Sports imaging requires open mind, anatomical know-how and great care over modality choice

By Philip Ward

Sports imaging is playing an increasing role in confirming a provisional diagnosis, detecting other conditions, planning and monitoring treatment, and reassuring patients that they can return safely to their activity and there is no significant injury, ECR delegates learned at Sunday morning’s musculoskeletal refresher course.

It is important to consider not only the mechanism and cause of the injury but also the associated features, said session moderator Dr. Gina Allen, radiologist and sports physician from the Oxford Soft Tissue Injury Clinic in the U.K. Among the questions to ask are: Is the athlete’s technique correct? Has their technique developed as they’ve grown? Are they getting the right diet? Are they taking additional substances, such as drugs? Have they had previous injuries? Are they overtraining? What is the psychology behind the injury? Are they presenting because they don’t want to compete?

"Imaging is just one key element of the process," noted Allen, a member of the London Olympics 2012 imaging committee. "We’re always being asked by the patient, ‘How quickly can I get back to my sport?’ We don’t just have to cope with the pressures of the patient; we also have pressure from the management and the coach to get the athlete back to the sport."

For example, in tendon overuse injuries, it may be that the patients have had improper training or coaching. They may have changed their shoes, altered their equipment, trained at a different altitude, or started playing sport on a different all-weather surface. These factors must be taken into account, she advised.

Allen said ultrasound is now a core subject in sports medicine training in the U.K., and portable scanners have become the ‘stethoscope’ of the sports physician. However, the modality has its limitations. For instance, acute muscle injuries may be difficult to identify with ultrasound during the first few hours after trauma, according to Dr. Carlo Martinoli, associate professor of radiology at the University of Genoa, Italy. A new haemorrhage is echogenic and similar in appearance to normal muscle, and a fresh haemorrhage can mix with the normal fibrofatty tissue within the muscle and be inconspicuous in an early ultrasound examination.

"It is easy to underestimate or even overlook muscle tears within the first few hours of the injury. This places great demands on image quality and the examiners’ skills," said Martinoli, stressing that MRI is more sensitive and reliable immediately after trauma, but then an ultrasound examination can be performed several hours later.

Muscle strains are not the result of muscle contraction alone; in fact, strains are the result of stretching while the muscle is being activated. Muscles are more susceptible to strain injuries because they cross two joints, have a complex architecture, act mainly in an eccentric fashion, and contain a high percentage of fast-twitch (type-II) fibres, he explained.

After six hours, the haematoma starts to liquify, and it becomes of low echogenicity over the next two or three days, allowing greater precision in the diagnosis. The pattern of the haematoma can be better appreciated and understood, but radiologists must make sure they look at the myotendinous junctions and avoid putting too much pressure on the fascial planes, he recommended.

"An in-depth knowledge of muscle anatomy and the systematic scanning technique of aponeuroses and intramuscular tendons is essential not to miss low-grade muscle strains with ultrasound," said Martinoli.

Ultrasound provides an ideal way of assessing the sequential stages of haematomat reabsorption, which occurs in six to eight weeks. The haemorrhagic cavity progressively shrinks, and its walls thicken and collapse.

Compared with ultrasound, MRI can provide a more comprehensive study of musculoskeletal...
Detecting liver tumours: the search for the Holy Grail

By Frances Rylands-Monk

Liver tumour detection has moved beyond anatomic imaging to establishing the correlation between imaging and physiology, according to Baron, chairman of the department of radiology at the University of Chicago. He paid tribute to experts such as Drs. Rui and Matsu, who have helped radiology to acknowledge the central role it plays in patient care and research through understanding tumour, contrast and blood flow biology.

"They have pushed our frontiers in liver imaging. We have learned that imaging can paral- el clinical and biological findings," he noted.

Over the past 30 years, guidelines about patient management have changed, particularly for transplant in patients with HCC, making radiologists pivotal determiners of individual outcomes.

"That demands that we know accurately the number of tumours and size of each tumour to the decimal point. If you see a tumour of 3 cm with multiple tumours in the U.S., you won't be transplanted. If it's 2.9 cm, you get ahead of the line," Baron said.

He questioned where this trend of steering patient care had led in the past, citing the example of 43 patients who had received transplants using these criteria. Fifteen patients were diagnosed with HCC and accelerated ahead of the others. Following transplantation five of these were false positives.

"This was a very bad outcome for ten patients. The five who didn't need the transplant, and the five in the intensive care unit dying of liver failure who didn't have a cancer, but were denied the transplant because these patients went ahead on the list," Baron said.

Radiology has come full circle and uses techniques employed three decades ago to understand the importance of the equilibrium phase.

"We can see the enhancing module of HCC but many lesions enhance in the liver including focal mass hypervascularity and portal venous or equilibrium phase wash-out, Baron outlined.

"We should continue to focus in narrow areas to improve our ability to seek, characterise and detect tumours, and we did with liver-specific contrast agents, diffusion-weighted imaging and some MRI hold oxygen physiology in liver tumours. But the crusade must evolve to have impact, to deliver the 'value of the Grail to all,'" he said.

Baron urged all radiologists to develop the skills to understand clinical medicine and its nuances, and integrate imaging with other as yet unknown critical measures to reflect patient outcome potential. If imaging is still the key means of medical triage, radiologists should define the key remaining components.

In research the radiological community must take the lead in using relevant clinical outcomes as the true gold standard, leading imaging into true multi-disciplinary participatory research.

Detecting liver tumours: the search for the Holy Grail

By Mélisande Rouger

The radiologists of the future were very much present at the ECR yesterday as the best medical student lectures were recognised with awards.

For the first time, medical students were invited to give a lecture at ECR, after 20 of the best submitted abstracts were selected. Four of them received a certificate from Professor Adrian K. Dixon, the ESR Publications Committee Chairman, signed by ECR Congress President Professor Yves Menu and ESR President Professor Maximilian Reiser.

Students were invited to submit abstracts on topics ranging from radiology in undergraduate education to the challenges for the future for radiology, among others.

"It is important to have a place for students, not only at the ECR but at all radiology congresses," said Marcello Messina, a student at the Medical University of Milan, who was commended for his abstract 'Radiology: a holistic medicine beyond medicine.'

Alexander Sachs, a student at the Medical University of Vienna, concurred. "It was an experiment, they wanted to see how students can present their work. I appreciated very much, it is a great opportunity and a good educational experience," he said.

Most of them were attending their first radiology congress and tried to make the most of it – even if they struggled to see everything.

"I was invited to the breast cancer workshop symposium for students, organised by Siemens. Normally it is a topic I don't know much about, so it was quite interesting to see what is actually going on there," said Sachs, whose presentation "Keep It Simple and Straightforward (KISS)." But as we had to do presentations, it was difficult to attend all the sessions," said Carmello Messina from the Medical University of Milan. His lecture 'How radiology is changing: three unavoidable challenges for the future' was also chosen as one of the best.

"I attended sessions on evidence-based medicine and on incidental findings. I think it is important because it is a challenge for the radiologist to make the right diagnosis," said Petrini, who is sure about his vocation as a radiologist.

Adrien Rácz from Budapest also received a certificate for her presentation 'Fascinating imaging and promising research in the brain'.

"It is really a great honour to be here. I hope it continues like this," Sachs said.

Rising stars shine brightly at ECR

HIGHLIGHTS

Monday, March 7, 2011

ECR TODAY 2011
Bonomo turns attention to ECR 2012 and looks forward to presiding over the next congress

By Mélisande Rouger

ECRT: ECR 2011 also saw the launch of two initiatives, the Stars programme, in which students can submit abstracts, and the CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus.

Finally, the Foundation Course will focus on ultra- sound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose validation questions, receive the opinion of the audience and invite speakers to give their talks and state their positions, ultimately leading to a consensus. Finally, the Foundation Course will focus on ultrasound, and the Workshop Series will deal with arthrogenal imaging and neurological emergencies. The CLICK format introduced at ECR 2011 on the most common clinical problems in abdominal imaging. Each session will be interactive, and we will propose valid
Hot Shots from Day 4

More photos @
facebook.com/myESR
myESR.org/ecr2011/hot-shots

All pictures © ESR – European Society of Radiology / Sebastian Kreuzberger, Lukas Schaller, Harry Schiffer
Young radiologists take the ESR Diploma to boost their careers

By Mélisande Rouger

European radiologists are increasingly working abroad, yet national board examinations still differ from country to country. Radiologists in training will be able to increase their chances of gaining employment abroad by taking a brand new examination for the ESR Diploma today at ECR.

Fifty radiologists from 14 different European countries will have their general radiological knowledge tested for this new qualification offered by the European Society of Radiology (ESR). Most of them expect success in the examination to aid their career development, both nationally and internationally.

"Right now we are not certain to get equivalent work somewhere else in Europe. I think the ESR diploma is a good way to facilitate migration," said Elodie Adel, a medical student in radiology training at Grenoble University Hospital in France.

Until 1935, Iran was called Persia, Pers or Pars. The racial background of its 75 million inhabitants is Arab (45%), according to Prof. Abdolrasoul R. Sedaghat, President of the Iranian Society of Radiology. The country occupies an area of 1,648 million sq. km, making it slightly larger than Alaska. Around 89% of the population is Shi'a Muslim, compared with 90% Sunni Muslim and 2% other religions, mostly Jewish and Christian. In the Persian calendar, the current year is 1389, and the New Year begins on March 21. The official language is Farsi.

One of the nation's many historical landmarks was the world's first human rights document, written by Cyrus the Great of Persia during the Achaemenian Era.

In an attempt to promote understanding and build bridges between Europe and Iran, the country's rich culture and heritage came under the spotlight at yesterday's ESR Meets Session.

In an attempt to promote understanding and build bridges between Europe and Iran, the country's rich culture and heritage came under the spotlight at yesterday's ESR Meets Session.

"I did an internship in Graz, Austria, for three months, and I noticed how different things are from home. The Austrian curriculum is, for instance, much more specialised. All these differences could make things more complicated if I were to work in the United Kingdom," Bari said.

"In Austria, everything is very specialised; we don't have a general radiology diploma. But when you're on call you have to do everything, you should have knowledge of paediatric radiology, emergency radiology, etc. This examination is good to test your general knowledge, and it could help to travel and work everywhere in Europe," said Katja Pinker, a consultant radiologist at the department of radiology of the University of Vienna, who specialises in breast imaging.

"When I first heard about this diploma, I was interested. I told my friends and family and they thought it was a good idea. I am looking forward to sitting the exam and getting it done," Pinker said.

Candidates from Austria, France, Germany, Greece, Hungary, Ireland, Italy, Malta, Poland, Portugal, Romania, Spain, Switzerland and Turkey will sit the exam, and the fact that the examination will be in English didn't seem to worry them.

"We learn in French but we read a lot of scientific papers in English. It could actually be a good reason to learn this language better," Adel said.

"I feel ready for another examination, I think this is an opportunity to test myself. I don't mind that it is in English," echoed Riera.

The ESR Diploma does not replace any national board examination and should be seen as a continuation of and a complement to radiological training.

Iranian radiologists hold out the hand of friendship to Europe

By Philip Ward

In an attempt to promote understanding and build bridges between Europe and Iran, the country's rich culture and heritage came under the spotlight at yesterday's ESR Meets Session.

Until 1935, Iran was called Persia, Pers or Pars. The racial background of its 75 million inhabitants is Arab (45%), according to Prof. Abdolrasoul R. Sedaghat, President of the Iranian Society of Radiology. The country occupies an area of 1,648 million sq. km, making it slightly larger than Alaska. Around 89% of the population is Shi'a Muslim, compared with 90% Sunni Muslim and 2% other religions, mostly Jewish and Christian. In the Persian calendar, the current year is 1389, and the New Year begins on March 21. The official language is Farsi.

In an attempt to promote understanding and build bridges between Europe and Iran, the country's rich culture and heritage came under the spotlight at yesterday's ESR Meets Session.

In an attempt to promote understanding and build bridges between Europe and Iran, the country's rich culture and heritage came under the spotlight at yesterday's ESR Meets Session.

"From the bottom of my heart, I want to thank the ESR for inviting us to take part in this session," said Sedaghat. "The recent visits of several important ESR officials to Tehran has meant a great deal to us."

"From the bottom of my heart, I want to thank the ESR for inviting us to take part in this session," said Sedaghat. "The recent visits of several important ESR officials to Tehran has meant a great deal to us."

During the clinical part of yesterday's session, interventional radiology was the focus of four Iranian speakers, who gave presentations about how to start interventional radiology (Dr. Hossain Ghanati, associate professor of radiology, Tehran University of Medical Sciences), stent implantation for the treatment of symptomatic fibroids (Dr. Karouk Fereidoun, associate professor of radiology, Advanced Diagnostic and Interventional Radiology Research Centre, Tehran University of Medical Sciences), interventional procedures in liver transplantation (Dr. Aliyak Rasaei, associate professor of radiology, Shiraz University of Medical Sciences), and radiofrequency ablation of liver metastases (Dr. Mansoor Fatahi, Day General Hospital Tehran).

During the clinical part of yesterday's session, interventional radiology was the focus of four Iranian speakers, who gave presentations about how to start interventional radiology (Dr. Hossain Ghanati, associate professor of radiology, Tehran University of Medical Sciences), stent implantation for the treatment of symptomatic fibroids (Dr. Karouk Fereidoun, associate professor of radiology, Advanced Diagnostic and Interventional Radiology Research Centre, Tehran University of Medical Sciences), interventional procedures in liver transplantation (Dr. Aliyak Rasaei, associate professor of radiology, Shiraz University of Medical Sciences), and radiofrequency ablation of liver metastases (Dr. Mansoor Fatahi, Day General Hospital Tehran).

During the clinical part of yesterday's session, interventional radiology was the focus of four Iranian speakers, who gave presentations about how to start interventional radiology (Dr. Hossain Ghanati, associate professor of radiology, Tehran University of Medical Sciences), stent implantation for the treatment of symptomatic fibroids (Dr. Karouk Fereidoun, associate professor of radiology, Advanced Diagnostic and Interventional Radiology Research Centre, Tehran University of Medical Sciences), interventional procedures in liver transplantation (Dr. Aliyak Rasaei, associate professor of radiology, Shiraz University of Medical Sciences), and radiofrequency ablation of liver metastases (Dr. Mansoor Fatahi, Day General Hospital Tehran).
HIGHLIGHTS

Imaging professionals strive to come to terms with age old clinical problems

By Frances Rylands-Monk

A declining birth rate and an increasing elderly population have resulted in new socio-economic and healthcare problems. Physicians are confronted with complex clinical scenarios arising from this situation.

