imaging them during treatment phase. Specifically, in haematological patients with lymphoma and leukaemia, in relation to deficiency may be severe in the weeks after chemotherapy due to neutropenia, Heussel noted. He thinks the widening availability of thin section CT for imaging high-risk patients constitutes the main major advance in their management.

"After a patient has been treated for febrile neutropenia, the fever may return a second time. If nothing was seen on the baseline CT, a second CT scan at a later date if fever persists or relapses may show pneumonia, possibly a fungal or viral infection, or in transplant recipients, a non-infectious disease or microbacterial infection, resistant to the initial choice of antibiotics," Heussel said.

This second CT scan would exclude or confirm pneumonia, aid in guiding invasive procedures in the affected lobe, and characterise features of the infiltrate to discern the underlying disease, particularly when no biopsy can be performed because of concomitant chronic obstructive pulmonary disease, or when microbiology would take several days to find out underlying disease after a bronchoscopy with lavage.

"With a CT scan we can get an immediate idea of the disease much faster and this can guide changes in antibiotics prescribed, antifungal treatment, or even treatment of non-infectious complaints, such as congestion, organising pneumonia, pulmonary toxicity, or graft versus host disease," he explained.

Anti-fungal treatment can cost up to 10,000 euros per cycle and is more toxic than antibacterial treatment, at times causing irreversible renal impairment. CT not only reduces mortality but also by allowing the selection of the correct candidates, it curbs toxicity to the patient population and helps minimise overall costs.

During today’s course, Heussel will also discuss how to use EORTC (European Organisation for Research and Treatment of Cancer) wording in reports for better understanding of findings.

"The language within the report must be clear, with key words such as halo, macronodule, air crescent sign, and bone erosion triggering adequate treatment measures" he commented. "The report should state if the focus of the infection is found or not. To say that something looks suspicious is not good enough."

Scans for immuno-compromised patients with the suspicion of infection should be scheduled immediately with, minimal waiting periods between scans. Specifically, neutropenic patients treated as outpatients run a lower risk of becoming infected by resistant multi-organisms. Finally, interpreting results from treatment monitoring is not always easy as sometimes recovery of the immune system means that the apparent lesion regresses in reality, reaction to the infection – might grow. Therefore, treatment failure or success must be interpreted with the clinician, according to Heussel.

The typical imaging appearance of tuberculosis (TB) and multi-drug resistant TB remains on the rise in Europe, posing a major health problem with difficult therapeutic approaches, pointed out Dr. Catherine Beigelman-Aubry, head of chest imaging department of radiodiagnostic and interventional radiology, University Hospital of Vaudois (CHUV), Lausanne, Switzerland. While x-ray and CT are likely to remain the mainstay for diagnosis and treatment monitoring, PET CT could help in the recognition of responders versus non responders in the case of multidrug resistant TB.

Particularly directed towards general radiologists who may have to diagnose TB in routine practice and emergency situations, Beigelman's talk will aim to clarify their role in this setting, as well as providing details about the different appearances of TB and non TB infections in imaging.

"The frequency of the disease and its atypical manifestations must be understood. The recognition of some patterns such as miliary disease may be tricky, and analysis requires careful attention," she said, adding that CT is the modality of choice to help recognise a miliary pattern and to differentiate it from a bronchogenic dissemination due to its capacity to depict disease extent and complications.

In her department, chest x-ray remains first line in a patient with suspected TB, but low dose CT is used if doubt remains over diagnosis. In the case of mediastinal enlargement or pleural effusion, contrast administration is recommended. "CT can reveal active TB that may not be visible on chest x-ray as well as differentiate fine nodules of old TB versus active lesions. In some complex cases, CT after treatment may be helpful for confidently detecting reactivation," Beigelman said.

She anticipates that delegates will be keen to hear about the less common radiological signs of TB.

In non-immuno-compromised patients, primary TB typically presents with consolidation in the middle and lower lobes, and necrotic lymphadenopathy. Fibrosis, tuberculosis and calcified nodules may result as sequelae. Meanwhile the hallmarks of TB reactivation comprise cavitation and tree-in-bud appearance involving the apical and posterior segments of the upper lobes and the superior segments of the lower lobes.

In immuno-compromised patients, primary TB may manifest as hilar, mediastinal or disseminated feature, or in the case of severe immuno-suppression as atypical, potentially with pleural effusion and tracheobronchial involvement. Less common than TB, non-tuberculous mycobacterial (NTM) infections are frequently under-diagnosed, according to Beigelman. Despite a great overlap in their presentation, the absence of cavities on sites other than the upper lobes should suggest NTM infection.

Delegates will also learn about emerging infections and the radiological patterns that suggest human metapneumovirus (hMPV), SARs-CoV, influenza A and B, and West Nile virus and enterovirus from Dr. Tomas Franquet, section chief of thoracic radiology, Lausanne University Hospital, Switzerland. While x-ray scans for immuno-compromised patients, primary TB typically presents with consolidation in the middle and lower lobes, and necrotic lymphadenopathy. Fibrosis, tuberculosis and calcified nodules may result as sequelae. Meanwhile the hallmarks of TB reactivation comprise cavitation and tree-in-bud appearance involving the apical and posterior segments of the upper lobes and the superior segments of the lower lobes.

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Advanced MR imaging helps in interpretation of brain tumours

By David Zöls

Advanced MR imaging techniques such as perfusion and functional imaging have been a great help in improving the diagnosis and staging of brain tumours. Unlike conventional MR techniques, advanced MR techniques can be used to obtain information not only on the morphological, but also on the functional characteristics of tumours.

One of the most common types of brain tumour is glioblastoma, which is highly malignant and has a high cell reproduction rate due to the fact that it is nourished by a large network of blood vessels. According to the American Brain Tumour Association there are two types of glioblastoma: primary glioblastoma, which tends to form, and secondary glioblastomas, which are also aggressive but show slower growth and only represent 10 percent of all diagnoses.

Due to a lack of effective therapies, the prognosis in cases of glioblastoma remains poor, and so there is an urgent need to find new therapeutic approaches.

One of the reasons why the treatment of glioblastoma is such a challenge is its high aggressiveness. The current therapeutic approaches are surgical resection of the tumour bulk if possible, depending on the location of the tumour, followed by radiation and chemotherapy. One of the main difficulties is that it can be difficult to exactly measure the tumour’s extent, since malignant tumour cells often infiltrate the brain parenchyma beyond the tumour’s contrast-enhanced portion, which makes it difficult to completely surgically resect the initial tumour, as said Professor Pia C. Maly Sundgren, head of the department of diagnostic radiology, Clinical Sciences, Lund University, and Senior Consultant at Skåne University Hospital, Lund, Sweden.

Radiation and chemotherapy are used to slow the growth of tumours that cannot be removed surgically. Chemotherapy may also be used in young children to delay the need for radiation.

Despite achievements in the field of advanced imaging techniques it still remains difficult to predict and monitor brain tumour response in individual patients, especially when it comes to the use of anti-angiogenic therapies, during which uncommon patterns of tumour response and progression can be seen.

Pseudoprogression for example usually occurs early while treating a brain tumour with radiation and Termodar, which makes the tumour appear to progress due to its increased size and contrast enhancement. This is a common reaction to the treatment, but the lesion will decrease in size and concentration on its own if the initial treatment is continued without any change.

Pseudo-response on the other hand occurs during anti-angiogenic therapy, for example the use of Avastin, which causes significant reduction in contrast enhancement but will not be mistaken for a real reduction in the extent of the lesion.

Prof. Sundgren explained how to spot these pseudo-reactions. “Both can be best detected with advanced MR imaging especially diffusion-weighted imaging, which looks at the random motion of water molecules and perfusion imaging, which studies the cerebral blood volume and cerebral blood flow in the brain, including the tumour. Though MR spectroscopy is less helpful.

Confusion and incorrect interpretation can in part, be avoided by having good clinical information about the original tumour type, tumour extent, as seen through MR imaging after contrast administration, current course of chemotherapy treatment, radiation dose; and the time between radiation treatment and imaging findings. It is also helpful to use perfusion and diffusion imaging as part of the MR imaging protocol. The use of PET imaging might also be valuable, as well as a combination of information gained from both modalities.

Despite the fact that the long-term prognosis remains poor, there have been recent studies which have shown an increase in the overall survival rate for glioblastoma patients treated with Avastin, according to Prof. Sundgren.

Especially in recurrent glioblastoma, the treatment options have limited been mainly limited to high-dose chemotherapy. The administration of Avastin alone or in combination with CPT-11 has shown a significant improvement in response rates, progression-free survival times and overall survival.

