Tough new questions confront radiologists in the molecular era

By Philip Ward

Crystal ball gazing reached new levels at ECR on Saturday, when Prof. Dieter Enzmann took delegates on a trip to radiology tomorrowland, as he referred to his W. C. Röntgen Honorary Lecture.

"Radiology is in the information business, not the film-reading business, and that information is in image phenotypes, at least currently," said Enzmann, chair at the David Geffen School of Medicine at the University of California, Los Angeles.

Radiologists are good at gathering imaging data, and they do this because it leads to information upon which others can act. This in turn leads to a medical decision. Currently this process relies heavily on anatomic and physiologic information.

"The raison d'être of radiology is that there is a medical decision. Without a medical decision, there is not much need for radiology," he said.

"What's changing is that in medical decisions, there are now additional factors to be considered."

In today's molecular era, radiologists need new information, new imaging data, new knowledge, and new experience. They will have to learn about integrated diagnosis by imaging phenotypes, Enzmann said.

"Diseases are defined by the states of complex biologic networks, and one of radiology's goals is to define the cell network and to establish its state."

"Radiology will be in the business of imaging biologic networks and their states," he predicted. "All biological processes are driven by networks, not by simple pathways."

Cancer is a paradigm for radiology's network challenges, and radiologists are uniquely positioned to detect and measure heterogeneity in cancer, he continued. In this context, it is important to regard cancer as a genetic disease that modifies the cell network. Although this network is very complex, a limited number of pathways cause abnormal signaling in cancer. Therefore, cancer should be regarded as a signaling problem.

Experts speculate on the future of cardiac MR and CT

By Philip Ward

Future magnetic resonance systems used in cardiovascular imaging will inevitably operate at higher field strengths, including 7T, according to a leading cardiac radiologist.

"The future will be about more Tesla," Prof. Matthias Gutherlet of the cardiac imaging unit, department of diagnostic and interventional radiology, Leipzig University and Leipzig Heart Center, Germany, told attendees at Saturday's cardiac categorical course.

"Cancer is a paradigm for radiology's network challenges, and radiologists are uniquely positioned to detect and measure heterogeneity in cancer," he continued. In this context, it is important to regard cancer as a genetic disease that modifies the cell network. Although this network is very complex, a limited number of pathways cause abnormal signaling in cancer. Therefore, cancer should be regarded as a signaling problem.

The crucial aspects in cardiac MR are the analysis of ventricular function, myocardial perfusion and viability, and imaging of the coronary arteries, he said.

Gutherlet emphasised this point by referring to research from the Society of Cardiovascular MR. The SCMR asked its members: Which is the most important problem in your daily routine with cardiac MR? A staggering 66% of the respondents replied imaging of the coronaries, whereas 17% cited myocardial perfusion, 14% cited flow quantification, 2% cited functional imaging, and 1% delayed enhancement imaging.

Switching from 1.5T to 3T improves the image quality and doubles the signal-to-noise ratio (SNR). It reduces the acquisition time and increases spatial resolution. Moving to 7T leads to further improvements in image quality by increasing the SNR by around five times, i.e., (SNR x 2) x 2.33, he explained.
Swiss radiologists display their knowledge of high-field MR imaging systems

By Paula Gould

Switzerland is leading the way in terms of high-field MRI. The country has one of the highest densities of 3T systems in Europe, if not the world, delegates learned yesterday at the ‘ESR meets Switzerland’ session.

Of the 207 MRI systems installed in Swiss hospitals and clinics, 42 are 3T units. This means that there are five 3T scanners for every million Swiss residents. In comparison, the number of 3T MRI scanners per million inhabitants is half this number in Germany.

Swiss radiologists’ knowledge and expertise of high-field MRI was showcased at the 90-minute session, during which analogies were made between alpine peaks and the heights that radiologists are reaching at 3T. Presenters from four leading centres discussed the pros and cons of working at higher field strengths in a wide range of practical applications.

High-field MRI is playing a key role in stroke management in Switzerland, according to Dr. Karl-Olaf Leibl, neuroradiologist at General University Hospital. Because most 3T systems are sited in larger cities, air ambulances are used to transport stroke patients from remote, alpine locations to centres that have advanced imaging technology.

“The problem with stroke imaging is that you have to do something very complex in a short space of time,” he said.

Although CT is typically regarded as the modality of choice when deciding which acute stroke patients should receive thrombolytics, MRI may be a better bet. Diffusion-weighted MRI is more sensitive to the detection of ischemic events. Moving from 1.5T to 3T for the scan means double the signal-to-noise ratio, more BOLD contrast, and an increase in the effect of T1 relaxation of contrast.