Diagnostic imaging plays a valuable role in the care of older patients. In the elderly, co-morbidities compounded by physical and cognitive impairment make it difficult for radiologists to provide the clinician with anticipated answers. It is important for radiologists to know the complex health scenarios occurring in geriatric patients, which are different from those seen in younger adults. They must be aware of the possibilities – and limitations – of imaging the geriatric population.

Yesterday’s Special Focus Session was designed to enhance doctors’ recognition of the co-existence of the healthy older person from those in need of treatment.

Key to management of diseases in the ageing brain is understanding the structural visualised brain changes that occur in normal ageing, which were presented by Professor Frederik Barkhof, professor of neuroradiology at the Free University of Amsterdam, the Netherlands. Widening in the Virchow-Robin spaces (VRS), as seen in MRI, is a normal aging phenomenon even in patients as young as 30, and of no pathological significance, he said. Some degree of atrophy of the medial temporal lobe was also sometimes visible.

Extreme widening in VRS was more difficult to determine. Patients often presented with headaches but no discernible pathology. It still might be a sign of normal ageing, while homogenous dot-like structures of UBOs was an abnormal finding and indicated local atrophy often associated with diffuse white matter changes and always with a pathological finding.

“Normal ageing is often defined as the absence of overt disease, but there are a lot of things happening below the threshold. There’s a small group of people who, if you image them, have a healthy brain, but that’s uncommon because most people with typical ageing have some subclinical pathological white matter lesions. The predictive value of these images is only partly known,” Barkhof said. “Even if it’s known, there are inferences at a group level, but on an individual level it is very difficult to make an exact determination of the impact down the line.”

Determining whether or not patients will be able to live independently and for how long is crucial not only for the patients themselves but also for their families. Unidentified White Objects (UBOs) are probably a sign of mild hypoxia, and in a young subject should be reported as abnormal and lead to investigations. Once they start forming small bridges or become confluent, they should be considered abnormal, independent of age. Arterial spin labelling in subjects with extensive white matter changes usually reveals poor perfusion of the tissue.

In one study, healthy subjects with severe confluent lesions (Fransxak grade 2 and 3) showed a 20% reduction in perfusion compared to patients with milder lesions. A LADIS-study imaging patients with mild, moderate or severe confluence showed that 60% of 639 subjects with severe white matter lesions were unable to live independently at home after three years or had died, even though they were doing well at the time of scanning. The results indicate that healthy subjects with severe white matter lesions have a poor prognosis, Barkhof pointed out.

Premature ageing can be predicted through imaging markers, highlighting confluent white matter lesions, silent infarcts, cerebral microbleeds, medial temporal atrophy and amyloid markers.

ECR delegates heard how patients with Alzheimer’s disease (AD) have increased amyloid binding, but presence of amyloid didn’t necessarily mean a patient would develop AD or predict when they would develop it. However, functional biomarkers could show whether or not amyloid was interfering with brain function and aid in predicting premature aging. Now PET tracers could rule out AD in favour of other diseases.

“MRI or CT should be used to work up suspected dementia and rule out treatable disorders or suggest a specific diagnosis. If scans are negative, PET/MRI should be used,” he said. “PET/MRI can also help to diagnose early dementia, even short of established therapy.”

Musculoskeletal disorders through trauma, degeneration or malignancy were a particular problem for the elderly, delegates heard from Professor Anne Cotten, head of musculoskeletal (MSK) radiology at Hôpital Roger Salengro, Lille, France. Loss of mobility and independence could have devastating effects on their quality of life.

Radiologists should know the most common MSK disorders as well as misleading presentations, potentially rendering in inappropriate or erroneous management. Besides low impact falls from standing height, fractures caused by osteoporosis, particularly vertebral fractures, need careful attention as they are associated with excess mortality and significant morbidity, and because the risk of subsequent fractures was high, she said.

When vertebroplasty is indicated, MRI should be performed to localise vertebral fracture and stabilise the vertebroplasty and deliver fast pain relief, Cotten continued.

It was also very important to be able to distinguish between osteoporotic vertebral collapse (OC) and metastatic VC. In osteoporotic VC, imaging findings showed multiple affected vertebrae in the thoracolumbar spine, with diffuse increased radioluency and no osteolysis. Conversely, cases of metastatic VC were often unique, located in the cervical spine, with radioluency and osteolysis.

Massed vertebral fractures presented another pitfall for doctors.

“Rapid diagnosis is fundamental to avoid any delay in treatment, or the risk to the patient in this population is increased morbidity and mortality,” Cotten said.

Partly focusing his talk on imaging features as potential predictors of cardio-vascular disease, Dr. Tobias Saam, a radiologist at Ludwig-Maximilians University, Munich, Germany, began by pointing out that this disease is a more common cause of death than cancer in any age group.

Age-related changes in vascular structure could indicate different stages of atherosclerotic development and therefore risk factors of developing cardiovascular disease.

“Many studies have shown that certain imaging features are associated with an increased risk, however laminar stenosis alone is an insufficient marker to identify the vulnerable plaque,” he commented.

Asked by session moderator Prof. Giuseppe Ogliomelli, from the department of radiology at Foggia University Hospital, Italy, which modality was best to assess the risk factors, Saam responded that prospective studies were needed in PET/CT and MRI, both to determine the best methods to screen for atherosclerosis and identify the modality best suited to determine a patient’s individual risk.

“We could be waiting five to ten years for the results,” he said.

Enjoy Europe’s No. 1 journal!

Benefit from the exclusive advantage of your ESR membership:
Your printed version for only €70 (per year).
Subscribe now at myESR.org/myUserArea and never miss a single issue!

Your benefits:
• more than 3,000 pages of the best scientific content
• sensational new Impact Factor in 2009 of 3.589
• all supplements included
• direct delivery to your home every month

Further information at office@european-radiology.org or www.european-radiology.org

All subscriptions are valid from the day of payment until the end of the calendar year.

ECR TODAY 2011

Monday, March 7, 2011

myESR.org

Frédéric Barkhof from Amsterdam, the Netherlands.

Anna Cotten from Lille, France.

Talita Saam from Munich, Germany.
In 2011, the CIRSE Foundation will organise nine local courses in different university hospitals around Europe. All courses will be held in English.

**Biliary Interventions**  
1-2 April, 2011  
Amsterdam (NL)

**CLI and Diabetic Disease**  
8-9 April, 2011  
Budapest (HU)

**Extrahepatic Tumour Treatment**  
6-7 May, 2011  
Frankfurt (DE)

**Basic Vascular**  
3-4 June, 2011  
Bucharest (RO)

**Aortic Disease**  
10-11 June, 2011  
Milan (IT)

**Dialysis Access & Venous Interventions**  
1-2 July, 2011  
Ingolstadt (DE)

**Embolisation**  
14-15 October, 2011  
Rome (IT)

**Liver Interventions**  
28-29 October, 2011  
Porto (PT)

**Drainage, Biopsies & Venous Access**  
4-5 November, 2011  
Dublin (IE)

www.cirse.org
CT sheds new light on complex cases of small airway disease

By John Brosky

Modern CT scanners can provide volumetric acquisitions with excellent spatial resolution and high-quality images, while reducing the radiation exposure for patients. One area where high-resolution CT has had a great impact is in a dramatically increased sensitivity for detecting signs of small airway disease (SAD), which quite simply could not be seen on traditional X-rays. Yet even with CT's powerful capabilities and sophisticated analysis with post-processing tools, the diagnosis of SAD can be difficult and, at times, confusing.

At this morning's Special Focus session, 'CT of small airways: elementary images for disease classification,' four specialists will help to decrypt the direct and indirect features of SAD to sharpen skills for distinguishing between inflammatory/oxidative or fibrotic/constrictive/obliterative bronchiolitis.

"Patients with SAD have clinical symptoms which may go unexplained but may actually be very harmful," said Prof. Hans-Ulrich Kauczor, who heads the radiology and diagnostic department at the University Hospital in Heidelberg, Germany. "Many people think SAD is rare and does not occur in routine clinical practice, or it is not important because incidence is rather low, but this is not true."

His presentation, 'Beyond morphology,' will focus on advanced functional imaging for assessment of the functional impairment that goes along with SAD, yet his first concern is the tendency to underestimate a condition that often remains under-diagnosed. SAD is important in any form of bronchitis or chronic obstructive pulmonary disease, she said. Furthermore, in any clinical setting, it is always important to integrate all the patient data and to know the condition of the patient – whether they have fever, whether they are experiencing an acute illness, or whether they have any history of connective tissue diseases.

In her presentation, 'From pattern to diagnosis,' Beigelman-Aubry will outline what she calls an optimal approach that navigates a variety of schemes proposed for classifying SAD, which she admits can be confusing. The first step is to determine if there are predominantly direct signs of inflammatory or exudative bronchiolitis, such as centrilobular nodules with tree-in-bud appearance, which can be quickly identified thanks to the enhanced contrast and spatial resolution of CT. The maximum intensity projection tool facilitates the recognition of the tree-in-bud pattern, which is extremely useful in the detection of the profusion and characterisation of micro-nodules.

The highlight of the session promises to be a panel discussion that focuses on a deceptively simple question: "When and why do signs of SAD really matter?"

Beigelman-Aubry acknowledged that in some conditions, detected signs may not be at all useful. For example, air trapping has been described in diseases such as sarcoidosis as significant in the literature, but in practice, reporting of it tends to be of little use. Conversely, if there is a ground glass opacity associated with lobular areas of air trapping, then this pattern it is quite typical of interstitial lung disease related to hypersensitivity pneumonitis and is very useful to report.

Kauczor agrees there is often a question as to whether the very small changes detected by high resolution CT really mean anything with regard to clinical symptoms or indications for a therapy. "In the case of air trapping, I believe a functional assessment with 4D imaging of the respiratory cycle helps detect real trapped volumes and helps assess the physiological condition or a pathologic change that needs to be treated."

Numerous ill-defined ground glass opacities and micro nodules with a heterogeneously distribution are difficult to assess and classify on a single coronal reformatted image (left). Conversely, the tree-in-bud appearance is obvious with a 14 mm thick maximum intensity projection slab (right), allowing a definite recognition of the bronchiolar origin of the anomalies related to infectious bronchiolitis. (Provided by J. Beigelman-Aubry)

See page 10

Management of post-treatment head and neck cases

See page 14

Images gain prominence in surgical suites

See page 16

New techniques display promise in bone tumours
Radiologists work hard to unravel post-therapeutic head and neck mysteries

By Philip Ward

Management of the post-treatment head and neck represents a stern challenge for radiologists. The accurate assessment of tumour response following radiotherapy or chemotherapy is especially problematic, according to Dr. Ann King, from the department of diagnostic radiology & organ imaging, Prince of Wales Hospital, The Chinese University of Hong Kong. Residual masses at primary and nodal sites are common, and in the early post-treatment period, when salvage surgery is desirable, it can be difficult to distinguish a residual cancer from a benign post treatment mass.

At this afternoon’s refresher course, King and her two fellow speakers will attempt to shed light on this complex field.

Conventional imaging with CT or MRI requires knowledge of expected post-treatment changes and appearance of residual cancer. In the post-treatment period, a residual/recurrent cancer (expansile mass that is moderate contrast-enhancing and on MRI of intermediate T2 signal intensity) can be distinguished from a benign post treatment mass (retracted scar tissue that is non-contrast-enhancing and on MRI is of low T2 signal intensity), she explained. The ability of MRI to identify scar tissue on the basis of low T2 signal is especially useful in post-treatment assessment, but in the earlier post-treatment period before the benign post-treatment mass has had time to mature, it may have some similar features to residual cancer.

“Histories can have unwanted side effects in the post-treatment neck and may not confirm or exclude cancer in all cases,” King pointed out. "FDG-PET has a proven role in the assessment of the post-treatment neck, with more accurate results than conventional imaging. However, the best results are usually obtained at least several months after treatment, and while FDG-PET has a high negative predictive value, a positive scan is less specific and may be caused by tumour or post-treatment changes.

For those patients with indeterminate residual masses, a useful method is to calculate the apparent diffusion coefficient (ADC) from DWI-MRI. This measure reflects the diffusion of water molecules, and according to King, is especially helpful for monitoring tumours post-treatment in the neck, as the ADC of tumour is significantly lower than that of residual scar tissue.

ECR lecture should provide a brief overview on how to distinguish scar tissue from a tumour and how to identify complications of treatment that may be confused with tumour recurrence. The lecture will also provide a check-list for assessing the post-treatment neck during imaging surveillance.

Functional MRI for pre-treatment prediction and early intra-treatment monitoring may become more important, but only the role of imaging in the post-treatment neck will be covered in her presentation. In the field of research, serial functional MRI during treatment may help to identify time points and causes for development of treatment resistance, King concluded.

As treatment planning becomes progressively more tailored to a patient’s needs, strong predictive factors for the individual tumour must be identified, noted Prof. Roberto Magnaldi, department of radiology, University of Brescia, Italy. These factors should provide a quantitative assessment of the risks of both relapse (in the primary, nodal or distant sites) and developing treatment-related complications. Predictors are related to a tumour’s characteristics and to a patient’s overall clinical conditions. Imaging-based predictive factors have been found on morphological findings, but the landscape is changing due to development of new techniques that analyse functional parameters like FDG-PET-CT and perfusion CT and DWI-MRI.

Perfusion CT and DWI-MRI are promising techniques because they provide information about neo-angiogenesis and water-flow in sub-microscopic tissue compartments, but they still require randomised trials and confirmation studies about the reproducibility of their interesting results, said Magnaldi, who will moderate and speak at today’s session.
Moving image data beyond radiology promises to transform working practices

By Philip Ward

Better and faster imaging enables more accurate diagnoses with less risk and at lower cost than ever before. Faster scanning techniques also mean a change from static to dynamic information, while increasing computer power and faster and more complex post-processing algorithms can deal with enormous datasets and provide new types of information, such as functional imaging.

"These changes require new expertise from radiologists," said Dr Erik Ranschaert, a radiologist at the Jeroen Bosch Ziekenhuis (JBZ), s-Hertogenbosch, the Netherlands, and a speaker at this afternoon's refresher course on image sharing. "We need to be aware of the entire disease process and able to analyse this dynamic and functional information. Multidisciplinary collaboration is also a prerequisite for useful integration of these new imaging techniques with the patient's treatment. For example, cardiologists are increasingly using non-invasive imaging techniques, and advanced post-processing with supercomputer technology will eventually allow them to choose less invasive procedures. These are exciting developments."