A more recent study has shown how Avastin alone was nearly as effective as it was in combination with chemotherapy, but with much milder side effects. When dealing with patients suffering from terminal glioblastoma a stand-alone Avastin therapy may lead to an improvement in quality of life, without the common toxic side effects of chemotherapy.

When asked about whether we need advanced imaging techniques in daily practice, Prof. Sundgren gave a very clear answer: “Yes. I strongly advocate the use of advanced MR imaging in the work-up and follow-up of a patient with brain tumour. It is helpful for the radiologist or neuroradiologist to give the correct interpretation and it is helpful for the clinician in the treatment of the patient.”

The session will also feature a talk by Professor Meng Law from the Los Angeles County Hospital & USC Medical Center on the topic of diffusion-weighted imaging (DWI) and diffusion tensor imaging (DTI). His talk will include information on how to use diffusion imaging for predicting the response to radiation while using functional diffusion maps, as well as chemotherapeutic agents such as temozolomide and bevaczirumab. The challenges and pitfalls of using DTI, fibre tractography (FT) and fractional anisotropy (FA) maps for presurgical planning will be discussed.

There is significant error in comparing FA and PT presurgical maps to intraoperative electrophysiological mapping up to 8.7 mm and sometimes even more. This is due to errors in co-registration, brain shift, imaging error and surgical error,” explained Prof. Law.

Some controversial issues about whether DTI is really useful in the clinical setting or merely just a mathematical tensor algorithm will also be raised.

Aydin, Turkey.

Reference:

A. Diffusion-weighted imaging (DWI) and diffusion tensor imaging (DTI)
B. Perfusion imaging
C. Follow-up after treatment

Clinical Corner
Saturday 9 March 2013

Have you picked up one of our fresh Austrian apples today?
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MRI manufacturers target business opportunities in emerging markets

By John Bonner

This week the eyes of the radiology world are firmly fixed on events here at the ECR. But in the months leading up to this congress, the major imaging equipment vendors have been looking elsewhere, beyond the borders of Europe to the growing markets of the developing world.

Medical services in countries like China and India are becoming increasingly sophisticated, and both doctors and patients are demanding the same high quality diagnostic technology available in developed economies, and some companies in the commercial exhibition at the Austria Center are demonstrating the solutions that have been specifically developed for these emerging markets. In the current climate of financial austerity, they believe these products are also relevant for Europe.

A good example is GE Healthcare’s Brivo MR355 Inspire, one of two new MRI systems being presented for the first time in Europe. While the other machine, the 1.5-Tesla Optima MR360 Advance, is a premium product designed for traditional markets, the Brivo is an entrance-level machine specifically created for use by customers in Asia, South America and Africa, explained Richard Hausmann, general manager of GE’s MRI business.

“The magnets used in Brivo were developed at our U.S. research headquarters, but much of the rest of the system was designed and built in China,” he said. “We have a ‘distributed’ research and development workforce with centres in emerging markets of the developing world that are thinking of acquiring their first machine.

“We are trying to bring MR technology to everyone and particularly those living in distant rural areas. The scanner has to be easy to use because the standard of training for technicians may not always be as high as we would want,” Hausmann said. “Patient comfort is another important consideration, as patients in developing countries will often be seen at a later stage of the disease process. So, for example, we have designed a low level table which very sick people will find easier to get on or off.”

Although Brivo is geared for use in emerging markets, GE aims to provide the same diagnostic standards for all its customers. This is part of a broader policy that is attempting to ‘humanise’ MR procedures and make them a less intimidating experience for patients. The company recognises that a major cause of patient discomfort is the noise generated within conventional MR systems, which may sometimes reach levels of around 110 dBA – equivalent to standing next to the speaker stack at a rock concert.

As with the new premium system, Brivo features OpTix Optical RF technology, which offers a high channel count, with analogue to digital signal conversion inside the MR suite to minimise noise and signal degradation, but it operates away from the patient to enhance comfort and safety. GE reckons that OpTix provides up to 27% higher signal-to-noise ratio over conventional, analogue signal receivers, improving image quality and clinical confidence.

At the ECR, the vendor is also unveiling its new Silent Scan product, which can reduce noise in the MR suite to something equivalent to normal ambient levels.

“Previous acoustic noise mitigation techniques have focused on insulating components and muffling sound rather than treating the noise at the source. With Silent Scan, acoustic noise is essentially eliminated by employing a new advanced 3D acquisition and reconstruction technique called Silenz, in combination with the company’s high-fidelity MR gradient and RF system electronics,” Hausmann said.

“Expanding on its global R&D footprint that includes a new high tech facility in Suzhou,” Philips has developed a reliable and to develop a reliable and simple to use machine for developing markets. The Multiva 1.5-Tesla unit is designed to ease patient comfort and increase productivity by reducing the time spent setting up an examination. It features the FlexStream workflow system, which enables efficient handling of coils for head, spine, musculoskeletal and neurovascular examinations, allowing a reduction of up to 40% in the time it takes to position the patient and coils before securing an image, according to the manufacturer.

Another feature of the Multiva system is SmartSelect software, which automatically determines which...
coils and elements should be activated to yield the maximum signal-to-noise ratio (SNR) in the region of interest for greater efficiency and higher image resolution. Additionally, a large neurovascular coil design allows patients to use headphones during their examination, which can help improve patient comfort. These improvements will maximise the value of the system and allow clinicians to treat more patients each day without compromising image quality, the company explained.

Meanwhile, Hitachi Aloka Medical Systems believes that tackling patients’ anxiety and their feelings of claustrophobia is as important as controlling noise during a procedure. Moreover, it can also make life easier for the medical staff by reducing the number of examinations that have to be aborted because of anxious patients.

The company has pioneered a novel oval-shaped bore for its devices to more accurately reflect the typical human body shape. The idea was introduced last year with its 1.5-Tesla Echelon Oval system, and now Hitachi has developed the 3-Tesla Trillium Oval machine to support the increasing application of high-field machines in routine procedures. As with the Echelon Oval, the new system has a 74 cm bore, giving greater comfort than the 60 cm available in standard 1.5-Tesla MR units or the 70 cm offered with the latest generation of wide-bore magnets. Other features intended to improve patient comfort include a 63 cm-wide mobile table with a 250 kg weight capacity and retractable arm boards for better patient safety, along with ‘feet-first’ imaging as standard for all procedures.

Siemens Healthcare is introducing a 3-Tesla machine and is emphasising its value as a research tool in neurology, physiology and tissue metabolism studies. The company believes that the Magnetom Prisma sets new standards, having a gradient strength of 80 milli-Tesla per metre (mT/m) combined with a slew rate of 200 Tesla per metre per second (T/m/s). The system also offers a tandem configuration unavailable in any other commercial whole-body system, according to the vendor. The device’s combination of high gradient strength and fast gradient switching speed allows for increased image quality compared to conventional devices. Due to this combination of high spatial and temporal resolution, the new machine can reportedly achieve good image quality, especially in very demanding applications. Furthermore, by combining high gradient strength with fast gradient switching speed, the Magnetom Prisma offers new possibilities in areas such as diffusion imaging, because even minor diffusion effects can be captured. Moreover, the diffusion spectrum imaging (DSI) application makes it possible to resolve fine anatomical details of the brain, such as crossing white-matter fibres by using up to 514 diffusion encoding directions, Siemens stated.

At Toshiba’s ECR booth, employees are keen to demonstrate the potential advantages of an upgrade for the M-Power operating system in improving workflow. These enhancements are available on its Vantage Titan 1.5 and 3-Tesla MR systems. They help to create a user-friendly interface that simplifies both acquisition and post-processing and that streamlines many of the time-consuming steps used in routine clinical scans, according to the company.

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Monday, March 11: 10:00–14:00

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SlicerRT sets new standard for radiation therapy research tools

By Csaba Pinter, Andras Lasso, An Wang, David Jaffray, and Gabor Fichtinger

Recent years have seen a growing interest in adaptive radiation therapy (RT) research, and yet the available software tools do not reflect this tendency. The commercial applications are not only expensive, but typically cover only routine clinical procedures, and often lack flexibility and extensibility. On the other hand, the available open-source packages fall short in terms of limited scope, reliability, user support, lack of documentation, or dependency on commercial software packages (such as MATLAB).

Our research team, funded by Cancer Care Ontario and the Ontario Consortium for Adaptive Interventions in Radiation Oncology (OCAIRO), a diverse community covering over twenty RT research groups in Ontario, Canada, proposed to develop an RT research platform that overcomes these challenges.