New techniques that are under development could tip the balance further in favour of MRI. Arterial spin labelling at 3T may remove the need for contrast altogether when studying revascularisation, Leibl said. Meanwhile, susceptibility-weighted imaging has been shown to demonstrate haemorrhages better than standard T2* imaging sequences.

“Three-T does have an impact on stroke imaging because by simply going beyond research purposes it allows clinical implementation of new and improved sequences,” Leibl said.

Another area where high-field MRI can make a difference is myocardial perfusion imaging, according to Dr. Jens Bremerich, radiologist at the University Hospital in Basel. The most robust protocol for perfusion MRI is first pass contrast-enhanced imaging, he said. Other options include BOLD imaging, spin labelling, and magnetisation transfer, though these are currently regarded as works-in-progress.

Patients scheduled for 3T perfusion MRI at the University Hospital in Basel are given adenosine so that stress imaging can be performed. The alternative - to image whilst patients exercise - is not viable. It would be impossible to take a bicycle into the scanner bore, Bremerich joked.

The 3T MRI examination can be used to acquire information on mass and cardiac viability as well. As such, 3T MRI has an advantage over scintigraphy, which will only offer data on perfusion, he said. The negative predictive value of normal adenosine stress perfusion MRI is ~99%, similar to that of perfusion scintigraphy.

Bremerich cautioned radiologists to remember that moving to 3T does not always mean better imaging. One downside, common to all applications, is that imaging is slower. The longer T1 relaxation time means a longer TR. This is typically compensated for by using parallel imaging. Some findings can also be missed on high-field images.

The higher spatial resolution realised at 3T has clear diagnostic advantages when imaging the hand and wrist, said Dr. Harald Bonel, radiologist at the University Hospital Inselspital, Bern, who considered the topic of sports imaging.

Moving from 1.5T to 3T should boost diagnostic confidence when examining the knee, ankle, and shoulder, and when looking at cartilage defects. However, returning to the mountain metaphor once again, Bonel observed that high-field MRI has yet to reach its peak.

The case for 3T abdominal MRI has yet to be proven too, according to Prof. Dominik Weishaupt, chair of radiology at Triemli Hospital, Zurich. Weishaupt began his presentation by outlining the strengths of abdominal MRI at 1.5T. He then posed the question: why move to 3T at all when you can do so much at 1.5T?

High-field MRI has traditionally presented many challenges for abdominal radiologists, Weishaupt said. Issues associated with increased energy deposition and acoustic noise, and greater chemical shift artefacts are being overcome. He regards the major remaining problem to be B-field inhomogeneity and standing wave artefacts.

The thorny issue of: ‘Is the gain worth the financial pain?’ was also debated when the floor was opened up to questions. All speakers stressed that the choice of whether to invest in 3T depended critically on local circumstances. A clinic with a large neuroimaging workload, for example, would be well advised to invest in a high-field system. For departments with a mixed caseload, including a high proportion of abdominal studies, the case may not be so clear cut.

Prof. Borut Marincek, co-moderator for the session, challenged Weishaupt directly to say what type of system he would buy next. The Institute of Radiology at Triemli Hospital currently has just one 1.5T MRI system and the purchase of a second scanner is planned. Weishaupt confirmed that this is likely to be a 3T system.

This morning’s ‘ESR meets’ session will turn the spotlight on to Croatia. Speakers will discuss the national mammographic screening programme, image-guided breast biopsies, endovascular interventional procedures and endovascular aortic repair.

To attend the session head for Room A at 10:30.
European hospitals may vary a lot in terms of their management strategies. This process has reached Vienna, hometown of the ECR, where new plans are underway to optimize the organisation of hospitals’ workload. In Milan, the European Institute of Oncology (EIO) is also an example of modernity. These models, and many others, were presented on Saturday during the Hospital Management Symposium, an event co-organised by European Hospitals.

Dr. Leonardo la Pietra, chief medical officer of the EIO, opened the symposium by speaking about his institution, which he described as a unique model in Europe. The EIO is privately run and is partly financed by national health services and concentrates on three core activities: clinical work, research, and training.

It treats about 20,000 patients per year, and contracts out most of its 1000 staff. Its modernity is reflected in the fact that the average age of its staff is just 23. It covers almost all subspecialities except neurosurgery and paediatrics, and uses the Joint Commission International Accreditation System to measure its performance.

The EIO attributes its success to the putting the patient at the centre of all its activities. It is also working towards more integrated medical records, which should accompany the patient in his or her journey through the healthcare system.

"Information technology, with the realisation of an electronic patient record, accessible online from different places, could provide a valuable aid in the management of medication continuous therapy," Dr la Pietra said, adding that the EIO plans to expand its coverage to include cardiology and neurology in the future.

"Not only do we need new structures, but we must also change the organisation, the way of life in our hospitals," said Dr. Wilhelm Marhold, CEO of the Vienna Krankenanstaltverband (KAV), Vienna Hospital Association.