An increasing number of surgical interventions use computer-based image-guided navigation techniques, such as computer-assisted orthopaedic and spinal surgery (see www.cass-international.org), computer-assisted head and neck and ear, nose and throat surgery, image-guided neurosurgery and minimally invasive cardiovascular and thoracoabdominal surgery. Also, the increasing development of laparoscopic surgery puts a better organisation of image distribution because it is of major importance for preoperative planning and intra-operative guidance, he noted.

In oncology, there is increasing integration of images, particularly interventional radiology, with treatment in several areas: CT/MR diffusion and perfusion for planning and follow-up of tumour treatment, e.g. to differentiate between necrotic and viable parts of the tumour; 3D segmentation for planning of treatment of liver tumours; robots used for automated navigation of a needle or other instrument in brain surgery, surgery and radiation oncology; interventional techniques for embolisation of tumours; TACE (transarterial chemoembolisation); radiotherapy, radiofrequency ablation (RFA), cryosurgery, etc.

This trend has contributed to the formation of multidisciplinary societies such as the Society of Cardiovascular Computed Tomography (SCCT), the International Cancer Imaging Society (ICIS), the Intraoperative Imaging Society (IoIS), the Society for Molecular Imaging (SMI) and others.

At the JBZ, the new operating suite is being equipped with large screens that can be pulled down from the ceiling so that surgeons can make better use of imaging, as the diagram shows. Real-time guidance using ultrasonography will also be offered. Surgery is becoming more and more micro-invasive due to the use of endoscopic techniques, and precise guidance is increasingly important. Radiologists and surgeons will work together closely in areas like selective tumour ablation using RFA with ultrasound, followed by partial liver resection.

Sharing images with colleagues outside of a radiologist's own hospital is also becoming easier, according to Ranschaert. For most second opinions offered in secondary or tertiary centres, previous images studies are still transferred on CD or DVD, but a more efficient and less costly solution is to make images automatically available by storing them in a "virtual cloud" that is accessible to other health care providers and patients. Several companies are already providing this type of service, especially in the US.

More surgical and clinical/oncologic specialists will use their own software with navigation and visualisation tools. Radiologists need to become more subspecialty oriented in order to be able to create added value in this process, and they need to focus on competence in specific areas, he said. They will also need to become more clinically oriented so that they are able to give useful advice. Treatment of the patient is increasingly complex and requires more intensive collaboration from all players involved. To be part of this imaging chain, from image acquisition to the report, they have to specialise and participate with other disciplines.

"We need to think in more broadly and creatively," Ranschaert noted. "We should not limit our activities to just reading images from behind our workstations. Communication skills and a thorough knowledge of new treatment strategies are necessary. To increase awareness, it is important to incorporate presentations about this theme into meetings like the ECR."

An additional consideration for the future is imaging biomarkers, which raise the prospect of earlier detection of some diseases and promises to revolutionise basic research, drug development and treatment. He observes that biomarkers are already enabling researchers to see in detail how candidate drugs are behaving, from determining the percentage of receptors occupied by a drug on target cells to looking at a drug's ability to cross the blood/brain barrier. This in turn can save time and money at the drug development lab-bench. In particular, he is looking forward to new developments in target-specific MR contrast agents, which will allow the in vivo visualisation of disease processes. MR contrast agents are being developed that are bound to specific targets, of which the distribution can be evaluated using MRI (e.g. liposomes with cholesterol and PEG-containing lipids).

At the University of Pisa in Italy, PACS was introduced 20 years ago, and for many years these systems served as "production tools" designed to enhance the provision of radiological services. Soft-copy reporting and online access to images and reports from the clinical led to a reduction in turnaround time and helped physicians to make better use of imaging, explained session moderator Prof. Davide Caramella, from the department of radiology, Santa Chiara Hospital, Pisa. Only in recent years have radiologists and clinicians worked together in a real multidisciplinary setting.

At today's course, Caramella's surgical colleague, Prof. Andrea Pietrabissa, will explain in detail about how the advent of minimally invasive surgery has made preoperative imaging an assessment of patients of paramount importance. Preoperative planning can be enhanced by the use of 3D models of the target anatomy, derived from a CT dataset. Using a 3D helmet with a built-in microcamera, a surgeon's view of the operative field can be fused with the preoperative 3D anatomy of the patient.

"Imaging is part of a changing medical environment," said Caramella. "As radiologists, we have to understand that the availability of image data beyond radiology is a challenge that we should not be afraid to meet. In fact, it might turn out to be a splendid opportunity to make our discipline more pervasive across different medical domains. The future will be shaped by our capability to use information and communication technology to improve workflow and quality of care in clinical settings."

To complete the session, Prof. Heinz Lenke from Berlin will illustrate a conceptual design and implementation of a novel infrastructure: therapy imaging and model management system (TIMMIS), which can pave the way to patient-specific medicine. TIMMIS provides a concept and framework for the collection, organisation, and utilisation of medical information from sources such as the electronic medical record, PACS, etc.
AWARENESS OF INTERVENTIONAL METHODS AMONG GENERALISTS LEADS TO MAJOR IMPROVEMENTS IN CARE

By Philip Word

An Italian musculoskeletal expert has maintained that general radiologists have a special duty to their patients to ensure they have an up-to-date knowledge of interventional techniques.

"Interventional radiology, both vascular and musculoskeletal, is a very fast developing discipline, he comments. The musculoskeletal field is an integration of basic sciences with the clinical aspects of patient care. A true necessity for any radiologist to keep up-to-date with interventional techniques which can improve patient care and optimize outcomes."

At the opening presentation in this morning’s refresher course on musculoskeletal interventional techniques, Masala will focus on spinal infiltrations and nerve blocks. He lists the main four interventional techniques available for the relief of back pain as:

- Epidural/peridural drug injections, consisting of small gauge needle (<1.5G) injections, usually via translaminar/transforaminal and parametrical approaches; these are virtually painless procedures with a relatively steep learning curve, but the main disadvantage is their limited duration.
- Facet joint injections, essentially divided into drug-based interventions (articicular or periarticular infiltrations) and neurotoxins (e.g. radiofrequency medial branch neurotomy). The relative ease of drug-based interventions accounts for their widespread use, but the drawback is their short duration. Neurotoxins are more difficult to use, based on the operator's ability to target the nerve involved, and the main advantage is its long life.
- Disc interventions on painful nerve roots including disc penetrations, which may be reduced by nucleus pulposus shrinkage and/or local nerve ablation by several techniques, including electrothermal therapy, bupivacaine, mechanical suction and 

The modern radiologist should be as close as possible to the patient, and that is particularly true for the interventional one. On the other hand, the best clinical practice embeds its roots in the perfect symbiosis with different specialties, he states. "Interventional radiologists who are going to perform a procedure are first of all physicians, and based on professional ethics, it is mandatory for them to treat patients clinically with their own hands and to lay down the correct indication. Updated technical knowledge and teamwork are the leading factors for best clinical practice.”

Interventional radiology is making an increasingly significant overall contribution to healthcare, according to session moderator Prof. Adnan Gange, from the department of interventional radiology, B. University Hospital of Strasbourg, France. “Minimally invasive procedures of bone and joint require less resources, time, recovery, and cost, and often offer reduced morbidity and mortality, compared to other modalities,” he noted. “The interventional radiologist with an efficient imaging-guided technique like flat panel fluoroscopy, CT or MRI can increase the precision of procedures, allowing an improvement of the results and reduction of the complications.”

Both of these images come from the same left S1 adhesiolysis procedure. Left: the caudal approach for adhesiolysis with sacral channel and perineural sheath (all indicated by puncture). Right: the approach of fascia cut at S1 root. is used for targeted adhesiolysis. Provided by S. Masala

---

**Refresher Course**

**Monday, March 7, 2011, 08:30-10:00, Room D2**

**RC 1509 Musculoskeletal interventions**

**Chairman’s introduction**

A. Gange, Strasbourg/FR

**A. Guidelines for spinal infiltrations and nerve blocks**

S. Masala; Rome/IT

**B. Vertebraloplasty and kyphoplasty**

S. Masala; Rome/IT

**C. Interventional management of painful osseous metastases**

A.G. Ryan, Watford/Harlow/UK

**F. Further discussion: Experience-based vs evidence-based practice in spinal intervention**

---

**Art Direction**

Robert Purz, Vienna/AT

**Layout**

Robert Purz, Vienna/AT

**Marketing & Advertisements**

Bapti Wink

e-mail: marketing@myESR.org

Contact the Editorial Office

ESR Office

Neutorgasse 9

1010 Vienna, Austria

Phone: +43-1-533 40 64 41

Fax: +43-1-533 40 64 44 1

e-mail: communications@myESR.org

**EOR Today is published five times during 2011.**

**Circulation: 20,000**

Printed by Angerer & Göschl, Vienna 2011

**neuESR.org**
Imaging unveils epilepsy's mysteries

By Mélisande Rouger

Imaging has enabled the understanding and treatment of epilepsy, a neurological disorder with multiple origins. Diagnosing and managing epilepsy patients has been made easier through advances in MRI, while multimodality techniques enable the acquisition of functional information that may be relevant to surgery and post-surgery follow-up, as experts will explain during a dedicated refresher course today at the ECR.

The precise cause of epilepsy is still a mystery, but knowledge is increasing hand-in-hand with the development of imaging techniques. Over the last thirty years, improvements in MRI, which can depict very small brain structures like the hippocampus, have enabled doctors to identify a large number of underlying causes, particularly for intractable epilepsy.

“If there is a field where imaging has had an impact, it is certainly in patients with intractable epilepsy,” said Dr. Beatriz Gómez-Ansón, head of the NeuroRadiology Unit at Hospital Sant Pau in Barcelona, who will chair the course.

Intractable epilepsy only affects 5% of all epilepsy patients but its impact is considerable for the sufferers, with seizures that can occur as often as every minute and require constant medication. This condition is even more of a burden given that it is resistant to drugs, meaning that the only possible treatment is surgery.

Identifying the underlying causes of this condition is crucial. Thanks to imaging, physicians now know that intractable epilepsy is mainly caused by non-epileptic conditions, such as hippocampus sclerosis, or abnormalities of cortical development, either congenital or related to an infancy condition.

Tumours can also trigger seizures and lead to epilepsy, especially in adults. Any benign or malignant brain tumour can be responsible for seizures. Brain tumour-related epileptogenesis is not yet fully understood, but one can list a number of factors that play an important role in this process, including the disruption of physiological neuronal structure, a tumour affecting the release of neurotransmitters, and abnormal electrical activity of the brain.

One should make a clear differentiation between a couple of seizures and repeated seizures, as in epilepsy. Gómez-Ansón pointed out, “Not every seizure is epilepsy and epilepsy is a certain condition among patients with seizures,” she said.

High-resolution TD weighted coronal MRI, showing a heterogeneous lesion affecting the right insula and superior temporal gyrus. The right hippocampus also appears more globular, but there is no hyperintensity within it. This image shows the improved spatial and contrast resolution, which is crucial for evaluating patients with epilepsy. (Provided by B. Gómez-Ansón)

Seizure is an irritation of the brain in which a group of neurons begin firing. Their connections become dysfunctional and they alter the whole network. A seizure can be triggered by metabolites or electrolytes, but also by the use of drugs or by nutritional factors.

“Seizure is quite an important topic because imaging departments see many patients who have suffered a seizure, and there is really no evidence to support imaging in that clinical setting. ‘The burden on the healthcare system is huge, as the number of patients with one or just a couple of seizures is very large,’” she explained.

Imaging offers a whole variety of tools to help set treatment planning. Surgery may be the only option in intractable epilepsy and partial or total seizures, and more and more patients are being treated with it. If these seizures are not treated, they can damage the cognitive functions of the patients, and eventually their entire brain. Once the affected part of the brain is removed, patients may recover their full cognitive status. After surgery, imaging can reveal whether the lesion or tumour that was responsible for seizures has been excised.

MRI usually provides sufficient structural information to show, for instance, where a tumour is located. But when MRI fails to reveal structural pathology, other modalities can be taken into account. Single photon-emission computed tomography (SPECT) and magnetoencephalography (MEG), among others, provide very useful functional information.

“These functional techniques may be able to provide indications about the area of the brain that is firing. If you combine structural and functional knowledge of pathologies and molecular mechanisms in order to select how the diagnosis should be done,” he said.

However, doubts remain as to whether molecular imaging will become strong in the clinic. Sub-specialised training would certainly help to raise attention to the tremendous possibilities offered by reading cellular functions. The European Institute for Biomedical Imaging Research (EIBIR) already offers training workshops in cell imaging via its ENCITE project. But one major aim of the ECR session is to push for the creation of a master's degree in molecular imaging. Kiessling underlined. “We all think that it will change the diagnostic procedure in the future, so it is very important that radiologists are getting on with this,” he concluded.

Molecular imaging made easy for radiologists

By Mélisande Rouger

Today, most of the research done in molecular imaging is performed not by radiologists but by scientists from other disciplines. As ultrasound, optics and MRI are gaining weight in pre-clinical imaging, it is probable that they will soon compete with PET and SPECT, currently the most widely used molecular imaging modalites in practices. With this whole range of tools about to make their way into the clinic, radiologists should seize the opportunity to be among the first to master these techniques.

A dedicated session this morning will deliver key simple tips about the current possibilities offered by various modalities, to spark radiologists’ interest in functional and molecular imaging.

“Our aim is to give radiologists an introduction to molecular imaging. It should guide them through this field by giving them useful knowledge and explaining how they can become active in their institution,” said Fabian M.A. Kiessling, Professor of Experimental Molecular Imaging at Heinrich-Heine University Hospital, who will chair the session.

Except for a few brilliant specialists, most radiologists have limited involvement with molecular imaging, but interest is growing. A session on the topic during the last German Congress of Radiology attracted crowds of delegates, mainly young radiologists eagerly keeping an eye on these tools from the very beginning of their training.

“Currently molecular imaging research is dominated by biologists, chemists and nuclear doctors. But now that we are moving towards clinics, there is more point for radiologists to get closely involved. Most of them have a rough idea of what it is about. They may know FDG-PET and other PET and SPECT applications but not consider that Gd-DTPA-EBR enhanced liver MRI, SPIO-enhanced lymph node and liver imaging, and MRI-spectroscopy are also molecular imaging tools,” he said.

In particular optical imaging could be a great chance for imaging professionals to get started. In pre-clinical imaging, optics are the classical tool to investigate on a small animal.

Successful examples of work done with optics are many, from 2008 Nobel Prize chemist Roger Y. Tsien and his studies with GFP and RFP (fluorescent proteins) to the recent introduction of the fluorescence camera system Xiralite, which enables diagnostic imaging of rheumatoid arthritis in the joints of both hands.