As a result of extensive and coordinated long-term efforts, 3D Slicer has emerged as a widely used platform for image computing and image-guided interventions. Its extensibility, built-in algorithms, and choice of tools make it a natural choice of platform for an RT research toolkit. Our SlicerRT toolkit thus builds on 3D Slicer, leveraging its flexible plug-in mechanism to provide additional features needed for RT research. Its feature set was defined through consensus discussions with a large pool of RT researchers, including both radiation oncologists and medical physicists from OCAIRO.

The RT-specific features include loading DICOM-RT data, handling various structure set contour representations, computing and displaying dose-volume histograms, creating accumulated dose volumes, comparing dose volumes and contours, visualising isocentre and surfaces and lines (Figure 1), performing morphological operations on contours, and registering images using multistage B-spline deformable registration or landmark deformable registration. The imported images, dose maps, and structure sets are represented as standard 3D Slicer data objects, together with all the existing 3D Slicer modules are all usable for the analysis, processing, and visualisation of data.

The underlying algorithms are either implemented utilising the libraries already used by 3D Slicer for visualisation (VTK) and image processing (ITK), or provided by the Pixmapmath library (plastimatch.org). The architectural details are described in an article recently published in Medical Physics.

An example of the use of the SlicerRT package is the evaluation of the effectiveness of RT plan adaptation techniques. The goal is to simulate and assess different types of adaptation methods for multiple-fraction external beam radiation therapy treatment cases. One of these is the isocenter shifting technique, which optimises the dose delivered to the target volume and the organs at risk by physically moving the isocenter. The 3D Slicer’s built-in rigid registration and resampling modules are used to align the planning and daily anatomy images, and then a SlicerRT module is used to accumulate the delivered daily doses. The other technique uses deformable registration to simulate online re-planning, which is also part of the 3D Slicer repertoire. Next, the dose-volume histogram (DVH) for the accumulated dose distributions is computed using a SlicerRT module for the original case without adaptation, the isocenter shifting case, and the online re-planning case. The DVH curves can be displayed for the target volumes for visual assessment (Figure 2). To quantify the results, the D90 metric is computed for the target volume, and the D1 and D99 metric for the organs at risk.

SlicerRT has been developed following software development practices that have already proved to work well for 3D Slicer, thus ensuring software quality. The source code and test data are openly available. The project has an wiki page, which contains detailed guidelines for users and developers, as well as information about events and meetings (www.assembla.com/spaces/slicerrt). The SlicerRT functions are automatically tested on various operating systems every night, identifying potential regressions by reporting the test results on a dashboard system. SlicerRT and 3D Slicer are distributed under a BSD-style open-source license. The software may be used not only for research purposes but also for clinical and commercial projects.

The SlicerRT extension is supported on Windows, Mac, and Linux operating systems. To get started, download and install 3D Slicer from www.slicer.org, then use its built-in extension manager to download and install the SlicerRT extension.

As current funding ensures further development for several years, SlicerRT will foreseeably evolve further, incorporating new features and integrating closer with other tools. We also expect that other research groups will join these efforts.

The current version of the toolkit will be presented at the IMAGINE Workshop presented by the European Institute for Biomedical Imaging Research (EIBIR). The project will be showcased on Saturday, March 9, 14:00–15:30 in the EIBIR Conference Theatre on the second level.

The accompanying poster to this presentation is published in EPOS™ and can be accessed online at myESR.org/EPOS. The poster (E-NNNN) is titled ‘SlicerRT – Radiation therapy research toolkit for 3D Slicer’.

EIBIR presents IMAGINE

After last year’s success, EIBIR is again hosting the IMAGINE Workshop, under the heading ‘Novel technology that shapes radiology’. IMAGINE aims to stimulate interaction between imaging researchers and radiologists. Leading international academic and industrial research groups present their latest developments in medical image analysis and image-guided interventions. During the interactive software demonstration sessions, the visitors got hands-on experience with developed techniques and tools. The presenters of the workshops were invited to introduce their work at ECR Today.

Figure 1: Isodose lines and surfaces created by SlicerRT shown in a standard 3D Slicer scene.

Figure 2: Comparison of dose escalation results in SlicerRT. The upper right view shows the 3D models created from the contours in red (targets), organs at risk (in blue) intersected by the same axial slice shown in the bottom left viewer. The DVH plots in the upper right corner show the difference between the delivered total doses to the target volume using the three techniques (solid: no registration, dashed: rigid registration, dotted: deformable B-spline registration).
Alzheimer’s, a debilitating and deadly disease, is on track to become a global epidemic. To help physicians take on this growing healthcare challenge, Siemens is proud to introduce comprehensive hardware and software PET•CT imaging solutions for the detection of amyloid plaques in the living brain.

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*Based on competitive literature available at time of publication. Data on file.

**syngo PET Amyloid Plaque is intended for use only with approved amyloid radiopharmaceuticals in the country of use. Users should review the drug labeling for approved uses.
The Brain Research Imaging Cen-
tre (BRIC) within the School of 
Clinical Sciences at The Univer-
sity of Edinburgh, has developed 
BRIC1936, a suite of software for 
lesion assessment, segmentation, 
progression and 
intensity analysis in magnetic resonance imaging

By Maria del C. Valdés Hernández, 
Michael J. Jackson, Mark E. Bastin 
and Joanna M. Wardlaw

The European Society of Head and Neck Radiology. This allows for bal-
some of whom are neuroradiolo-
gy is often neglected. It is impor-
tant that it fills part of core train-
ing, allowing the acquisition of 
knowledge necessary for acute 
care and general radiology. The ESHN-
R education board members therefore 
submit questions to the ESR to be 
especially in the European Diploma in 
Radiology (ESR) examination.

The ESHNR has a particular inter-
est in education. It holds an annual 
meeting which is very popular, with 
a mixture of cutting-edge topics, 
scientific research presentations 
and a refresher course. The last 
meeting took place in September, 2012 in 
Leipzig. The next meeting (the 26th 
Congress and refresher course) is 
to be held in Izmir in October, 2013.

There are ESHNR prizes for the 
best oral presentation and poster.

We recognise that high level spe-
cialist training in head and neck radi-
ology may be difficult to attain. We 
have therefore established head and 
neck radiology scholarships for radi-
ologists, within three years of certifi-
cation. Eleven training centres in eight 
countries took part in 2012. These 
programmes offer trainees the 
opportunity to supplement their exist-
ing knowledge, with further inter-
est in modular training in head and neck 
radiology, supervised by a specialist 
tutor in highly regarded academic 
training centres around Europe. Three 
programmes were offered and 
taken place by the European School of 
Radiology (ESOR) in 2012. The 
successful applicants receive a jointly 
awarded grant provided by the ESR, 
ESOR and the ESHNR. A certificate 
from the ESR and ESOR is awarded 
upon successful completion of the 
programme and receipt of a written 
report of the work undertaken.

Members of the society assist the 
ESR in the preparation and organisa-
tion of the head and neck component 
of the annual European Congress of 
Radiology, providing a broad spec-
trum of educational resources to those 
who want to learn basic head and neck radi-
ology, to those who wish to learn 
more from and compare with lecturers 
from the best centres in the world.

We welcome new members. 
Please come to Izmir to learn, 
have fun and make new friends.

More information on the ESHNR 
can be found at www.eshnr.eu

The authors are from the Department of Neuroimaging Sciences, Western General Hospital, University of Edin-
burgh, UK.

References:

Features:
BRIC 1936 allows users to use volumes stored in a number of common image formats including 
bitmap, TIF, JPEG, NIFTI or Ana-
lyze 7.5. BRIC 1936 supports real-
time processing via a user-friendly 
interface. The results can be saved 
as 8-bit binary mask volumes with 
associated text files with meta-data 
about the output masks (for exam-
ple, the tissue mask volume). Com-
ponents are also provided for visual-
ising several slices of MR sequences 
simultaneously in sagittal, coronal 
and axial planes as well as in sev-
eral colour maps, performing logical 
operations with MR sequences and 
binary masks, and exploring effec-
tive sequence combinations. The 
C++ version replicates the func-
tionality of the MATLAB version 
but as a standalone application for 
the segmentation component but 
as a standalone application for 
which users need not download any 
additional software.

The project will be showcased on 
Saturday, March 9, 14.00–15.30 in 
the EEBIR IMAGINE Theatre next 
to room U on the second level.