Over the past few months, 300 to 400 cases have successfully been investigated with this tool. As well as being reliable and relatively cheap (400,000 euros) it is also small, which could facilitate its installation in hospitals or ambulances.

“Optical imaging will be widely used in clinics, which is why I think it’s very important to talk about it now,” Kiessling believes.

Experts will also present their work with ultrasound (US) in the imaging of angiogenesis, cancer and plaque characterisation.

“I did a lot of molecular MRI in the past, and I am very sceptical about whether it will broadly make its way into the clinics within the next years because it is less sensitive than PET or optics or even US,” Kiessling said. However, molecular agents may be used to identify healthy tissues like lymph nodes and thus delineate pathologies by their non-enhancement. In the long run, hyperpolarised agents may significantly broaden the capability of MRI in molecular imaging.

Further developments in PET and SPECT should also encourage radiologists to acquire skills in nuclear imaging. Its current use in clinics seems to be just the tip of the iceberg and many more applications will be possible within a few years. Its refinement will trigger a redefinition of diagnostic imaging, Kiessling envisions.

“Molecular imaging is already here but there is still much more potential. It should be of big interest to the radiologist, it adds a tool to the specialisation of diagnostic radiologists. In my opinion, the diagnostic radiologist as we know him/her now will disappear, and I have the feeling that in the future radiologists will become the universal diagnostic doctors. They will need profound knowledge of pathologies and molecular mechanisms in order to select how the diagnosis should be done,” he said.

However, doubts remain as to whether molecular imaging will become strong in the clinic. Sub-specialised training would certainly help to raise attention to the tremendous possibilities offered by reading cellular functions. The European Institute for Biomedical Imaging Research (EIBIR) already offers training workshops in cell imaging via its ENCITE project. But one major aim of the ECR session is to push for the creation of a master's degree in molecular imaging. Kiessling underlined. “We all think that it will change the diagnostic procedure in the future, so it is very important that radiologists are getting on with this,” he concluded.

Special Focus Session

By Mélisande Rouger

• Chairman's introduction
  F.M.A. Kiessling, Aachen/DE
• Probes and targets in optical imaging
  C. Weidner, Linz/LI
• Ultrasound providing molecular imaging
  M. Pichler, Innsbruck/AT
• MRI in molecular imaging
  E.A. Schellingerhout, Berlin/DE

Panel discussion: What can radiologists easily play in molecular imaging?

To GS, Düsseldorf, Germany/UK
New interventional approaches widen horizons for liver cancer patients

By Frances Rylands-Monk

The incidence of hepatocellular carcinoma (HCC) has increased steadily, particularly due to the spread of chronic hepatitis C virus (HCV). Surgery and liver transplantation are being used in selected cases, but emerging interventional techniques can offer improved palliative care and potentially life-saving cures. Further clinical trial results must still be established.

Rapid advances are occurring in the trans-arterial treatment of hepatic tumours, and a special focus session on this hot topic looks certain to generate considerable interest today at ECR.

According to the Milan Criteria, liver transplantation may be considered if a tumour is less than 5 cm in diameter, or if there are two or three lesions each of less than 3 cm in size. If the tumour is confined to one lobe and the residual lobe has good function, then resection becomes an option. Also, radiofrequency (RF) ablation can be considered if the tumour is no larger than 3 cm in diameter.

For around 80% of liver cancer patients, no curative therapy is available, but for those disease has been diagnosed, which means that the patients become candidates for chemotherapy. However, because the liver is highly chemo-resistant, the traditional method of classical systemic infusion chemotherapy is not very effective. This means that chemotherapeutic agents such as doxorubicin must be infused locally in high concentration into the artery supplying the tumour. After local application using a catheter, arterial flow to the tumour must be blocked by embolisation.

This method, trans-arterial chemo-embolisation (TACE), has shown promise in randomised trials. Furthermore, drug-eluting beads allow small particles to be loaded with the chemotherapeutic agent to transport doxorubicin directly into the tumour, blocking arterial flow at the same time.

Results published from a European multicentric randomised study (Johannes Lammer et al. Cardiovasc. Intervent. Radiol. 2009) showed improved outcome compared to conventional TACE. Drug-eluting beads used with doxorubicin are now attracting attention as a palliative life-prolonging treatment. Compared with conventional TACE – which may damage the liver, reduce blood count and cause nausea and hair loss – drug-eluting beads have significantly fewer adverse side effects because the therapeutic agent remains in the tumour and does not circulate in the patient’s body.

“TACE is a very interesting option, it is likely to be news to many radiologists. It’s important for them to know that for patients with even advanced tumours there is now a viable treatment,” said Prof. Johannes Lammer, director of cardiovascular and interventional radiology at Vienna Medical University, who will moderate the session this afternoon.

Previous options would have included conventional TACE (intrarterial drug infusion followed by embolisation) and bland embolisation without any chemotherapeutic agent. Another study published last year in the Cardiovascular and Interventional Radiology Journal by Dr Katarina Malagari has demonstrated that chemo-embolisation using drug-eluting beads compared to bland embolisation was significantly better in terms of subjective patient response and time to progression.

RF ablation are being studied in a multicentre randomised trial now in its second year.

“TACE can first reduce the size of the tumour, so that those patients who aren’t candidates for surgery, or whose tumours are a little too large for ablation, initially can still profit from curative ablation rather than palliative treatment,” Lammer said.

Where possible, surgery is still the best option in terms of patient survival, and there is less chance of liver cancer returning, but if research over the next couple of years proves that a combined approach is effective, its routine use in the clinical setting will increase, he added.

In another large randomised international study, at present in its early stages, a combined approach to palliative treatment using systemic drug therapy with sorafenib in combination with TACE using drug-eluting beads is under evaluation.

Radiologists who want to learn more about which patients should be a candidate for surgery or RF ablation and find out what can be achieved with TACE should certainly attend today’s session. They will also hear about the most recent techniques using drug-eluting beads, radio-embolisation and the latest combined approaches.

The Royal College of Radiologists (RCR) has approximately 8,600 Fellows and members worldwide in the disciplines of clinical radiology and clinical oncology. All members and Fellows of the RCR are registered medical or dental practitioners. The RCR’s role is to advance the science and practice of radiology and oncology, further public education and promote study and research through setting professional standards of practice.

Over the last year, the RCR has led on and promoted the development of the Imaging Services Accreditation Scheme (ISAS), an accreditation process supporting radiology services in the UK, in their delivery of higher quality patient-focused services. The scheme, which has established the standards and criteria against which radiology services are assessed, accredited its first U.K. radiology service in December 2010. ISAS is now a new style of accreditation scheme that is developmental and user-focused, and this approach is fast becoming the model of service accreditation for U.K. healthcare.

The development of the World Health Organisation’s Surgical Safety Checklist for Radiological Interventions, published in April 2010, resulted from a collaborative project between the RCR and the National Patient Safety Agency (NPSA) in England. The checklist was further developed in November 2010 into a version covering interventional radiology, the first of its type in Europe. The checklists are a vital tool in increasing the reliability and safety of care during radiology procedures, and will support the development of improved teamwork and communication in radiology. The RCR will continue to play an active role in supporting the further development and implementation of these checklists, and monitoring progress.

The RCR is exploring ways in which it can help nuclear medicine physicians to train in the use of imaging. The training situation is different in the United Kingdom, to mainland Europe, and is likely to involve some training in core radiology. The RCR has close working links with the radionucleide medicine and nuclear medicine communities, and is keen to work closely together to improve the current situation.

In November 2010, to coincide with the anniversary of Wilhelm Roentgen’s discovery of x-rays in 1895, the RCR was delighted to hold the first in a planned series of free public lectures in London, at the Royal Society of Medicine. The lecture, Stop Worrying – Radiation is Good for You, looked at public attitudes towards radiation, and a history of the use of radiation in medicine since the early 20th century. Further lectures on topics relating both to clinical radiology and clinical oncology are planned for 2011.
CT and MR make rapid and sustained clinical progress in brain perfusion

By Philip Ward

Perfusion imaging is proving increasingly useful for assessing the biological behaviour of central nervous system diseases, particularly the haemodynamic features. Qualitative and quantitative information can now be acquired for evaluating pathoanatomical structures and pathophysiological changes of the lesions.

Due to rapid technical developments, CT and MR perfusion are available on most modern scanners. Furthermore, early and accurate diagnosis is a requisite condition for the successful treatment of vascular diseases, and perfusion imaging should not be limited to large centres but should be used by any institution treating acute and chronic vascular diseases, according to Prof. Josef Vymazal, from the department of radiology, Na Homolce Hospital, Prague, Czech Republic.

Ultrastiff CT scanners can cover most of the brain with perfusion imaging, but there is widespread concern about radiation dose levels. In general, he thinks this concern is justified.

“CT is a significant source of radiation for the population of developed countries. However, newer CT scanners are able to deliver high quality images, while exposing the patient to less radiation,” said Vymazal, who will be speaking at this afternoon’s Special Focus Session on the brain perfusion. “The radiation dose is also dependent on the type of examination performed. For example, newer scanners can perform examinations of the heart while exposing the patient to 10 times less radiation than older scanners.”

MRI has the advantage of performing a contrast agent-free perfusion study using arterial spin labelling (ASL). ASL describes a group of MR techniques that allow noninvasive perfusion imaging, i.e. without the application of an exogenous contrast agent. Blood water is labelled (by saturation or inversion) as it passes through a magnetic field gradient. As the labelled spins enter the imaging slice, the tissue magnetisation is altered and perfusion-weighted images may be generated, he explained.

ASL has found application in many research and clinical areas. One area that has received much attention is in the evaluation of patients with cerebrovascular disease, both in the initial assessment of perfusion as well as in evaluating treatment response. Vymazal believes the greatest limitation of these techniques may be that MRI is often not the preferred investigative method in acute situations. In non-emergency settings, however, ASL has the benefit of not only being a powerful, noninvasive perfusion imaging method but also that it allows the investigative physician access to the many other high quality soft-tissue imaging techniques that can be applied in the MRI setting.

“I expect that CT will continue to be an essential part of the workup of acute cases,” he predicted. “Hardware, software and contrast development will continue to evolve at a rapid pace. This will maintain the current trend of increasingly superior images at lower and lower radiation doses. MRI will continue to evolve rapidly as well, as noninvasive techniques are further refined and additional complementary protocols are further developed and perfected.”

The term ‘perfusion imaging’ is extensively used, but is in fact a misnomer because perfusion and blood flow are not the only imaging biomarkers of microvascular structure and function in common use, commented Prof. Alan Jackson, from the Division of Imaging Science & Biomedical Engineering, University of Manchester, U.K. Indeed, in oncological applications, measurements of the tumoral blood volume, endothelial capillary permeability or vessel size can be of equal or greater importance.

At today’s session, he will review the biological rationale for using perfusion imaging in brain tumours, the methods available for the imaging of microvascular structure and function in brain tumours, and the methods for dynamic contrast-enhanced imaging and its analysis. He also intends to discuss the clinical applications, focusing on distinguishing abscess from tumour, differentiating tumour types, distinguishing glioblastoma from solitary metastases, and predicting grade, histological subtype and prognosis in glioblastoma. He will also look at monitoring radiotherapy and predicting radiotherapy response, as well as applications in clinical trials of novel therapeutic agents, particularly antiangiogenic agents.
Advanced imaging has growing clinical impact on bone tumours

By Philip Ward

Advanced functional MRI offers huge clinical potential in the management of patients with bone tumours, but more research is needed to find out which types of tumours can be staged accurately with diffusion-weighted imaging (DWI) and dynamic contrast-enhanced MR (DCE-MRI). There is still a lack of standardisation in imaging acquisition and interpretation, and more training for radiologists in the interpretation of bone tumour images would be valuable.

Pans will be one of three expert speakers at this afternoon’s refresher course on bone tumours. Attendees will learn about the clinical impact of advanced imaging and when advanced techniques should be used.

DWI can play an important role in more accurate staging and therapy assessment, and should be performed in every patient with a suspicious malignant bone tumour, he noted. In certain types of bone tumours, such as lytic lesions and bone sarcoma, it is feasible to estimate the percentage of viable tumour tissue and tumour necrosis. Also, DWI can be useful in differentiating between malignant and benign fractures in cancer patients.

At Leuven, researchers are investigating the feasibility of whole body DWI and PET/CT in screening cancer patients for bone metastases, particularly in breast and gastrointestinal cases. They have established several study protocols to define the role of DWI in malignant bone and soft tissue tumours, and the first results are very promising. Patients with a bone tumour that suggests an osteosarcoma or Ewing’s sarcoma are scanned with the usual MRI sequences combined with dynamic MR and DWI, both in a diagnostic setup and in the preoperative phase. Depending on the type of cancer, the patient can be scanned not only for bony metastases but also for visceral (e.g., liver) and soft tissue metastases in a single MR examination. Advanced tools can also be used for histopathology and patients suffering from primary bone sarcomas or malignant bone tumours.

Different vendors are involved in developing software for handling the data of advanced imaging, and this helps interpretation of the images and comparing different MR exams during follow-up. "To define the different b-values, the number of b-values and the apparent diffusion coefficient (ADC) value of the different types of bone tumours is essential to compare the results of different studies, and this means uniformity in scan protocols is necessary for future success. Multicentre studies are necessary for development of more standardised protocols and sequences. DWI is likely to remain a largely research topic for the next three or four years, but understanding the limitations, handling the pitfalls and optimising the technique will help to move it forward, concluded Pans, who is currently working on a paediatric study of bone sarcoma that involves comparing and correlating DWI results with histopathology.

CT is typically used to obtain information on a bone lesion that is not sufficiently depicted by radiography, e.g., due to location at a site of complex skeletal anatomy such as the spine, pelvis or shoulder girdle or due to limited contrast resolution, according to Dr. Klaus Wörterl, associate professor of radiology at the University of Munich. MRI, on the other hand, is particularly helpful to demonstrate tissue composition and internal morphology in cystic bone lesions and cartilaginous tumours, as well as some vascular lesions, but the modality is limited by its inability to depict mineralised bone substance. Therefore, radiography remains the gold standard for the evaluation of solitary bone lesions.

"Personally, I am not too euphoric about solving all problems with new imaging techniques or applications," he warned. "In the differentiation of benign, and in particular low-grade, malignant tumours, imaging will probably not be able to replace biopsy and histopathologic evaluation, even with advanced techniques. Perfusion and diffu-
Vendors line up to display innovation in mammography among digital and computed radiography exhibits

By John Bonner

Visitors to this year’s ECR technical exhibition have been able to see colour x-ray images produced by a new generation of detectors. The spectral imaging application will soon be available on Sectra’s MicroDose Mammography system, and it is a gimmick designed merely to brighten the lives of those reading the images, according to the vendor. Instead, it aims to be a valuable diagnostic tool that will spare thousands of women the stress and discomfort of biopsies after routine screening has highlighted a suspicious lesion.

Prof. Mats Danielsson, who is head of the research group at the Royal Institute of Technology in Stockholm that designed the new detectors, thinks that using spectral imaging may help to identify the 20% or so of tumours that are difficult to spot in a conventional mammogram. Key to the process is the detectors’ ability to count photons of different energy levels in the same low dose exposure. As different types of breast tissue absorb specific photon energies, the detectors measure variations in the transmitted radiation corresponding to the presence of fluid-filled cysts or much denser lobular cancers. Then they convert these variations into colour differences in the resulting image.

Breast examinations can be carried out with or without an iodine-based contrast agent. When given with contrast, image quality matches that achievable with breast MRI but at a fraction of the cost. Used as a screening tool without contrast, the system allows the same short scan times as a standard mammogram. Indeed, the technology upgrade allows spectral imaging to be performed on existing mammography units normally be used to produce standard images, with the colour function used only to look more closely at suspicious lesions. The system is also likely to assist investigations in challenging cases, such as women with breast implants, again providing additional detail on tissue composition from a single acquisition.

The clinical value of this product is currently being assessed at five hospitals before becoming commercially available later in 2011. Danielsson, who co-founded Sectra’s mammography subsidiary, Sectra Mamm AB, in 2000, reckons the only competitor providing equivalent information is GE Healthcare’s dual energy technique, which acquires two consecutive exposures at different voltages. “There is a big difference in the underlying technology, with theirs being focused on the radiation source and ours on the detector system,” he said.

Both approaches could affect the diagnostic efficacy and workflow in a modern radiology department, but he feels that the Sectra system can produce the more fundamental changes. “This is the first time that colour images have been produced using conventional x-rays. We have been looking in black and white for more than 110 years, so we have completely changed the game.”

More innovation is on display at the exhibition booths of two major manufacturers of computed radiography (CR) mammography systems, Agfa Healthcare and Carestream. Both companies have been independently researching phosphor needle-based detectors that can produce quality images at a lower radiation dose than traditional phosphor powder screens. At the end of last year, Carestream launched the SNP-M1 Screen as an upgrade for its range of mammography systems, while Agfa unveiled its DX-M digitiser in the early summer.

Industry’s renewed focus on detector technology reflects the concerns over x-ray dose and patient safety, especially for children, and these concerns have filtered through from the CT area to the other radiation-based imaging modalities, according to Marc De Fré, global marketing manager for Agfa’s digital radiography (DR) business. The new crystalline needle phosphor plate makes more efficient use of the radiation exposure, and the introduction of new image processing software allows further reductions in dose. “The amount of radiation is continuously monitored by creating an exposure index for every x-ray examination that the technician performs. We have carried out clinical studies on both sides of the Atlantic and these have shown a dose reduction of between 30 and 50% compared with standard systems, depending on the type of examination,” he explained.

He thinks that developments like this will finally put an end to speculation as to whether DR will eventually replace CR, or vice versa. “It is not going to be a case of ‘either/or’; the two technologies will continue to co-exist. The choice depends on various factors – it depends on the

continued on page 18
TECHNOLOGY FOCUS

Monday, March 7, 2011

ESTI: chest radiology beyond lung structure

By Hans-Ulrich Kauczor, ESTI President

Chest radiology has become a key discipline for a series of recent groundbreaking technological developments. They involve all major radiological imaging techniques such as CT, MRI, PET, hybrid imaging and ultrasonography, and benefit from high imaging speed, gating techniques, either respiratory, cardiac or intrinsical, signal enhancement technologies including new contrast agents and mechanisms, as well as new probes and targets.

The Scientific work of ESTI

The aim of the European Society of Thoracic Imaging (ESTI) is to promote cutting edge science, basic knowledge, and expertise in clinical imaging of the chest for comprehensive imaging of the chest work ‘lung in screening and population-based screening and the respective offers of healthcare providers.

Chronic airway disease and definition of CT-phenotypes in COPD are important for the assessment of smoking-associated lung disease in screening cohorts for lung cancer as well as for genotype-phenotype correlation in large cohort studies, such as COPACETIC, COSYCONET and COPDGene.

ESTI meeting 2011

All these topics will be highlighted during the 19th annual ESTI meeting, which will be held as a joint meeting with the Fleischer Society, with its official chest radiology journal, ESTI will succeed in both generating new attractive benefits for our members and in gaining increased visibility for our activities and the research of our members.

From 2011 onwards, ESTI will also enter into a closer collaboration with the STR, to foster exchange between Europe and America.

Recent achievements of ESTI

As ESTI, we are strengthening our links with our partner societies worldwide such as the Fleischer Society, Society of Thoracic Radiology (STR), Japanese Society of Thoracic Radiology and Korean Society of Thoracic Radiology.

For 2011, ESTI announces a new affiliation with the Journal of Thoracic Imaging (JTI) as our sub-specialty journal, publishing a variety of ESTI content, including annual meeting abstracts, selected society announcements and advertisement.

Further information can be found at www.esti2011.org; www.esti-society.org

The Mobilett XP from Siemens is a digital mobile x-ray system with flat panel detector technology and instantaneous image display that can be integrated into standard clinical environments.

Performance studies have shown that the new system will allow a 40 to 50% reduction in dose compared with conventional analogue x-rays, yet it has the same detector technology and the same pre and post image processing software as large fixed systems, he said.

The technical exhibition will be open today between 10:00 and 14:00 hours.
Computer assistance for image-based diagnosis and therapy

By Guido Prause, Fraunhofer MEVIS, Institute for Medical Image Computing

Fraunhofer MEVIS, Institute for Medical Image Computing, in Bremen/DE, is a research and development centre for computer-assisted image-based medicine. After almost 15 years of being an independent non-for-profit research centre at the University of Bremen it was transformed in 2009 into an institute of the Fraunhofer Society, the largest organisation for applied research in Europe.

Directed by Prof. Heinrich-Otto Peitgen, Fraunhofer MEVIS has strengthened its expertise in four particular fields of research: modelling and simulation, medical image acquisition, image registration, and computer-aided detection and diagnosis. Recent developments of Fraunhofer MEVIS will be presented at the IMAGINE Workshop presented by the European Institute for Biomedical Imaging Research (EIBIR).

The development of clinically useful image-based computer assistance for patient-specific diagnosis and therapy has been the focus of Fraunhofer MEVIS since its inception in 1995. Based on the software platform MeVisLab (www.mevislab.de), more than 70 interdisciplinary researchers are developing image-based software assistants for epidemiologically significant diseases such as oncological disorders, diseases of the brain, liver and lung, as well as the cardiovascular system.

Fraunhofer MEVIS is connected with the University of Bremen and the Jacobs University Bremen through four professorships. In April 2010, the Fraunhofer MEVIS Project Group for Image Registration was founded at the University of Lübeck, Germany. The field of computer-aided detection and diagnosis (CAD) is developed through a partnership with the University of Nijmegen, the Netherlands.

HAMAM
An example of the R&D activities of Fraunhofer MEVIS is the project HAMAM (Highly Accurate Breast Cancer Diagnosis through Integration of Biological Knowledge, Novel Imaging Modalities, and Modelling) funded by the European Commission within the Seventh Framework Programme. The aim of HAMAM is the seamless integration of patient information and multimodality image data in a clinical workflow for improved diagnosis of breast cancer via established (mammography, DCE-MRI) and newer (tomosynthesis, PEM) imaging modalities. Eight of the leading European research institutes and centres for breast cancer diagnosis cooperate in the HAMAM project. It is scientifically coordinated by Fraunhofer MEVIS and supported by an international clinical advisory board consisting of recognised experts from Europe and the U.S.

Recent Developments
Medical images enable generalised models of biophysical and pathological processes, as well as diagnostic and therapeutic concepts, to be adapted and optimised to the specific needs of an individual patient. Recent developments at Fraunhofer MEVIS are targeting four promising fields of medical imaging and image computing:

• Modelling and simulation (Prof. Tobias Preusser): Mathematical modelling and numerical simulation of biophysical and pathological processes are essential for a reliable patient-specific diagnosis and therapy. An example is the planning and risk assessment of radiofrequency ablations (RFA) of liver tumours. Based on the knowledge of the individual anatomy of a patient’s liver, RFA-induced thermo lesions can be calculated and optimised in advance, taking into account the cooling effects of the blood flow.

• Medical image acquisition (Prof. Matthias Guenther): Efficient medical image computing requires close interaction with the image acquisition. This is especially true for MRI with its huge variety of imaging protocols and sequences. The mutual optimisation of MRI image acquisition and computation for various clinical applications is therefore a second recently developed field of research at Fraunhofer MEVIS. Like the working group for modelling and simulation, the group for medical image acquisition is headed by a dedicated foundation professorship.

• Image registration (Prof. Bernd Fischer): Accurate and efficient fusion of images from different modalities, time points, or patients is a ubiquitous task in medical image computing. It has a strong relevance to many clinical applications such as multimodality imaging, therapy planning, image guidance, and response monitoring. This field of strategic importance is developed in close cooperation with the newly established Fraunhofer MEVIS Project Group at the University of Lübeck.

• Computer-aided detection and diagnosis: CAD applications for early detection of breast and lung cancer are developed in a partnership with Prof. Karssenmeijer and Prof. van Ginneken at the University Medical Center in Nijmegen.

Fraunhofer MEVIS maintains an international network of more than 150 clinical, scientific, and academic partners. In cooperation with the spin-off MeVis Medical Solutions AG and other industrial partners, Fraunhofer MEVIS has established a quality-assured technology platform for computer-aided disease detection.

Information: www.mevis.fraunhofer.de

Combined aspects of multimodality breast imaging and diagnosis in HAMAM. Registered multimodal images (MRI, US and PEM) of the segmented lesion representing different physical and biological properties. They are visualised together with a coronal view of the breast, MR volume and the mammographic projections.

MyESR.org

Simulation-based calculation of heat distribution for an RFA applicator derived from patient individual CT images. The temperature is calculated in the grid crossings. Areas of high-temperature variation around the applicator (heat source) and the vessels (heat sink) are resolved by a finer grid. The red isolines represent locations of same temperature. The small distances of isolines close to the applicator indicate a large decrease in temperature. The cooling effect of vessels induces a deformation of isolines.
When you've checked in to ECR 2011 on Foursquare
catch up with the latest #ECR2011 news on twitter
become a fan and post us a photo on Facebook
and then check out our videos on YouTube

'ECR 2011' on foursquare - twitter.com/myESR - facebook.com/myESR - youtube.com/myESR
Neurodegenerative and neuro-oncologic disorders impose an ever-increasing burden on society. In the coming decade, neuroscientists will face the daunting challenge of unravelling the complex pathophysiology of these disorders. There is hope that innovative neuro-imaging methods (including new data acquisition techniques and image analysis software) will help to tackle this challenge. The increased complexity of neuro-imaging protocols requires a close collaboration between medical doctors, engineers and physicists.

Such a partnership is available in the Medical Imaging Research Center (MIRC) in Leuven, Belgium. The MIRC, headed by professor Paul Suetens, is a multidisciplinary research center that brings together extensive expertise in life sciences and engineering. MIRC is physically located within the university hospital. By placing medical doctors and imaging engineers side-by-side, we are able to conceive, develop, validate and disseminate innovative medical imaging applications. The juxtaposition promotes cross-fertilisation to produce technically feasible solutions to clinically relevant problems.

The MIRC is proud to be a co-founding partner of EBRK and has developed significant collaborations with other research groups. For several years there has been a fruitful and productive alliance with Prof. Paul M. Parizel and the neuro-radiology group at Antwerp University Hospital (UZA), as well as with Prof Jan Sijbers and his team of medical physicists at the Vision Lab of the University of Antwerp (UA). This article provides a few examples of how this collaboration has led to novel research and diagnostic methods.

In the neurosciences, group studies are receiving an ever-increasing amount of attention. In group studies, multiple patients (and control subjects) are studied jointly. By accurately aligning or registering the images, corresponding brain regions can be statistically compared. With the adoption of non-rigid image registration methods to align the images, group studies allow investigators to study and quantify the evolution of a neurologic disease over time, study the effect of therapy, and compare different patient groups. As an example, we present two of our recent contributions: SPARC and voxel-based DTI group studies.

SPARC presents a unified framework for automatic segmentation, probabilistic atlas construction, registration and clustering of anatomical brain MRI images. It offers the opportunity to perform a global population analysis, providing new insights in disease-specific structural changes and characterising subtypes of a particular disorder.

We have applied the SPARC framework to neurodegenerative diseases. For example, in Alzheimer research, SPARC is able to automatically classify healthy volunteers with mild cognitive impairment, and patients with Alzheimer’s disease into three different groups. In another study, SPARC was able to separate normal controls from patients with Huntington’s disease, and indicate the morphological differences between both groups.

Diffusion tensor imaging (DTI) is a relatively new MR technique, which is used to characterise the orientation and integrity of white matter fibres. In DTI group studies, images of multiple patients are registered and compared. In this way, the investigators can study the quantification of changes in white matter structure caused by the disease. Thanks to the combination of state-of-the-art hardware, image registration and image processing methodologies specifically adapted to DTI images, we have developed a highly accurate framework for voxel-based DTI studies.

The DTI group study has been extensively validated and applied. We have successfully used this technique to show significant white matter differences between mildy impaired MS patients and control subjects. In addition, our diffusion measures correlated with measures of cognitive decline in parietal, frontal, as well as temporal white matter (WM) regions. It has been shown that DTI-derived parameters have the required sensitivity to quantify neural changes related to chemotherapy-induced mild cognitive impairment. Furthermore, we have performed DTI group studies in patients with Amyotrophic Lateral Sclerosis, Huntington’s disease, and autism, with much more ongoing.

Multidisciplinary collaboration leads to direct improvements in diagnosis and treatment. For example, multimodal quantitative tumour characterisation [Fig 1] requires the combined analysis and interpretation of multiple MR acquisition techniques, all of which contain complementary information about the tumour. This allows more accurate classification of brain tumours and improves treatment planning and follow-up.

Treatment planning can further be improved by taking into account both functional (fMRI, perfusion) and structural (DTI) information. Functional imaging yields information about the displacement and re-organisation of functional brain units around the tumour, with the goal of saving functionally important cortex. DTI provides the neurosurgeon with detailed information about the displacement or invasion of white matter tracts, and can assess the connectivity of white matter tracts between the functional units and the rest of the body. These examples are merely an introduction to the translational research performed at research institutions such as the MIRC and UZA-UA.