ESHRN continues to bring 
radiological specialists together

By Martin Mack

The European Society of Head 
and Neck Radiology (ESHNR) was 
formed in 1987. The ESHNR is one 
of the smaller subspecialty societies 
affiliated with the European Society 
of Radiology (ESR) and general 
organisation is open to all qualified 
professional who has made a significant contri-
bution to head and neck radiology or 
who devotes a significant portion 
of their time to the study of 
head and neck radiology. We are 
looking forward to our annual meet-
ing in Izmir in October, 2013.

We welcome new members.

Please come to Izmir to learn, have 
fun and make new friends.

More information on the ESHNR can 
be found at www.eshnr.eu

Professor Martin Mack from Frank-
furt am Main, Germany, is the 
ESHNR President.

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Saturday 9 March 2013

Technology Focus

ECR Today 2013 21
The ESMRMB looks forward to its 30th Annual Scientific Meeting in Toulouse 2013

By Elna-Marie Larsson

The European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) is a non-profit organisation with more than 1,300 active members, which aims to promote research and educational activities in the field of magnetic resonance in medicine and biology. Our society was founded in 1984 and is a platform for radiologists, physicists, basic scientists, technicians/radiographers and others with an active role in the field of MR.

The ESMRMB continues to attract more and more participants to its Annual Scientific Meeting, which offers a forum for integrated European research activities in basic and clinical MR applications.

This year the ESMRMB will hold its 30th Annual Scientific Meeting from October 3 to 5, 2013, in Toulouse, France. The ESMRMB congress, which reflects our close relationship with the French MR community, is a platform for radiologists, physicists, basic scientists, technicians/radiographers and others with an active role in the field of MR. This year the ESMRMB will hold its 30th Annual Scientific Meeting from October 3 to 5, 2013, in Toulouse, France and it expects to receive numerous contributions from specialists all over the world. Abstracts can be submitted until May 24, 2013, so make sure to contribute. The ESMRMB congress, which reflects our close relationship with the French MR community, is a platform for radiologists, physicists, basic scientists, technicians/radiographers and others with an active role in the field of MR. The ESMRMB continues to attract more and more participants to its Annual Scientific Meeting, which offers a forum for integrated European research activities in basic and clinical MR applications.

The ESMRMB is pleased to cooperate with the French MR Society SFRMBM at the congress, where a joint ESMRMB/SFRMBM session in English will be held. The French society will also offer French language sessions the day before the ESMRMB congress, which reflects our close relationship with the French MR community. Furthermore, the successful Round Table Discussion as well as Hot Topic Debate will once again be part of the programme, along with daily plenary, scientific, teaching and poster highlights sessions, as well as scientific posters, clinical review posters and software exhibits. Another highlight will be the Radiographers’ Sessions, held twice a day: The ESMRMB Scientific Programme Committee and the European Federation of Radiographer Societies (EFRS) are working on an exciting programme.

School of MRI: education for physicians and technicians/radiographers
- Thirteen advanced clinical English-language courses
- Course duration: two and a half days
- Interactive character with 50 percent of the total teaching time used for repetition in small groups (max. 16 people per group) to intensify the learning experience
- Professional and experienced teachers
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME) with up to 15 credits per course

Hands-On MRI: education for MRI technologists, radiographers and interested physicians
- One course is planned for 2013
- Course duration: two and a half days
- 50 percent vendor specific hands-on training on the scanner and workstations
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME)
- A maximum of 50 participants per course

Lectures on MR: education for MR physicists and other basic or clinical scientists
- Thirteen courses are planned for 2013
- Course duration: two and a half days
- 40 percent of the total teaching time is used for repetition, exercise, and practical demonstration in order to practice and intensify the learning experience
- Accredited by the European Federation of Organisations for Medical Physics (EFOMP) and the European Accreditation Council for Continuing Medical Education (EACCME)
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Towards focused ultrasound treatment of tumours in moving organs

By Jan Strehlow and Sabrina Haase

In recent years, high-intensity focused ultrasound guided by magnetic resonance imaging (MRI-guided FUS) has become an established means for the non-invasive treatment of uterine fibroadenoma and bone metastases. In this method high-intensity ultrasound waves are sent into the body from an extra-corporeally placed transducer and focused on a desired target area to heat and finally ablate it. FUS is non-invasive, as it allows for ablation of tissue deep inside the patient’s body while minimising damage to healthy tissue. FUS is gaining acceptance in clinical routine and more applications for high-intensity focused ultrasound are being investigated in preclinical studies. Treating tumours in moving abdominal organs such as the liver, however, is still a great challenge due to several complexities. Major problems arise from the motion of the abdominal organs due to breathing. The location of the tumour may be difficult to reach due to adjacent structures such as the rib cage, lungs, and intestines. The physiology of the organs, the heat absorption of the tissue, and heat transfer within the body can also determine therapy outcome. Due to these complexities intervention planning by visual judgement alone is not feasible.

In planning a FUS intervention the radiologist tries, using the acquired MR imaging data, to assess whether the intervention is feasible, how best to destroy target, and whether it is possible to do so without harming surrounding structures. While the feasibility can mostly be judged by the location of the target area and the possible transducer positions, tissue destruction is less predictable due to the multitude of physical and physiological processes taking place during the treatment. The FUSIMO project provides a dedicated simulation software tool for FUS ablation in moving organs, thus enabling reliable outcome prediction for planned FUS interventions, helping the clinician optimise the results.

The first layer of the FUSIMO software deals with organ motion due to breathing. Breathing continuously alters the position of the liver and consequently the position of the lesion to be treated. Since it takes up to a few minutes to heat the tissue to a critical temperature the FUS focus spot has to be guided along with the tumour motion. In FUSIMO a generic liver motion model is transferred to the planning scan, enabling estimation of the target area and position throughout the whole procedure.

The second layer of the FUSIMO software predicts the propagation of the ultrasound waves through the body and the heating of the tissue. To achieve this in a patient-specific manner the clinician is provided with a set of image segmentation tools that allow the delineation of all structures relevant to the FUS treatment, i.e. the target area, organ area, structures at risk and risk structures the FUS beam cannot pass through. Given this information the propagation of the ultrasound waves and their focusing can be accurately simulated, and the heating of the moving tissue can be estimated.

The damage to the tissue depends on the duration and the temperature of the heating, which is controlled by the third layer of the FUSIMO model. For all relevant structures, including the lesion and the risk structures in the vicinity of the sound path, the heat generation and diffusion is simulated. Blood vessels adjacent to the tumour can have a significant cooling effect on the tumour, making it more difficult to ablate the whole target area. The FUSIMO simulation software incorporates all these effects and allows for a prediction of the tissue damage in the tumour and other abdominal structures.

The information gained from the integrated patient-specific FUSIMO simulation models allows the clinician to accurately evaluate the possible outcome of the treatment. The FUSIMO system will be evaluated with experiments in ex vivo organs and then embalmed cadavers, which

**Novel technology that shapes radiology:**

**EIBIR presents IMAGINE**

*Image-guided interventions and computer-aided diagnosis*

Saturday, March 9, 14:00–15:30, EIBIR IMAGINE Theatre, Room U

Oral presentations

Moderator: EIBIR IMAGINE committee*

Markedly tracking lung tumours during radiotherapy treatment using Alpin RT optical surrogate and motion model built from cone-beam CT on day of treatment

J. Martín, London/UK

**FUSIMO: A prototype for patient-specific focused ultrasound surgery in moving organs**

J. Strehlow, Bremen/DE

**SlicerRT – 3D Slicer based open-source toolkit for radiation therapy research**

C. Pircher, Kingston, ON/CA

**MRI guided prostate biopsy: a multiparametric, multireader, registration assisted, template based workflow**

T. Horvath, Boston, MA/US

**BRIC1936: software package for lesion assessment: segmentation, progression and intensity analysis, in magnetic resonance imaging**

M.C. Valdés Hernández, Edinburgh/UK

**Automated labelling framework applied on full and partial spine CT scans**

J. Hadama, Vienna/AT

**EIBIR Sessions at ECR 2013**

Saturday, March 9, 10:30–12:00, Meeting Room T4, 1st Level

**EIBIR/EBRAHD Sessions**

Moderators:

- F. Schwindt, Mainz/DE
- M.D.M. Kurur, Rotterdam/NL
- G. Oulas, Milan/IT
- Guidelines in radiology
- D. Stathopoulos, Mainz/DE
- Clinical decision support for the safe and effective use of imaging tests
- E. Krouskopoulos, Rotterdam/NL
- Preoperative breast MRI: the MIPA study
- T. Tamboli, Milan/IT