Other fields include cardiology, nuclear medicine, image-guided cancer treatment, virtual forensics and small-animal imaging studies. The multidisciplinary setting in the MIRC fosters close collaboration between doctors and engineers. Both disciplines increase their understanding of each other, providing real solutions to clinical problems.

A major future challenge for our researchers is the translation of the innovative, joint medical/technical methods to the clinical practice. The development and practical application of these new image analysis methods, such as group studies, requires highly specialised technical skills that are hard to assimilate. In our vision, widespread access to advanced image analysis methods, both for research and for clinical purposes, will be provided by the emergence of medical image analysis centres, which are specialised in advanced data processing and quantitative analysis of medical images. Thanks to fast and secure internet connections, image data can be transferred from the hospital to an image analysis centre. Scientists at the image analysis centre process the data and return a report to the requesting physician, providing the requested analysis results or data quantification. This advanced, quantitative image interpretation is of great value in establishing the correct diagnosis, especially for those patients with early changes.

For that purpose, we have founded icoMetrix, a spin-off company that aims to offer advanced medical image analysis services to the medical community, in the field of neuro-imaging and beyond. icoMetrix is a joint initiative of doctors and engineers of the academic hospitals and medical image computing groups of the universities of Leuven and Antwerp.
Subspecialisation in academic radiology in Switzerland

Current situation and views of the Chairmen of the five radiological University Departments

By Christoph D. Becker, Geneva, for the Chairmen of the Swiss Academic Radiology Departments

Impact of Subspecialisation and recognition of European Subspeciality Board Certificates

The concept of subspecialisation covers a stra
gic need for the future of academic radiol
gy in Switzerland, regarding the domains of
care, postgraduate training, and clinical research.

Creation of organ-related or disease-related multidisciplinary treatment centres is currently underway in many large Swiss hospitals. Integration of radiology in such centres requires subs
division of radiologists who interact on a regular basis with their specialised colleagues in the
different fields of surgery, internal medicine, etc.

Although local priorities may differ from one institution to another, the subspecialty domains defined by the European Society of Radiology and represented by the ten corresponding Euro
can Subspecialty Societies are generally consid
ered appropriate for Swiss radiology.

Subspecialisation is appreciated by the academic teachers that the Swiss Society of Radiology has decided to officially recognise the certificates of the Euro
can Subspecialty Societies at the national level.

In Switzerland, as in other European countries, the number of academic radiologists has increased significantly over the past two decades. This has led to a growing number of subspecialists, who have divided their time between clinical practice and research. As a result, the subspecialty structure has become more complex, with each subspecialty requiring a specific level of education and training.

School of MRI: education for physicians and technicians

- Eleven English-language courses and one Spanish-language course in 2011
- Duration of course: 2.5 days, Thursday to Saturday
- Interactive character with 50% of the total teaching time used for repetition sessions in small groups (max. 15 people per group) to intensify the learning experience
- Professional and didactically experienced teachers
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME)
- Limited to 60 participants per course
- Lectures on MRI: education for MR physicists and other basic or clinical scientists
- Six courses are planned for 2011
- Duration of course: 2 to 2.5 days
- 45% of the total teaching time is used for repetition, exercises, and practical demonstrations to gain 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)
- Limited to 30 participants per course

Hands-On MRI education for MRI technologists, radiographers and interested physicians

- Three courses are planned for 2011
- Duration of course: 3.5 days, Thursday to Saturday
- Limited to 30 participants per course
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME)
- Limited to 72 participants

Teaching Sessions on 'Hybrid systems'

- Limited to 60 participants per course
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME)
- Limited to 30 participants

Hands-On MRI education for MR physicists and other basic or clinical scientists

- Six courses are planned for 2011
- Duration of course: 2 to 2.5 days
- 45% of the total teaching time is used for repetition, exercises, and practical demonstrations to gain practice and intensify the learning experience
- Accredited by the European Accreditation Council for Continuing Medical Education (EACCME)
- Limited to 30 participants per course

Postgraduate training

As a rule, a training programme for a radiological subspecialist may be accomplished in a two-year period. Although five years of formal training are required for the Radiology Board in Switzerland, some candidates may be able to accomplish the objectives within four years, and thus dedicate one year of their basic training to a subspecialty. In practical terms this usually implies that the resident or fellow participates in the daily activi
ties of the respective subspecialty unit rather than continuing his modality-related rotations.

All Swiss academic teachers believe that at least part of the fellowship training should be accom
complished abroad, fellowship grants are available at local and national levels. A period of com
temporary training in a corresponding clinical discipline is also to be recommended for some subspecialties, such as interventional radiology.

All academic teachers in Switzerland motivate their candidates for subspecialty training to obtain the board examinations as far as they are offered at national level (e.g. diagnostic neuro
radiology, interventional neuroradiology and paediatric radiology), or at European level (e.g. neuroradiology, interventional radiology, and head and neck radiology).

Last but not least, it remains important for the majority of radiologists to have accomplished subspecialty training that they maintain general radiological skills, not only in order to facilitate internal institutional organisation, but also to be prepared for a potential future career outside the academic environment.

ESMRMB looks forward to a year of high level educational programmes and its 28th Annual Scientific Meeting

The next ESMRMB Annual Scientific Meeting will take place in Leipzig, Germany, October 6-8, 2011. The picture shows the entrance hall of the famous ‘Trade Fair’.
The EuroAIM initiative for the Evidence-Based Radiology Working Group

By Claudia Muzacuopol and Veronica G. Nardella, Milan/IT

The European Network for the Assessment of Imaging in Medicine (EuroAIM) was initiated because the evidence for the rational use of imaging technology is frequently lacking. The European Society for Biomedical Imaging Research (EUSBI) therefore decided to establish a network to assess radiological technology and the evidence for its best use in clinical practice. The mission of EuroAIM is to have a strong commitment towards the field of imaging and radiology among European radiologists, in particular defined by a clinical and mathematical commitment.

The European Working Group on evidence-based radiology (EBR WG) was initiated by Prof. Gabriel Krestin in the context of the ESR Research Committee and produced a position paper on evidence-based radiology (F. Sardanelli et al. Eur Radiol 2010; 20:1-15).

Under the lead of Prof. Francesca Sardanelli (as Director of EuroAIM) the launch meeting of the EBR WG was held during ECR 2010 in Vienna on March 5, 2010, involving more than 40 members from twelve countries. There are three fundamental reasons for this initiative. The first one is an ethical aim: to do the best for our patients.

Second, we must avoid unnecessary imaging examinations, saving money and reducing radiation exposure. Third, we should keep EBR within the radiologists’ remit, as a cornerstone of professionalism.

The main points of the work programme are as follows:

1. To assess by means of systematic research which radiological topics are covered by systematic review or meta-analyses and which topics are not covered.
2. To assess which radiological topics not covered by systematic review or meta-analyses have enough original primary studies to be meta-analysed and which topics do not.
3. To select more relevant topics on which primary studies are available while systematic reviews and meta-analyses are lacking.
4. To create an EBR youth group with web-based educational aims.

During 2010, the EBR WG performed a systematic literature search for secondary studies published between January 2000 and April 2010. Using the two main medical databases (MEDLINE and EMBASE), studies were selected according the following inclusion criteria:

1. Involving at least one of the imaging modalities, including interventional diagnostic/therapeutic procedures and nuclear medicine tests;
2. Written in English;
3. Concerning humans;

A total of 3,147 abstracts were initially found. At a preliminary evaluation, 1,699 studies were discarded due to not fulfilling the stated inclusion criteria. Of the remaining 1,448 papers, 807 (56%) concerned diagnostic imaging procedures and 45 (3%) concerned interventional procedures performed by radiology/nuclear medicine specialists; 243 (17%) and 158 (11%) concerned diagnostic imaging or interventional procedures also performed by non-radiology/nuclear medicine specialists, respectively. A further 13% of papers (n=195) were on the estimation of a treatment effect using diagnostic imaging or interventional procedures as a surrogate end-point. As a matter of fact, there is a clear underrepresentation of secondary radiological studies. Moreover, the role and number of radiologists in the authorship of radiological secondary studies as well as the publishing journal should be investigated.

These first results were presented at the ESR/EuroAIM Session on March 6.

In October 2011, SRIM will hold the national congress in Cluj together with the Balkan Congress of Radiology. We are looking forward to better integrating our status and better integrate into Europe.

FRANCESCO SARADANELLI is Director of EuroAIM

News from the Romanian Society of Radiology and Medical Imaging

By Dragos Negru, President of the Romanian Society of Radiology and Medical Imaging

The Romanian Society of Radiology was founded in 1929 in Bucharest. Between 1945 and 1989 the society acted as a branch of the Medical Scientific Societies Union, and after the 1989 revolution it was renamed the Romanian Society of Radiology, Imaging and Nuclear Medicine. In 2005 nuclear medicine organised its own society, so today the official name of the society is: the Romanian Society of Radiology and Medical Imaging (SRIM).

According to the statutes, the Romanian Society of Radiology and Medical Imaging is an apsidal, non-governmental and non-profit organisation, with its aim being to increase the scientific level of its members by giving access to facilities and the organisational, functional and material means to organise symposia, conferences and congresses.

The structure of the society consists of six local branches, founded in the traditional university centres: Bucharest, Iasi, Cluj, Timisoara, Craiova and Targu-Mures, which are each led by a local committee. The branches coordinate the scientific activity in their area and have autonomy in developing scientific projects.

The Romanian Society of Radiology and Medical Imaging is the body responsible for the provision of postgraduate training in diagnostic radiology in Romania. This year the board of the society decided to change the curricula for residents. After fruitful debates, the board adopted the European Curricula as the training programme for our residents. Until 1993 the residency in radiology in our country was three years. Starting in 1993 the programme changed to five years. Unfortunately, this year in July, the Ministry of Healthcare decided to reduce the residency time in our specialty from five to four years. We totally disagree with this point of view and we cannot understand the reason for such a measure. With the help of ESR, we will hopefully change this decision and return to a five-year training programme. During training the resident should pass exams after each module and at the end of residency. Having passed the final exam, the resident becomes a radiological specialist and is eligible to apply for a post as a radiologist in the public or private sector.

In Romania, there are approximately 1,200 radiologists and 250 residents in radiology. The number of posts in the public sector is controlled by the Ministry of Health. The ratio of radiology specialists to population (1,200/22 million) is low in comparison to most EU countries and thus the number of studies performed by individual radiologists is extremely high.

The standard of equipment in diagnostic departments in the country is relatively low, especially in small towns and rural areas. The purchase and replacement of the equipment depends on the Ministry of Health. In the same way as in 2009, the healthcare budget was cut drastically in 2010 to 3.8% of the entire country’s budget and major new developments are in doubt at present. Budgeting for radiological equipment is not based on a clear model and therefore replacement of old machines is not planned and is the subject of some controversy.

We are still facing another important problem concerning the migration of our specialists and residents in radiology abroad, especially to Britain and northern countries.

We are looking forward to better integrating our status and better integrate into Europe.

Interested radiologists and residents as well as colleagues from non-European countries are very welcome to contact Prof. Francesca Sardanelli or Dr. Giovanni DI Lev at office@eibir.org.

More details on the session programme can be found on the new page at www.cibit.org.

Wednesday, March 9, 2011

Session 8: European Network for the Assessment of Imaging in Medicine (EuroAIM)
Today at ECR 2011, examinations will take place that will be the very first to be taken as part of the European Diploma in Radiology, a brand new qualification that will provide radiologists with an objective, the ESR-endorsed test of their abilities. Professor Maximilian F. Reiser, to find out more about the background, aims and potential future of this long-anticipated initiative. ECR Today: The vision of a European Diploma in Radiology has existed for a long time and has been intensively discussed for years. Under your leadership, the ESR has now established this Diploma in a relatively short time period. What are the main reasons for your decision to realise this vision?

Maximilian F. Reiser: First of all I would like to clarify that although I was very much pushing this idea it was not my single decision but one of the whole ESR Executive Council and it was also strongly supported by other European leaders, including the national societies. This project is a major step for the society and shows its efficiency and credibility.

I think this initiative is so important as it is a major step in the direction of harmonising training throughout Europe, showing that the European Society of Radiology takes responsibility for radiology education and its established training standards.

It might also be an instrument to facilitate medical migration in the future as many national radiological societies are treating for pan-European structures to be established that allow them to assess and certify radiologists from other countries.

Furthermore, the ESR has a long-anticipated initiative to create robust, reproducible and high-quality test of knowledge requirements in general radiology as set out by the ESR in the European Training Curriculum (Ercal 2011).

I wish to thank all concerned for their commitment and their timely responses to their allocated tasks. I also wish to thank the national and subspecialty societies for their close cooperation in the nomination of examiners and production of appropriate case material. As Chairman of this working group I can report that the structure and enthusiasm within the ESR have accommodated the challenge well, and we look forward to an ongoing project, which represents a major educational step forward for the ESR.

**Structure of the examination**

**Part 1 (written) - Knowledge questions (MCQs)**

- Multiple Choice Questions.
- Knowledge in all subspecialty areas (including anatomy, medical physics and safety) will be tested.
- The MCQs will reflect knowledge in General Radiology at a standard to be expected at the end of training as outlined in the ECR curriculum.
- Single best answer format – a single item with 5 answer options but only one correct answer.
- No negative marking for incorrect answers.
- The MCQ section will last 90 minutes.

**Part 2 (written) - Short cases**

- Web-based radiological clinical case material.
- The initial task will be a sense of short imaging studies where candidates are asked to indicate normal/normal variant or abnormal.
- This will be followed by 24 short clinical radiological cases where candidates are required to respond to four questions per imaging case.
- Knowledge will be tested in all ten ECR recognised subspecialty areas (see ECR curriculum).
- Case material will reflect knowledge in General Radiology at a standard to be expected at the end of training as outlined in the ESR curriculum.
- The short case section will last 90 minutes.

**Part 3 (oral) - Oral examination**

- The oral exam will be conducted by internationally recognised radiology educators working under the auspices of the European Society of Radiology.
- Two examiners per candidate.
- The oral examination will last 20 minutes per candidate (10 minutes per examiner).
- During this part of the examination, candidates will be shown a variety of cases and will be asked on their knowledge of various aspects of the cases under discussion, including diagnosis, differential diagnosis, procedural details, outcomes, complications, safety, etc.
ESR spearheads consortium to identify needs in radiation protection training

By Monika Wierzbicka

Poland builds its radiological future on an exceptional history

The Polish Medical Society of Radiology (Polskie Stowarzyszenie Lekarskie z Podzialu Radiologicznego – PLTR) has long traditions and is one of the oldest radiological societies in Europe. In 2010 we celebrated the 85th anniversary of the PLTR. Our society was established during the 12th Congress of Polish Doctors and Naturalists which was held in Warsaw, on July 13–15, 1925. In 1926 the society started to publish the scientific magazine Polish Radiologic Review (currently Polish Journal of Radiology). The first Editor-in-Chief was Professor Zygmunt Gnidziński, an outstanding Polish radiologist who developed a unique method of localising foreign bodies in the eyeball. Pole Maria Skłodowska-Curie, a truly remarkable figure in the history of science, perhaps the first person ever to receive two Nobel Prizes had an enormous influence on our European activities was the Presidency of our society: the new President, Prof. Marek Sadawski, the new President of the Polish Medical Society of Radiology, Wrocław Medical University is full of ideas, power and willingness – the whole radiological community believes in his success. Renovation of the national radiological educational programme is one of the most urgent issues. There is a country-wide discussion considering the future model of training, whether to offer five years of general radiology or 3+2 (general and subspecialty). Education is not the only issue, of course. Scientific research is also one of the main aims of our society. The fast growing number of publications in European and international journals is one of the things that the society is proud of.

The PLTR is responsible for interfacing with the Ministry of Health and Ministry of Education, and like in many other countries this requires a lot of strength and patience. One can not forget about the working conditions of radiologists and technicians – this is also a goal in our daily work. Looking at the very near future – we deeply encourage everyone to take part in the XIVth Annual Meeting of the Polish-German Radiological Society, which will be held in the beautifully located Kliczków Castle in south-west Poland, on May 26–28, 2011. The topics of the meeting are advances in oncological diagnostic imaging and new interventional approaches. The other important event in the near future is an annual meeting on Advances in Neuroradiology in Kazimierz, on May 20–22, 2011. More detailed information on those and other events one can be found at www.polradologa.org – the official website of the Polish Medical Society of Radiology.

One work package is dedicated to the development and implementation of the EU study on radiation protection training of medical professionals; another one deals with the organisation of a European workshop on radiation protection training of medical professionals in the EU Member States; and the third work package aims at developing European guidance on radiation protection training containing appropriate recommendations in this field.

The project is supported by an Expert Advisory Panel that will advise the consortium on project-related issues and observe the developments. The members of the panel consist of representatives from relevant international organisations such as ICRP, WHO and IAEA, representatives from government bodies such as the German Federal Office for Radiation Protection, as well as representatives of European professional groups not covered by the consortium members (e.g. cardiologists, gynaecologists, dentists etc.).

The kick-off meeting was held at the European Commission offices in Luxembourg in early February. The kick-off meeting is an important milestone of the methodology to be used and agreed on the next steps.

For more information on the project, check the EU Affairs section of the ESR website. A dedicated project web space will also be available shortly.

The successful Polish Radiological Week is the forum of Prof. Marek Sadawski, the new President of the Polish Medical Society of Radiology.

The beautiful old town of Wrocław is the home of Prof. Marek Sadawski, the new President of the Polish Medical Society of Radiology.

One work package is dedicated to the development and implementation of the EU study on radiation protection training of medical professionals; another one deals with the organisation of a European workshop on radiation protection training of medical professionals in the EU Member States; and the third work package aims at developing European guidance on radiation protection training containing appropriate recommendations in this field.

The project is supported by an Expert Advisory Panel that will advise the consortium on project-related issues and observe the developments. The members of the panel consist of representatives from relevant international organisations such as ICRP, WHO and IAEA, representatives from government bodies such as the German Federal Office for Radiation Protection, as well as representatives of European professional groups not covered by the consortium members (e.g. cardiologists, gynaecologists, dentists etc.).

The kick-off meeting was held at the European Commission offices in Luxembourg in early February. The kick-off meeting is an important milestone of the methodology to be used and agreed on the next steps.

For more information on the project, check the EU Affairs section of the ESR website. A dedicated project web space will also be available shortly.

The successful Polish Radiological Week is the forum of Prof. Marek Sadawski, the new President of the Polish Medical Society of Radiology.

The beautiful old town of Wrocław is the home of Prof. Marek Sadawski, the new President of the Polish Medical Society of Radiology.

One work package is dedicated to the development and implementation of the EU study on radiation protection training of medical professionals; another one deals with the organisation of a European workshop on radiation protection training of medical professionals in the EU Member States; and the third work package aims at developing European guidance on radiation protection training containing appropriate recommendations in this field.

The project is supported by an Expert Advisory Panel that will advise the consortium on project-related issues and observe the developments. The members of the panel consist of representatives from relevant international organisations such as ICRP, WHO and IAEA, representatives from government bodies such as the German Federal Office for Radiation Protection, as well as representatives of European professional groups not covered by the consortium members (e.g. cardiologists, gynaecologists, dentists etc.).

The kick-off meeting was held at the European Commission offices in Luxembourg in early February. The kick-off meeting is an important milestone of the methodology to be used and agreed on the next steps.

For more information on the project, check the EU Affairs section of the ESR website. A dedicated project web space will also be available shortly.
Communication and cooperation are key issues for incoming ESR President

By Milaande Rouger

ECR Today met with new ESR President András Palkó, Professor of Radiology at Sze- ged Medical School in Hungary, who made it clear that he wants to bring the society closer to its members than ever. As well as tackling the many issues facing radiology in Europe, Palkó hopes to make the voices of East Euro- pean countries better heard and to open avenues of closer cooperation with radiologists in the region.

ECR Today: What are your plans and ambi- tions regarding your presidency? András Palkó: I came to office following a line of continuity established by our recently successful former presidents who not only created the ESR as the common house of radiology in Europe but most importantly took it to the top;成立于 2011年的欧洲委员会

in the region. So, I would like to see us closer to our members by introducing and/or further developing communication lines in both directions. And more specifically: we will carry on the matter of uniform regulations for graduate, post- graduate training and continuous medical education on a European level; decreasing prestige of academic versus ‘money-making’ radiology; and so on, and so forth. Even for a huge and professional organisation with multiple activities like the ESR it is a major assignment to try to tackle all or even most of them. Nevertheless, our existing strategic plan introduces a timeline to deal with them in an incremental way.

ECRT: How will you make sure that the steps recently taken by the ESR regarding potentially damaging EU legislation will be continued?

AP: The highest risk our specialty is exposed to is the temporarily suspended directive regulating working conditions in varying electromagnetic fields, which would affect very unfavourably our diagnostic and research activities in magnetic resonance imaging laboratories. The Alliance for MRI (of which the ESR is one of the major stakeholders) has so far been very successful in preventing this directive from coming into effect, but there is a lot more to be done. Similarly we must pay close attention to what happens in Brussels in connection with the regulation of cross-border health activities, e-health, future amendments on regulation of medical devices, activities of the European Medicines Agency, EU Clinical Trials Regis- try, recognition of professional qualifications directive and many other issues. The ESR Office closely follows up these moves and our experts – coordinated by the ESR Past- President, responsible for EU affairs – make the necessary efforts to make our voice heard in Brussels. It may also be an advantage that during the first third of my presidency we will be cooperating with the Hungarian EU presi- dency teams, especially in areas like oncolo- gic and emergency care.

ECRT: Do you plan to increase cooperation with any countries or societies in particular?

AP: The ESR traditionally endeavours to extend and improve its professional and social ties with societies of countries and regions outside of Europe. This effort is focused in many areas (we may see very good examples of good and/or expanding connec- tions with the professional societies of Japan, South Korea, Australia, South America and the Middle East), but while maintaining and further advancing these relationships we have to pay more and more attention to very rapidly developing regions like China, India and Asia in general. Forms of much closer institutional cooperation with them have been elaborated very long ago but not least, our very close cooperation with the RSNA must be maintained, which has further sped up in the recent years in areas of educa- tion, postgraduate training and research.

ECRT: Many subspecialties of radiology are facing a crisis in manpower across Europe. Do you have any plans to address this issue in radiology among young physicians who may have not yet decided on their specialty?

AP: The best way to recruit young doctors for our specialty is to provide high quality and attractive training in radiology during the medical school year. A working group dedi- cated to evaluating the European arena from this point of view will report on its experi- ences and proposals during ECR 2011, and on this basis we will decide about our attitude and possible avenues for those who may have the ability and the inclination to enter radiology. And in this context we have to bear in mind that the national societies. Beyond this we intend to increase the involvement of medical stu- dents in the activities of the annual mee- ting and intend to motivate the subspecialty societies to act accordingly.

ECRT: What would be your message to those entering radiology today?

AP: I keep telling my students that radio- logy is one of the most wonderful specialties among medical disciplines because of its multifaceted nature, satisfying the curiosity of those interested in both medical sciences, engineering, biochemistry, molecular sci- ence, and nanotechnology; but also those interested in the diagnostic and the therapeutic side. They may find their fascination in this profession – not to mention the guaranteed opportunity to work at home or abroad as a highly esteem- ed member of the medical community.

ECRT: You are the first ESR President from an East European country. Do you think your presidency will influence the status of the ESR in this part of Europe?

AP: Beyond not only the first ESR society presi- dent from Hungary but also the first from the whole region doubles my responsibility in my function because of the role I see it to do my best for the further development and strengthening of our society. I have to satisfy the expectations I feel from our fellow radiologists residing and working in these countries. This may partly be a symbolic act, but must also be much more than that, in the form of making the voice of these countries better heard among our ranks and opening avenues for those who may have the ability and the inclination to enter radiology to get involved in our activities; and I am most convinced that through this the visibility and impact of our organisation will be further improved for the overall benefit of our society.

ECR Today met with new ESR President András Palkó, Professor of Radiology at Szeged Medical School in Hungary, who made it clear that he wants to bring the society closer to its members than ever. As well as tackling the many issues facing radiology in Europe, Palkó hopes to make the voices of East European countries better heard and to open avenues of closer cooperation with radiologists in the region.

ECR Today: What are your plans and ambi- tions regarding your presidency? András Palkó: I came to office following a line of continuity established by our recently successful former presidents who not only created the ESR as the common house of radiology in Europe but most importantly took it to the top. Nevertheless, there is at least one point that I feel is of the utmost impor- tance to strive towards: we have to fashion the society to be a much more service-providing organisation than before, by rendering new provisions to our individual and institution- al members, improving the visibility of the society by giving very detailed information about the activities and achievements of our governing bodies, and bringing it closer to the members by introducing and/or further developing communication lines in both directions. More specifically: we will carry on the matters of the European Diploma, based on the experience of the first exam in Vienna; upgrade the European Radiology Charter, process with creating the appropriate structures to give homes to functional/oncologic, emergency imaging, fine-needle biopsy, the activities of the European School of Radiology, allowing more space for a learning and self-assessment; improve cooperation with fellow societies like the EANM, ESRMMB and others; make further efforts to be effec- tive, influential and well recognised with the EU bodies; and last but definitely not least, provide for the annual European Congress of Radiology the professional independence, financial safety and potential to further deve- lop as one of the most important and highest quality professional meetings in the world.

ECRT: What are the challenges faced by European radiology today?

AP: Radiology in Europe faces multiple chal- lenges, the list of which includes – not neces- sarily in order of significance – turf battles with other specialties; shortage of trained radiologists/radiographers; uncontrolled migration of workers (especially from the East to the West); lack of proper regula- tion of cross-border activities including telemedicine; unfair and disadvantageous EU regulations; insufficient funding of research compared to the United States; need to improve or re- establish cooperation with medical organi- sations like the UEMS, IAEE, WHO; lack of harmonisation of the education and specialty training between European countries; lack of uniform regulations for graduate, post- graduate training and continuous medical education on a European level; decreasing prestige of academic versus ‘money-making’ radiology; and so on, and so forth. Even for a huge and professional organisation with multiple activities like the ESR it is a major assignment to try to tackle all or even most of them. Nevertheless, our existing strategic plan introduces a timeline to deal with them in an incremental way.

ECRT: How will you make sure that the steps recently taken by the ESR regarding potentially damaging EU legislation will be continued?

AP: The highest risk our specialty is exposed to is the temporarily suspended directive regulating working conditions in varying electromagnetic fields, which would affect very unfavourably our diagnostic and research activities in magnetic resonance imaging laboratories. The Alliance for MRI (of which the ESR is one of the major stakeholders) has so far been very successful in preventing this directive from coming into effect, but there is a lot more to be done. Similarly we must pay close attention to what happens in Brussels in connection with the regulation of cross-border health activities, e-health, future amendments on regulation of medical devices, activities of the European Medicines Agency, EU Clinical Trials Regis- try, recognition of professional qualifications directive and many other issues. The ESR Office closely follows up these moves and our experts – coordinated by the ESR Past- President, responsible for EU affairs – make the necessary efforts to make our voice heard in Brussels. It may also be an advantage that during the first third of my presidency we will be cooperating with the Hungarian EU presi- dency. In the region. So, I would like to see us closer to our members by introducing and/or further developing communication lines in both directions. And more specifically: we will carry on the matter of uniform regulations for graduate, post- graduate training and continuous medical education on a European level; decreasing prestige of academic versus ‘money-making’ radiology; and so on, and so forth. Even for a huge and professional organisation with multiple activities like the ESR it is a major assignment to try to tackle all or even most of them. Nevertheless, our existing strategic plan introduces a timeline to deal with them in an incremental way.

ECRT: How will you make sure that the steps recently taken by the ESR regarding potentially damaging EU legislation will be continued?

AP: The highest risk our specialty is exposed to is the temporarily suspended directive regulating working conditions in varying electromagnetic fields, which would affect very unfavourably our diagnostic and research activities in magnetic resonance imaging laboratories. The Alliance for MRI (of which the ESR is one of the major stakeholders) has so far been very successful in preventing this directive from coming into effect, but there is a lot more to be done. Similarly we must pay close attention to what happens in Brussels in connection with the regulation of cross-border health activities, e-health, future amendments on regulation of medical devices, activities of the European Medicines Agency, EU Clinical Trials Regis- try, recognition of professional qualifications directive and many other issues. The ESR Office closely follows up these moves and our experts – coordinated by the ESR Past- President, responsible for EU affairs – make the necessary efforts to make our voice heard in Brussels. It may also be an advantage that during the first third of my presidency we will be cooperating with the Hungarian EU presi- dency. In the region. So, I would like to see us closer to our members by introducing and/or further developing communication lines in both directions. And more specifically: we will carry on the matter of uniform regulations for graduate, post- graduate training and continuous medical education on a European level; decreasing prestige of academic versus ‘money-making’ radiology; and so on, and so forth. Even for a huge and professional organisation with multiple activities like the ESR it is a major assignment to try to tackle all or even most of them. Nevertheless, our existing strategic plan introduces a timeline to deal with them in an incremental way.