Discussion

Saturday, March 9, 12:45–14:15, Room Z

**EIBIR Sessions**

**Horizon 2020 – Setting the scene for Europe’s next research programme**

Moderators:

- G. Knörrer, Rotterdam/NL
- J. Hennig, Freiburg/DE

**Horizon 2020: setting the scene – insights into Horizon 2020 health priorities, including the research infrastructure perspective**

E. Riebschläger, Braunschweig/DE

**IM – How to speed up the development of better and safer medicines for patients**

E. Vaudano, Barcelona/ES

**Public private partnerships as a booster for research and economic growth in the future**

D. Daney, Brussels/BE

**The role of imaging in health research in the era of Personalised Medicine**

L. Mori, Rome/IT

**How EIBIR supports biomedical imaging scientists in their grant applications and research management**

J. Hennig, Freiburg/DE

Questions/Answers

Saturday, March 9, 16:00–17:30, Room Z

**Euro-BioImaging – Towards implementation of a pan-European imaging infrastructure**

Moderator: J. Hennig, Freiburg/DE

**Euro-BioImaging – Towards implementation of a European open access imaging infrastructure**

J. Hennig, Freiburg/DE

**Making the case: development of a pan-European imaging infrastructure**

J. Hennig, Freiburg/DE

**Potential of Phase-Contrast Imaging as a node within Euro-BioImaging**

F. Brandt, Munich/DE

**Discussion**

**Simulated heating induced by FUS sonication in a moving organ A with a static focal spot and B refocusing on the correct target position.**

By Jan Strehlow and Sabrina Haase

work at the Fraunhofer Institute for Medical Image Computing MEVIS, Germany. FUSIMO (www.fusimo.eu) is funded by the Seventh Framework Programme of the European Union. The FUSIMO consortium is coordinated by Fraunhofer MEVIS and consists of 10 additional Partners: ETH Zurich (Switzerland), Fundatia MEVIS (Romania), GE Medical Systems (Israel), IBRMM (Czech Republic), IM2D Dundee (UK), INSIGHTS (Israel), La Sapienza Roma (Italy), MEHR (Germany), SINTEF (Norway), and TU Delft (Netherlands). The FUSIMO consortium is Tobias Preusser (project coordinator, MEVIS), Matthias Günther (technical coordinator, MEVIS), and Andreas Nötzer (clinical coordinator, IM2D Dundee).
ENCITE concludes in November 2012 with huge gains in cellular therapy

By Alena Morrison

The 4.5-year ENCITE (European Network for Cell Imaging and Tracking Expertise) project, consisting of 29 project partners from 11 countries, began in June 2008 and was co-funded by the European Commission under the 7th Framework Programme. ENCITE was delighted to have the position of coordinating partner.

ENCITE’s vision was to develop and test new MR and optical imaging methods and biomarkers to get a more comprehensive picture of cell fate and the reaction of the immune system and to ultimately improve and further develop cell therapy for the benefit of the European patient. To its end, numerous promising achievements on labelling and cell-based techniques were presented at the final workshop in November 2012, such as:

**Novel Pulse Sequences**

The main challenges in this area included the tracking of pancreatic islet cells using positive contrast in a clinical setting, the signal enhancement for 19F imaging using ultra short TE (UTE) and the use of newly developed fluorine compounds. New combined protocols for the imaging of multiple MR biomarkers in tumour therapy were monitored and tested in vivo, with a special focus on imaging of SPIO-marked E.Coli bacteria.

**Novel Imaging Reporter Probes**

Several new MRI agents both in the field of paramagnetic metal complexes and in the field of superparamagnetic iron oxide particles (SPIO) were developed. The use of these MRI agents in cellular labelling has resulted in enhanced sensitivity and specificities.

**Novel Tools for Cell Labelling**

Optimal labelling conditions were defined for a number of contrast media, e.g. cellular incorporation of a responsive contrast agent into murine neural progenitor cells and labelling of mesenchymal stem cells with Gd-DTPA. Methods were developed for monitoring cell recruitment, differentiation and death. Imaging of cell differentiation was evaluated for a number of systems including neuronal differentiation and differentiation of tumour stroma fibroblasts. Cell death could be detected by complementation of split reporter proteins.

**Preclinical Validation**

Generic and specific imaging tools were further developed and validated for the application of cell-based therapies for neurological disease and stroke, cardiovascular disease, musculoskeletal disorders, diabetes and cancer.

**Translation towards Clinical Application**

Within the translation towards clinical application, there are several research highlights applicable to different diseases:

- **Cancer:** The infrastructure for the production of tracers was established and cancer patients were monitored with a tracer in order to detect an antigen-specific immune response in vivo shortly after vaccination. The used tracer offers a sensitive tool to study the kinetics, localisation and involvement of proliferating lymphocyte subsets. Measuring activities three weeks after vaccination was possible, in the future assisting clinicians with selecting responding patients at an early stage for follow up vaccinations.

- **Diabetes:** Patients were examined according to a new, refined protocol and the first data on the clinical application of the MR method was published.

- **Cardiovascular disease:** Initial studies have been performed towards the clinical application of imaging methods with tools developed in the two work packages cell labelling and preclinical validation.

**ENCITE Multi-Centre Cluster for Training**

Seven centres in Germany, Italy, Belgium, the Netherlands, Israel and France, involved in the ENCITE Multi-Centre Cluster for Training, provide flexible access to specific face-to-face training in laboratories, teaching files and e-courses as well as to the virtual database serving as a repository of newly developed chemical and biological imaging reporter probes for cell labelling. This includes procedures for the reporters’ preparation and their full characterisation, detailed protocols for their use, and methods for the accurate interpretation of the results obtained.

ENCITE’s scientists are confident that these technologies will help to speed up developments in cell therapies and that their entry into wider routine clinical practice could offer potential cures for many different types of diseases, including cancer, cardiovascular disease and diabetes, as well as preclinical implementation in stroke and musculoskeletal diseases.

To support this, ENCITE produced a video “Advances in image-guided cell therapy promise breakthrough in the treatment of cancer and diabetes’ showcasing how in vivo image-guided cell therapy is revolutionising medicine. The potential for cell therapy treatment, addressing today’s major healthcare problems diabetes, cancer and cardiovascular diseases, are highlighted in the video. To watch the video, please visit: www.encite.org.
Modernisation of Professional Qualifications Directive

By Javera Hemesberger

With the aim of facilitating mobility, the European Commission proposed the Modernisation of Professional Qualifications Directive (2005/36/EC) in December 2011, which is one of the priority actions within the European Union’s Single Market Act. The Directive covers the harmonisation of training requirements, which are mainly in the health sector, and mutual recognition of all professions for which a specific level of qualification is required. While the objective of the 2005 Directive was to simplify the legislation, this planned modernisation aims at adapting it to an evolving labour market.

In this proposed the European Commission put forward a European Professional Card (EPC), a voluntary tool based on the Internal Market Information System (IMIS) for the automatic recognition of seven professions, but the provisions of the Directive. The ESR welcomes the European Effort to increase the European labour market but emphasises the need for a harmonised training curriculum within radiology. Therefore the ESR has launched a petition, which was distributed among all European national radiology societies and endorsed by the vast majority.

In addition, the ESR is in regular contact with officials from the European Commission’s Directorate for Internal Market, and Services, who are in charge of the proposal, and members of the European Parliament’s Consumer Protection Committee, the lead Committee, in order to raise awareness of the ESR’s interests and concerns.

The ESR’s key interests lie in increasing the minimum duration of training from four to five years so that the Directive is in line with the ESR’s efforts. More equally high standards of training throughout Europe. The ESR also notes that the name of the discipline changed from diagnostic radiology to radiology, as the profession now encompasses both diagnostic and interventional procedures. There are other issues of concern to the ESR, such as appropriate language assessment and the exemption of healthcare professionals from partial access.

In July 2012, the rapporteur of this dossier, French MEP Bernadette Vergnaud from the Progressive Alliance of Socialists & Democrats, published her draft report on the European Commission’s proposal for a modernisation of the Directive on the recognition of professional qualifications.

In her report, she called for a simplification of the procedure by regularly adapting the requirements of common training for professions benefiting from automatic recognition. The ESR proposed a number of amendments to the rapporteur and shadow rapporteurs of the proposed modernisation of the Professional Qualifications Directive (2005/36/EC).

In October, the European Parliament’s Internal Market and Consumer Protection Committee has more than 700 tabled amendments, including the ESR’s proposed amendments regarding language assessment, partial access and the harmonisation of training standards.

On November 6, the Internal Market and Consumer Protection Committee had an initial discussion on the amendments tabled in the draft Directive on recognition of professional qualifications. The Members of the European Parliament have tabled more than 700 amendments, of which many would have implications for healthcare professionals.

Discussions within the Parliament and Council (representing the Member States) continue and involve the European Professional Card, harmonisation of the minimum training requirements for sectoral professions, as well as the number of regulated professions.

Negotiations on a compromise text between the European Parliament and Council are expected to start soon.
Management in Radiology:  
a topic of increasing significance

By Peter Mildenberger

Management in Radiology (MIR) is a subcommittee of the ESR’s Professional Organisation Committee (POC chair: Prof. Yves Menu). MIR is dedicated to issues related to management, developments in eHealth, and strategic aspects of radiology. MIR has two main tasks. One of which is to organise MIR@ECR, which is a half-day symposium during the ECR (Saturday, March 9 from 13:00 to 17:30) and the other is the MIR Annual Scientific Meeting, a two-day scientific meeting in October, combined with the one-day MIR Junior Course (October 9–11, Barcelona, Spain).

This year’s MIR@ECR sessions deal with two main topics.

In the first session, Professor Bruce Hillman, editor of the Journal of the American College of Radiology, will present a key lecture on ‘Imaging innovation and the future practice of radiology’. This will be followed by short statements from renowned radiologists discussing residency training, research, EIBIR, HTA, leadership and new imaging methods in radiology.

The second session at MIR@ECR will focus on new aspects of teleradiology, eHealth, appropriateness, and safety in radiology. Dr. Eric Ranschaert will present some initial results from the new ESR White Paper on Teleradiology. The European context and the patient’s perspective will be discussed with a speaker from the European Commission. The fragmented situation in Europe regarding appropriateness, referral guidelines, safety aspects and evidence-based radiology will be presented and discussed by Drs. Remedios, FitzGerald and Senol. MIR@ECR is an excellent opportunity to learn about strategic aspects of radiology from leaders, as well as how to prepare for upcoming developments and how to interact with referring physicians and patients. There will be time to discuss and meet the speakers during the coffee break.

More information on the MIR Subcommittee can be found at www.mir-online.org

Peter Mildenberger from Mainz, Germany, is Chairperson of the MIR Subcommittee.

Saturday, March 9, 13:00–17:30, Room Q

Session 1:  Innovation management and the future of radiology and radiologists

Chairmen:
Yves Menu, Paris/FR
Peter Mildenberger, Mainz/DE

13:00 Welcome by the chairs
13:10 Imaging innovation and the future practice of radiology
Bruce Hillman, Charlottesville, VA/US
13:40 Resident training: preparing young radiologists for the future
Birgit Ertl-Wagner, Munich/DE
13:45 Research, EIBIR, HTA
Luis Donoso, Barcelona/ES
13:50 Health technology assessment: can we show that radiology is value for money?
Jane Adam, London/UK
13:55 Leadership and personal development
Yves Menu, Paris/FR
14:00 New imaging methods
Moshe Graif, Tel Aviv/IL
14:05 Radiology 2020: residents’ and fellows’ perspectives
Myriam Edjlali-Goujon, Tours/FR
14:10 Debate on innovation management and requirements of radiology
14:45–15:15 Coffee Break

Session 2: Radiology in modern times: challenges by telemedicine, eHealth, appropriateness and safety

Chairmen:
Gay Frija, Paris/FR
Jan Schliebebeck, Bocharden/BE

15:15 The radiologist’s perspective: report on the development of an ESR White Paper for Teleradiology
Eric Ranschaert, s’Hertogenbosch/NL
15:35 The requirements of citizens and the role of patients using telemedicine
Karim Berkouk, Brussels/BE
15:55 Imaging referral guidelines in Europe: impetus, innovations and initiatives
Denis Remedios, Harrow/UK
16:15 Factors affecting safety of patients: workload, reporting speed, etc.
Richard FitzGerald, Wolverhampton/UK
16:35 Evidence Based Radiology: the math of decision in radiology
Utku Senol, Antalya/TR
16:55 Discussion
17:15 Closing remarks
Interaction between basic science and clinic key to successful research, claims today's Honorary Lecturer

By Michael Crean

In recognition of his work in cancer research and his efforts to further the development of oncological imaging, Jean-François Geschwind from Johns Hopkins School of Medicine, Baltimore, Maryland, United States, was appointed director of the division of vascular and interventional radiology research at the Johns Hopkins Hospital.

Geschwind had begun his early medical training at the University of Paris School of Medicine and subsequently moved to the United States, where he studied at the University of Pennsylvania and then completed his medical degree at Boston University School of Medicine in 1973. He then completed his residency training in diagnostic and research radiology as a research scholar (supported by the National Institutes of Health) at the University of California, San Francisco in 1996.

He went on to complete his two-year training in vascular and interventional radiology at the Johns Hopkins University School of Medicine, before joining the faculty there as an assistant professor. In 2002, he was appointed director of the division of vascular and interventional radiology and the Interventional Radiology Center at Johns Hopkins Hospital, and in 2007 he was promoted to professor of radiology, surgery and oncology at the Johns Hopkins University School of Medicine.

Reflecting upon his career so far, Prof. Geschwind explained why he loves working as a clinical scientist. "I am extremely grateful for having been able to pursue a clinician and scientific academic career. I have always been excited by concepts and ideas that I could then test in the clinical setting or in the laboratory. There is nothing more exhilarating than designing experiments and acquiring the results. This is the kind of intellectual exercise I enjoy most. It is a validation of my theories and it is extremely gratifying. As a clinical scientist, I have discovered that the process is not linear from bench to bedside but rather circuitous with a real need for constant interactions between the world of basic science and the clinic. The key though, is to have an idea or a research plan and pursue it diligently. Without a steady idea and the passion for the work, there will never be a successful outcome in the end."

A leading figure in the field of liver diseases, Prof. Geschwind has focused most of his research on hepatic cancer. He has received numerous grants from foundations, industry and the federal government for his research in the field.

Prof. Geschwind has authored or co-authored more than 350 scientific articles and abstracts on interventional radiology and, more specifically, the treatment of liver cancer. As lead or co-investigator on more than 40 clinical trials, Prof. Geschwind's research has been published in highly rated peer-reviewed journals, including the Journal of Clinical Oncology, Clinical Cancer Research, Radiology, European Radiology, Gastroenterology and Annals of Surgery. He has also won numerous national and international awards in recognition of his research accomplishments. In addition to having co-authored the first book dedicated to interventional radiology, entitled Interventional Oncology: Principles and Practice, Prof. Geschwind is currently co-editing the book, Abrams Angiography. Interventional Radiology with Dr. Michael Dake.

A prolific speaker and lecturer, both nationally and internationally, Prof. Geschwind has delivered over 200 keynote speeches at scientific assemblies, annual meetings and symposia. He has also served as professor at many prestigious institutions throughout the world.

"I am incredibly honoured and humbled to have been selected to give this honorary lecture," Prof. Geschwind said. "It has been a long journey since I left France to pursue my career in the US. This lecture is the fulfilment of this dream. Furthermore, the fact that it is taking place in Vienna is especially meaningful for me since it was the beloved home of my grand-parents."

ECR 2013 set to welcome top medical students and residents

By Milisandre Rouger

The European Society of Radiology (ESR), which organises the ECR, strives to stay at the cutting-edge of science, helping it shape the future of medical imaging. This commitment goes beyond technology and research, as the society nurtures the talent of physicians of tomorrow through support programmes. These programmes help them discover the wonders of imaging and, hopefully, choose radiology as their specialty. Students and residents are highly encouraged to take part in the Rising Stars’ programme, which grants students free registration to the ECR. This initiative has produced significant results, with more than 1,400 students visiting the ECR last year, making it the world’s largest student meeting in medicine.

Medical students and radiographers in training under the age of 30 and without an academic degree can register for the congress free of charge. They can also submit abstracts (the best submissions are offered free accommodation and travel) and attend Hands-on Workshops on ultrasound and many other scientific sessions.

The ESR launched the ‘Invest in the Youth’ programme for radiology residents and radiography trainees in 2003, and it has continued to expand ever since. The budget allocated to this programme has risen by 200 percent to €300,000 over the last four years, allowing more young professionals to attend the ECR free of charge. As of today, about 3,000 candidates have participated in ‘Invest in the Youth’, and 333 applicants have been accepted.

To apply for this programme, candidates must submit an oral or poster presentation directly to the congress in the Youth Programme. To be eligible, candidates must have valid ESR membership and be either trainee radiologists under the age of 35, or trainee radiographers aged 30 or younger. Successful applicants are also granted free registration for the ECR, four nights’ hotel accommodation and free public transport for the duration of the congress.