ECRT: You are the first ESR President from an East European country. Do you think your presidency will influence the status of the ESR in this part of Europe?

AP: Beyond not only the first ESR society presi- dent from Hungary but also the first from the whole region doubles my responsibility in my function because of the role I see it to do my best for the further development and strengthening of our society. I have to satisfy the expectations I feel from our fellow radiologists residing and working in these countries. This may partly be a symbolic act, but must also be much more than that, in the form of making the voice of these countries better heard among our ranks and opening avenues for those who may have the ability and the inclination to enter radiology to get involved in our activities; and I am most convinced that through this the visibility and impact of our organisation will be further improved for the overall benefit of our society.
The Spanish Society of Medical Radiology (SERAM) has continued with the implementa-
tion and development of its strategic plan that has positioned the society among the most influ-
ental radiological societies in the world, and particularly among Spanish-speaking countries.

SERAM is facing the fast technological changes and developments in our specialty and is com-
mitted to the position of leadership in medical imaging.

We should highlight some facts:

Cooperation agreements were made with other scientific societies, including the Spanish Society of Nuclear Medicine, which yielded the Third Course on Molecular Imaging and Biomarkers, and the Spanish Society of Cardiology, which will result in our first co-organised Congress in 2012. Another agreement with the long-standing Spanish Society of Radiological Protection, will generate agreed documents and procedures con-
cerning the area of safety.

SERAM is developing future collaboration agreements with primary care scientific socie-
ties, as we are aware of technologies now in widespread use, such as ultrasound, that radiologists must lead.

SERAM is aware that cooperation with other scientific societies is of utmost interest and will be another important undertaking in our society.

SERAM is integrating the full process of medi-
cal imaging and during our XXXIX National Congress we will hold Instructional courses for technicians, something that will definitely be incorporated into our future events.

Apart from that, we should mention our increased visibility and cooperation with inter-
national societies such as ESR, the RSNA, ARRS and others from Latin America. SERAM will
be the invited society at the 2011 ARRS Annual Meeting in Chicago, represented by four Spanish professors.

We celebrated the third iteration of our Interna-
tional Affiliates Meeting which took place at the Instituto Cervantes, Chicago, and included the
eld of the day of Spanish speaking radiology at the RSNA Congress.

This event, widely appreciated among our inter-
national affiliates, gathers a large representation of Latin American societies. This year, the topic
discussed was ‘Different healthcare models, and their influence in medical imaging, with lectures coming from Europe, South America and Spain.

Publications

Radiología Esencial, a vast compilation of state-
of-the-art radiological knowledge, published in January 2010, has been a great success, both in terms of scientific acknowledgement and com-
nercial reception, with a second edition to be
launched in early 2011. In this area, SERAM is preparing an edition specially aimed at students of medicine, as a guide to medical imaging and the possibilities for the future specialist.

Our peer-reviewed journal, Radiología continues its growth and is available to our international affiliates. Radiología is considered the most important radiological publication in the Span-
ish language.

Education

SERAM continues with its policy on education and training. Our courses for radiologists in training are well established and constitute an excellent source of competent professionals. Furthermore, SERAM is engaged with its inter-
national affiliates and has implemented a pro-
gramme of visiting teachers, with the participa-
tion of more than ten lecturers in 2010, at vari-
ous congresses abroad. SERAM also continues to support scientific activities, in the form of research and training grants for our national and international affiliates.

Collaborative projects

Radiology has been in focus this year. Three
radiologists, Askal Azak, Rolf Pedersen and Pål Bache Matthiasen, released a document for discussion in October. The report included liter-
ature research, a survey of present teleradiology
in Norway and legal aspects. The recommenda-
tions are based on the white paper written by
the European Society of Radiology (ESR) in col-
laboration with Union of European Medical Spe-
cialists (UEMS). We hope the report will guide
the members, societies, leaders, patients and
governments in their use of teleradiology. With
a precedent of PACS all over the country, the
location of the radiologist is less important than
before. The radiologist on call may be central-
ised, a second opinion is more easily available,
and radiographers can be given more responsi-

bility for patient handling and imaging.

The Norwegian Medical Association established
a working group on ultrasound for specialists in
General Practice. We have supported this work and a final report was presented at the end of 2010. Ultrasound may be recognised as
an extended part of the clinical examination and therefore helpful in experienced hands. Education of the doctor should be part of the specialisation for certification. Radiologists will contribute to the education and the candidates are encouraged to include radiology into their education. The ultrasound should not replace ultrasound examinations performed by radiolo-
gists and the choice of modality should not be influenced by these examinations.

The Spanish Society of Medical Radiology
(SERAM) in 2011

By Dr. Pablo Valdés Salas

Noraforum in the middle Río Aguilar (responsible for cardiac imaging at SEC).
Having started in 1995 as a search tool for radiological documents on the internet, EURORAD was soon redesigned as an independent case database, and has by now developed into an important collection of radiological cases and a high-quality search engine.

In 2010, several new features were implemented in order to improve the submission system and standardize the cases. The main change is that authors can now refer to pre-specified guidelines and structure their discussion according to this standard by focusing on background, clinical and imaging aspects. This will reduce the segments to be read and make the articles more concise and complete.

An important new element is the differential diagnosis list, giving the reader a better overview of the possible diagnoses based on clinical and imaging examinations. Authors can now also choose several additional image data to describe their cases, which are listed as keywords in the advanced search to help the reader find images and cases of interest. Revised and improved guidelines for authors and reviewers are now available on the homepage, and a downloadable author certificate can be obtained for each case.

Prof. Hans L. Bloem from Leiden, the Netherlands, took on the role of Editor-in-Chief of EURORAD in 2007, and since then has introduced many changes that improved the workflow, reduced turnaround times of the peer review to about 4 weeks, and helped promote the case database among researchers. ECR Today asked him about the present and future of EURORAD.

ECR Today: More than a thousand cases are available on EURORAD, translated by radiologists from the Societá Española de Radiología Médica (SEReAS). Do you think that a close cooperation with the Spanish speaking radiology community would be beneficial in the future?

Hans L. Bloem: Our Spanish colleagues did a great job in translating so many new cases into Spanish. This is of vital importance to EURORAD and the ESR in their mission to provide a high-quality educational tool to the international radiological community. The quality of radiology in Spain and the Americas is very high, and the eagerness of these radiological communities to share knowledge matches this high standard.

Since English often is not used as the primary language to communicate professionally in this vast territory, it makes sense to use Spanish to communicate and increase interaction between our communities. The challenge is upon us to expand on this substantial beginning, and to increase interaction with the Americas.

ECR Today: The specifications for new cases have been improved to make the cases more concise and better structured. What is your advice for authors regarding their case descriptions?

HB: For junior authors, it is easier to create a case report using this format. Enthusiasm and knowledge about the cases is an important issue for submissions. In addition, we strive to provide approximately 200 residents with financial support for their education abroad and $750 (US dollars) per month for education in Turkey. The Turkish Society of Radiology has established a Winter School for the training of residents. With this programme, every resident will get a two-week training programme once in their residency period. Every year, we aim to provide approximately 200 residents with training at the fundamental level from distinguished lecturers (there are 800 residents in training in all educational hospitals).

The first winter school programme was in December 2010, at which 180 residents were educated for two weeks. The second one was in January 2011 with 175 residents participating. The winter school programmes took place in Antalya in a 5-star hotel with all expenses covered by the Turkish Society of Radiology.

The Turkish Society of Radiology has also established a Scholarship Programme to support young radiologists in their further education. This programme was implemented to support our young colleagues who want to get higher education in the field of radiology in Turkey or abroad for six to twelve months.

The Turkish Society of Radiology will support the candidates with 8,200 (US dollars) per month for education abroad and $750 (US dollars) per month for education in Turkey. In 2010, seven young colleagues were given scholarships with the programme. With this programme, we aim to support 30 colleagues per year.

The Turkish Congress of Radiology was held on November 7–12, 2010, in Antalya, with 1,586 radiologists attending the meeting. Every year the number of attending radiologists is growing. At the Turkish Congress of Radiology 2010, sessions were held by 103 Turkish lecturers and seven lecturers from Europe and the United States. A total of 136 oral presentations and 709 electronic exhibits were presented. The main topic of the categorical course was ‘Inflammation and Radiology’. In addition to the Turkish Society of Radiology, several other societies exist in Turkey, including the Society of Medical Ultrasonography, the Turkish Magnetic Resonance Society, the Turkish Society of Interventional Radiology, the Turkish Society of Neuroradiology and the Turkish Society of Thoracic Radiology, all of which organise annual national meetings as well as international meetings and courses, every year.

The Turkish Society of Radiology publishes the quarterly peer-reviewed journal Diagnostik ve Interventionel Radioloji. This journal, which has been published since 1994, has the highest standards of peer review, editorial content and publication quality. In 2007, Diagnostic and Interventional Radiology was accepted for indexing in the Science Citation Index Expanded. The Impact Factor of Diagnostic and Interventional Radiology in 2009 was 0.771. This journal is also available free to all readers on the web (www.dijrjournal.org).

The number of scientific articles by Turkish authors in radiological journals has increased substantially in the last 15 years and Turkey has frequently ranked in the top ten countries submitting articles to journals such as American Journal of Roentgenology, Cardiovascular and Interventional Radiology, European Journal of Radiology, Pediatric Radiology and European Radiology. I think a steep increase in the number of articles published in radiology journals from Turkey will continue in the future.

Turkey is an ESR member country that develops infrastructures and human resources rapidly; implements high quality training programmes for the residents and young colleagues and makes an invaluable scientific contribution to the international community. I hope that these characteristics will gradually increase in the future.
Sammlung Essl
The Essl Collection

With 5,000 exhibits, the Essl Collection offers an excellent overview of Austrian painting since 1945, placing it in an international context. The collectors have acquired a number of works by those artists who have been of decisive importance for Austrian art. Creating a collection of real depth was the essential idea behind this collection, with the aim of showing the development of the artists over the course of their oeuvre. The scope of the Austrian exhibits in the collection ranges from Abstract Expressionism of the 1950s and 1960s to Vienna Actionism and New Painting of the 1980s, all the way to the reductionist art of the 1990s. In addition to the post-war paintings, the collection contains an important group of works of Classical Austrian Modernism. Artists such as Herbert Boeckl and Albert Paris Gütersloh, who played an important role in the new Austrian art after 1945, are of particular significance, but the collection also includes high-quality works by Alfred Kubin and the artists of the 'Nötscher Kreis'.

September 10, 2010 – May 8, 2011
Special Exhibition: Beautiful Klosterneuburg

The German artist Albert Oehlen will put on his curator's hat and show his personal choice of works from the Essl Collection. In the seven gallery rooms he will present paintings and sculptures by artists including Rudolf Hausner, Friedensreich Hundertwasser as well as contemporary art by Paul McCarthy and Heimo Zobernig. In the 1980s, Albert Oehlen was part of the Neue Wilde group, which included names such as Martin Kippenberger, Werner Büttner and his own brother Markus Oehlen. These 'new savages' took an ironic stance and challenged the entire medium of painting.
What’s on today in Vienna?

**Theatre & Dance**

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

**Akademietheater**
1030 Vienna, Luitpoldgasse 1
phone: +43 1 51444 4145
www.akademietheater.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Die Kunst der Unterhaltung</td>
<td>Akademietheater</td>
<td>1030 Vienna, Luitpoldgasse 1</td>
<td>+43 1 51444 4145</td>
</tr>
</tbody>
</table>

**Theater Drachengasse**
1010 Vienna, Fleischmarkt 22
www.drachengasse.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Der Kaktus</td>
<td>Theater Drachengasse</td>
<td>1010 Vienna, Fleischmarkt 22</td>
<td><a href="http://www.drachengasse.at">www.drachengasse.at</a></td>
</tr>
</tbody>
</table>

**Theater in der Josefstadt**
1080 Vienna, Josefstraßer Straße 26
phone: +43 1 42 700 300
www.josefstadt.org

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Cat on a Hot Tin Roof</td>
<td>Theater in der Josefstadt</td>
<td>1080 Vienna, Josefstraßer Straße 26</td>
<td>+43 1 42 700 300</td>
</tr>
</tbody>
</table>

**Vienna’s English Theatre**
1080 Vienna, Josefsgasse 12
phone: +43 1 402 12 60 0
www.englishtheatre.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Harold und Maude</td>
<td>Vienna’s English Theatre</td>
<td>1080 Vienna, Josefsgasse 12</td>
<td>+43 1 402 12 60 0</td>
</tr>
</tbody>
</table>

**Concerts & Sounds**

**Arena (Alternative Music)**
1030 Vienna, Baumgasse 80
www.arena.co.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Artist</th>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>20:00</td>
<td>UK Soho + The Vibrators</td>
<td>Arena (Alternative Music)</td>
<td><a href="http://www.arena.co.at">www.arena.co.at</a></td>
</tr>
</tbody>
</table>

**Gasometer (Alternative Music)**
BA-CA Halle Gasometer
1110 Vienna, Guglgasse 8
www.planet.tt

<table>
<thead>
<tr>
<th>Time</th>
<th>Artist</th>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>20:00</td>
<td>Maroon 5</td>
<td>Gasometer</td>
<td><a href="http://www.planet.tt">www.planet.tt</a></td>
</tr>
</tbody>
</table>

**Opera & Musical Theatre**

**Volksoper**
1090 Vienna, Währingerstraße 78
www.volksoper.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:00</td>
<td>Die Blume von Hawaii</td>
<td>Volksoper</td>
<td>1090 Vienna, Währingerstraße 78</td>
<td><a href="http://www.volksoper.at">www.volksoper.at</a></td>
</tr>
</tbody>
</table>

**Wiener Staatsoper – Vienna State Opera**
1010 Vienna, Opernring 2
www.wiener-staatsoper.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Ariadne auf Naxos</td>
<td>Wiener Staatsoper – Vienna State Opera</td>
<td>1010 Vienna, Opernring 2</td>
<td><a href="http://www.wiener-staatsoper.at">www.wiener-staatsoper.at</a></td>
</tr>
</tbody>
</table>

**Ronacher**
1010 Vienna, Seilerstätte 9
www.musicalvienna.at

<table>
<thead>
<tr>
<th>Time</th>
<th>Play Title</th>
<th>Theater</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:30</td>
<td>Tanz der Vampire</td>
<td>Ronacher</td>
<td>1010 Vienna, Seilerstätte 9</td>
<td><a href="http://www.musicalvienna.at">www.musicalvienna.at</a></td>
</tr>
</tbody>
</table>