If you want to apply for the ‘Invest in the Youth’ programme or register as a student for ECR 2014, please contact robert.guenneau@myESR.org.

Rising Stars Programme

Student Session 3
Saturday, March 9, 08:30–10:00, Studio 2013
‣ CT, MRI, US or x-rays for blunt trauma in pregnancy
‣ Cervical trauma: is plain x-ray still necessary?
‣ Scaphoid and cervical spine fractures: are plain x-rays really enough?

Student Session 4
Saturday, March 9, 10:30–12:00, Studio 2013
‣ New algorithm for treatment of trauma patients required: considering total body imaging instead of plain x-ray as initial management
‣ Post-mortem CT characteristics and its influence on virtual autopsy
‣ Implementing student to student mentorship in the Faculty of Medicine from ‘Grigore T. Popa’ University of Medicine and Pharmacy, Iasi

Student Hands-on Workshops on Ultrasound
In cooperation with SonosYou

After last year’s success, hands-on workshops exclusively for students will again be held at ECR 2013. An expert team of tutors will lead the students through the workshops, which will include specific workshops to give every participant the chance to familiarise themselves with the wide range of possibilities with ultrasound.

Workshops

‣ Workshop 1: Friday, March 8, 10:00–12:00
‣ Workshop 2: Friday, March 8, 14:00–16:00
‣ Workshop 3: Saturday, March 9, 16:30–18:00
‣ Workshop Advanced: Sunday, March 10, 10:00–11:00

Registration: These workshops are fully booked. Places may become available at short notice online.
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Radiology in the Netherlands: specialisation and consolidation

By Herman Pieterman

Over the last decade the number of radiologists, both in absolute figures and per 100,000 inhabitants, has grown between 16 and 20 percent in the Netherlands. According to most prognoses this growth will continue, or even increase, over the next decade. This is a global trend but in the Netherlands we see two interesting phenomena, which are both somewhat related to this growth: specialisation and consolidation.

Specialisation Nowadays some form of specialisation occurs within nearly every radiology department. Almost every member of the Radiological Society of the Netherlands is linked to one of the specialised sections of our society. The new resident training programme we started a few years ago has given this trend a firm boost. Healthcare insurance companies and the government, a director’s role in the hope of stopping the growth in healthcare expenses. The strategy is to focus, among other things, on concentration of care: contracting with first-hand information. This will inevitably lead to the specialisation of clinicians. In time this will also affect radiological departments, but even now we see a growing interest in teleradiology and collaboration between groups of radiologists. The most spectacular example is the recent merger of radiologists from five hospitals in the eastern part of the Netherlands into an association of 34 radiologists.

The increase in knowledge within radiology, enhanced by concentration of care, is not the only factor behind specialisation. The increasing number of complex questions concerning quality, training and so on demands some form of specialisation. Board activities are now assigned to portfolios. The growing number of meetings (caused by the increased number of committees and sections within our society) has forced us to increase the amount of office staff. More importantly, thanks to continuing professionalisation, a growing quantity of work can be delegated to specialised office staff.

Joining forces Although we are constantly growing in number, the opposite is true for our influence; a serious problem which is not limited to radiology. Besides the scientific societies there exist a number of individual doctors in the Netherlands, who wouldn’t consider vital information trivial events that others probably means it’s mainly used to discuss the same subject.

ESR and ECR Presidents in the Rising Stars Lounge

Meet & Greet with your RTF Representative

Don’t miss the opportunity to get in touch with your national RTF representative during the ECR and RTF General Meeting Point in the Rising Stars Lounge (Floor B, Level 2) where resident representatives from various countries will be available daily from 13.15 to 13.45 to provide you with first-hand information.

ESR and ECR Presidents in the Rising Stars Lounge

Meet the unique chance to meet and greet the ESR and ECR Presidents in the Rising Stars Lounge during the ECR.

Saturday, March 9, 15:45–16:00
Prof. José I. Bilbao (Spain)
ECR Congress President
Sunday, March 10, 12:45–13:05
Prof. Gabriel P. Krestin (Netherlands)
ESR President

RTF Highlighted Lectures and the RTF General Assembly

Make sure you catch the RTF Highlighted Lectures and the RTF General Assembly.

Sunday, March 10, 10:30–12:00, Room Q

Moderators: Dr. Bjørg Sandvåg

Emergency radiology management in patients with polytrauma
U. Linsernsammel, Munich, DE

Imaging of non-traumatic intracranial haemorrhage
Z. Mohammed, Sapporo, JP

Case-based learning in radiology
P. Piskarskas, Vilnius, LT

ESR General Assembly

Tuesday, March 12, 14:00–15:00, Meeting Room 3, Level 2

The programme includes five streams of lectures and workshops, which includes cancer screening in colorectal, mammography, upper GI and ERCP, lung, lymph nodes, head and neck and cardiac imaging. Educational elements of the programme include audit and scientific abstracts, focused sessions and live debates.

Abstract submissions for research and audit presentations and posters are received until 12pm Friday 19 April 2013. Registration is open with early bird tickets available until 2pm Friday 21 May 2013.

For more information contact The Royal College of Radiologists Conference Office conference@rcr.ac.uk 020 7929 1130.
French radiology takes on challenges posed by cancer

By Frank Boudghene

As is the case in many other countries, radiologists in France play a pivotal role in disease management, especially oncology. Hence, it came as no surprise to us that oncologic imaging was selected as the theme of the first International Day of Radiology on November 8, 2012. As a great many radiologists, from 80 societies over five continents, participated in the International Day of Radiology, we are convinced that contributions from imaging are crucial to oncologic medicine.

Imaging is already involved in every stage of cancer treatment:

- Imaging is essential at baseline for screening, detecting, and diagnosing cancer; favouring early stage management and improving outcome.
- Imaging is essential for direct tumour targeting, either for image-guided biopsies or image-guided tumour ablation or embolisation.
- Imaging is essential for cancer staging and disease extent assessment and crucial for treatment selection.
- Cancer response to treatment, as well as the detection of relapse or recurrences also relies on imaging. Metabolic and functional imaging provides additional data, enabling an early change in treatment, with a potential impact on treatment options and duration.

In France, two national screening programmes are in operation, one for breast cancer and one for colon cancer. However, the number of people participating in these two programmes remains relatively low. Only 52.7 percent of all French women from the target population (50–74 years old) have taken part in the breast screening programme; this figure varies in different parts of France, although the target level is 70 percent. The results for colon cancer screening are worse, as the level only reaches 42 percent of the entire target population (50–74 years old), also with large differences depending on region. Radiologists have developed a high level of continuous education in this field. The involvement of French radiologists in colon cancer screening is less important, because imaging is not part of the main screening test. However, this situation could change in the future; close cooperation with the French national health authorities (HAS) could redefine the role of radiologists in colon cancer screening programmes, as was the case with our colleagues in the United States through the United States Preventative Services Task Force.

For the French Cancer Imaging Federation and the SFR, radiologists can improve the participation of patients in national screening programmes by enhancing public communication and information. One of the most exciting solutions we have developed for cancer patient management is the continuous development of cooperation between radiologists and other medical specialities involved in oncology. ‘Multidisciplinary meetings’ have been set up in French hospitals with the mandatory presence of a radiologist. All initial and follow-up decisions for any cancer patient have to be made in these meetings. Here radiologists share clinical, biological, molecular and imaging data with surgeons, oncologists and pathologists. This core role of radiologists helps to optimise not only imaging procedures, but also treatment strategies such as chemotherapy and radiation therapy.

Interventional imaging procedures are more frequently included in cancer treatment protocols, representing true medical progress while also improving cost-effectiveness. However, the role of the radiologist in disclosing a disease diagnosis, or disease relapse, to the patient needs to be better defined. With the help of national patient associations we are trying to take on this challenge, which we see as vital to better patient care. Imaging equipment resources have become crucial during the economic crisis, and the decrease in the amount of radiologic equipment availability in France remains critical as CT, MRI and PET procurement rely on regulatory authorisation from the administration. This is especially the case for MRI and PET, which today can be considered major tools in the fight against cancer. When compared to the rest of Europe, France’s shortage of MR devices is evident: there are 10 MR machines per million people in France, while the number in Europe is 20 machines per million people. This low number has led to delays in cancer management, a national inquiry showed that the average cancer patient waiting time for an MR examination is 29 days while the French National Cancer Institute’s target is less than 10 days. The quality and amount of imaging equipment varies throughout the country. Despite these difficulties, our aim is to explore new fields that could improve cancer patient management. For example, we need to investigate the capabilities of PET-MRI in oncologic imaging. However, we still do not have even one PET-MR in the entire country, not even for research purposes.

Both whole-body diffusion and perfusion MRI also appear promising; however, both techniques are not adequate for covering cancer patient needs in France. National imaging has been proposed by the French College of Academic Radiologists (College des Enseignants de Radiologie de France). The three learning objectives levels in the oncologic programme described at the recent ECR Paris meetings are necessary in order to build new organisational schemes and improve cancer patient care.

More information about the Société Française de Radiologie can be found at www.sfrnet.org

Professor Frank Boudghene is President of the French Cancer Imaging Federation issued from the French Society of Radiology.
Italian radiology builds on its past to improve patient care

By Giuseppe Brancatelli

One of the leading national organisations for the promotion of education and science in Italy, and one of the world's oldest radiological societies, in 2013 is the Society of Radiology and Medical Imaging (SIRM). Celebrating the centenary of its founding, SIRM has traditionally been an enabler of education and research in radiology. To commemorate this anniversary, a panel of leaders formed by the past-president, Prof. Antonio Rondot; president, Prof. Carlo Paletti; and president-elect, Prof. Carlo Masciocchi, will coordinate and organise a meeting entitled 'Radiology beyond Medicine', to be held in Turin in May 2013. The goal of the event is to highlight the applications of radiology in fields such as archaeology, art, airport security, food inspection, etc.

The Italian Society of Radiology of Bosnia and Herzegovina, which was the first MRI school course in the country, was the first MRI school course in the region. The Clinical Center in Sarajevo, the country's third biggest country (the tertiary level of medical education), involved in the day-to-day education of residents. The association is involved in the day-to-day education of residents. The association is currently trying to emphasise to the competent authorities the importance of harmonising the current professional and research curricula in radiology and neuroradiology.

Another important event last year was the first MRI school course in Bosnia and Herzegovina, which was a project from the association and the department of radiology at the Clinical Center in Sarajevo. The school attracted around 30 participants from the region of southeast Europe, and the lectures were delivered by the most eminent professors in the region. It proved to be a great success and we hope that in the coming years it will become a constant feature of basic education and the latest trends in magnetic resonance imaging in the region.

Five clinical centres all over the country (the tertiary level of medical care) and teaching centres are involved in the day-to-day education of residents. The association is currently trying to emphasise to the competent authorities the importance of harmonising the current national curriculum for specialisation in radiology with European standards. Over the last couple of years the training system has improved but the duration remains at four years.

The Ministry of Health made further efforts to assist in the procurement of the latest equipment for clinical centres, however, in most cases secondary healthcare institution are still under-equipped, or using obsolete equipment. One of the focuses of our activities next year will be on influencing the competent authorities to provide basic radiological equipment for smaller hospitals and other health institutions. The Clinical Center University of Sarajevo has acquired the first PET-CT scanner our country. Almost all major radiology centres in Bosnia and Herzegovina have installed PACS systems.

The Clinical Center of Sarajevo has acquired the first PET-CT scanner in our country. Almost all major radiology centres in Bosnia and Herzegovina have installed PACS systems. One of the concerns of the association for next year is going to be encouraging Bosnian and Herzegovinian radiologists to present their current professional and research activities in radiology meetings throughout the region and Europe. In the future we hope that we will be able to bring Bosnian-Herzegovinian radiology up to the European level.

More information about the Società Italiana di Radiologia Medica can be found at www.sirm.org

More information about the Association of Radiology of Bosnia and Herzegovina can be found at www.radiologia.ba

Bosnia and Herzegovina focuses on education

By Zulejha Merhemić

The Association of Radiology of Bosnia and Herzegovina, with approximately 140 members, is a core part of education and scientific research for radiologists in Bosnia and Herzegovina. In 2013, it focused its activities on strengthening the organisation, completing the annual meeting of radiology. The Annual Meeting of Radiology was held in the city of Konjic, in September, with the intention of getting radiologists from around the country together to discuss current trends and issues in their work. The main focus was on the shortage of radiologists and radiographers in Bosnia and Herzegovina, compared with other European countries, and the solutions the association has to offer.

Another important event last year was the first MRI school course in Bosnia and Herzegovina, which was a joint project from the association and the department of radiology at the Clinical Center in Sarajevo. The school attracted around 30 participants from the region of southeast Europe, and the lectures were delivered by the most eminent professors in the region. It proved to be a great success and we hope that in the coming years it will become a constant feature of basic education and the latest trends in magnetic resonance imaging in the region. Five clinical centres all over the country (the tertiary level of medical care) and teaching centres are involved in the day-to-day education of residents. The association is currently trying to emphasise to the competent authorities the importance of harmonising the current national curriculum for specialisation in radiology with European standards. Over the last couple of years the training system has improved but the duration remains at four years.

No subspecialty is officially recognised by the government yet. As in previous years there is consensus among radiologists in Bosnia and Herzegovina on the need for the Ministry of Health to recognise and establish subspecialties, at least in interventional radiology, paediatric radiology and neuroradiology.

The Ministry of Health made further efforts to assist in the procurement of the latest equipment for clinical centres, however, in most cases secondary healthcare institutions are still under-equipped, or using obsolete equipment. One of the focuses of our activities next year will be on influencing the competent authorities to provide basic radiological equipment for smaller hospitals and other health institutions, as we witness an ever greater need for radiology examinations. The Clinical Center University of Sarajevo has acquired the first PET-CT scanner in our country. Almost all major radiology centres in Bosnia and Herzegovina have installed PACS systems.

One of the concerns of the association for next year is going to be encouraging Bosnian and Herzegovinian radiologists to present their current professional and research activities in radiology meetings throughout the region and Europe. In the future we hope that we will be able to bring Bosnian-Herzegovinian radiology up to the European level.

More information about the Association of Radiology of Bosnia and Herzegovina can be found at www.radiologia.ba

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What’s on today in Vienna?

Theatre & Dance
Please note that all performances are in German!

Akademietheater
1030 Vienna, Lizustraße 1
phone: +43 1 51444 4145
www.burgtheater.at
20:00 Der Talisman by Johann Nestroy

Burgtheater
1010 Vienna, Dr. Karl-Lueger-Ring 2
phone: +43 1 51444 4145
www.burgtheater.at
15:00 In 80 Tagen um die Welt by Jules Verne

Schauspielhaus
1090 Vienna, Porzellangasse 19
phone: +43 1 317 01 01
www.schauspielhaus.at
16:00 Der Seidene Schuh by Paul Claudel

stadtTheater walfischgasse
1010 Vienna, Walfischgasse 4
Phone: + 43 1 512 42 00
www.stadttheater.org
20:00 Der Vorname by Matthieu Delaporte and Alexandre de la Patellière

Theater Drachengasse
1010 Wien, Fleischmarkt 22
Phone: +43 1 513 14 44
www.drachengasse.at
20:00 Das normale Leben by Christian Lollike

Theater in der Josefstadt
1080 Vienna, Josefstaedter Straße 26
phone: +43 1 42 700 300
www.josefstadt.org
19:30 Der Mentor by Daniel Kehlmann

Volkstheater
1070 Vienna, Neustiftgasse 1
phone: 43 1 52111 400
www.volkstheater.at
19:30 Bon Voyage by Rupert Henning

Concerts & Sounds

Konzerthaus (Classical Music)
1010 Vienna, Lothringerstraße 20
www.konzerthaus.at
19:30 Patricia Kaas
Kaas chante Piaf

Porgy & Bess (Jazz)
1010 Vienna, Riemergasse 11
www.porgy.at
20:30 Harry Sokal ‘Groove’ (A)

Opera & Musical Theatre

Volksoper
1090 Vienna, Währingerstraße 78
www.volksoper.at
19:00 Die Zauberflöte by Wolfgang Amadeus Mozart

Wiener Staatsoper – Vienna State Opera
1070 Vienna, Spieglering 2
www.wiener-staatsoper.at
19:30 La Traviata by Giuseppe Verdi, conducted by Paolo Carignano
With Marlis Petersen, Rolando Villazón, Fabio Capitanucci

Raimundtheater
1060 Vienna, Wallgasse 18–20
www.musicalvienna.at
19:30 Elisabeth by Michael Kunze & Sylvester Levay

Ronacher
1010 Vienna, Scharnsteinstraße 9
www.musicalvienna.at
19:30 Natürlich Blond by Laurence O’Keefe, Nell Benjamin & Heather Hach