"This opening will be accompanied by the decommissioning of three hospitals, namely the Fledenburg Hospital, the Semmelweis Women’s Clinic and the Orthopedic Hospital of Greifswald. But rather than a simple closure, the KAV will coordinate the transfer of their medical services to the Hospital North. This decision reflects the evolution of medicine as a field, and the need to harmonise healthcare with economy.

"Today we do not need any more kingdoms of specialisation; the fantastic progress we have seen in medicine in recent decades must be accompanied by an evolution in hospital management," said Marhold, who admitted that this would also lead to a loss of acute care.

"Medicine and economy are not a contradiction, and they should not become one. They are like two fruits: combined together, they taste really good," he added.

Beyond the capital, Austrian hospital managers recognize the need for change, according to a study led by a Vienna-based consulting group involving CEOs of all major hospital groups in the country.

"90% of participants expect a rising need for change, particularly regarding the adaptation of service portfolio, quality assurance of results, and continual improvement of processes," said Stefan Furtmüller, project manager at Consultant Management-Consulting.

The study, which focused on strategic goals and challenges faced by hospital managers, also showed that private groups performed better in the development of management tools and techniques than public ones.

"The general conditions for hospital management are not easy, with too many stakeholders and interest groups, different finance systems, etc. Nonetheless, the existing conditions and structures still offer numerous opportunities to increase the efficiency with regards to customised, and high-quality patient care. Business tools and methods can help here ... for most organisations there is still quite a lot of room for improvement," he concluded.

By Melisande Rouger

Hospital management strategies come under careful examination at Saturday’s symposium

Vienna, ‘City of my dreams’

By Robert George, President, ISBRT

Vienna has always been a magical place for me. When my wife and I first had an opportunity to visit Europe in 1983, we made sure it was on our itinerary. The fact that our daughter and son were only nine and six years old, respectively, meant that we had to make every city we visited a special place for them. Vienna meant two things for them: dancing white horses and waltzing to a small orchestra in the amazing Rathaus. But the thing they still remember most vividly is the famous Prater amusement park, with its giant Ferris wheel (the Riesenrad, at the time, one of the largest in the world) and the merry-go-round with real horses pulling it around.

My subsequent visit to Vienna in 1992 coincided with the 50th anniversary of the ESR, the International Society of Radiographers and Radiological Technologists, when I had the great privilege to represent Australia as its council member. I still recall the exhilaration at walking down the main hall in the Hofburg Congresscentrum, proudly carrying our national flag, imagining the warmth and hospitality of the Viennese including the famous Krapfen – their traditional places for having a glass of wine, and walking to a small orchestra in the amazing Rathaus.

So why are these memories flooding back just now? Because I’ve returned to attend my very first ECR, and I can’t wait to renew my previous experiences of such a great city. Having attended many RNI and UKRC and ECR meetings, I am excited not only because of the location but because of the reputation that the ECR has gained internationally.

I presently have the privilege of being president of the ISBRT, the society representing over 350,000 radiographers from more than 80 countries. Our society has been associated with the ECR for more than 25 years. For both radiographers like me and those for the ESR, chairing the technologists organizing committee is a great privilege, with the responsibility to communicate the excellent and comprehensive technical programme.

There is no doubt that ECR has the leading reputation for technological advancement in presentations and education. For those of us who have enjoyed ECR from afar, the excellent range of material made available during and after the meeting is superb and almost makes not being in Vienna itself almost tolerable!

This year for me will be a milestone: my first ECR and a special Australasian session as well. This is made all the more enjoyable because these two small children from 1983 I talked of earlier are now both radiographers like me, and both have enjoyed the experience of working in the UK for two years and travelling widely throughout Europe and, of course, visiting Vienna.

I will take great delight in e-mailing them images of the Hofburg, the Schönbrunn Palace, some Sachertorte, and, of course, the Prater. I’m sure that, like many Australian radiographers, they will mark March and the ECR on their calendars for some time in the future, as indeed should all technologists!

Note: The column first appeared in Diagnostic Imaging.
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Clinical cell imaging starts to loom large, but still waits tantalisingly on the horizon

By Paula Gould

Can we do cell imaging? Yes we can! Can we use the techniques in clinical practice? Not just yet, I’m afraid, but we may be there in another few years.

The message at yesterday’s New Horizons session on cell imaging was clear to all: techniques are many unresolved issues need to be addressed.

Yesterday was the opening day of the 52nd European Congress of Radiology (ECR), which offers more visibility and a studious atmosphere than the number of computer scientists.

Interest in cell imaging has been prompted by preclinical research into the healing effects of stem cells. Transplanted stem cells could potentially help repair damaged or diseased cells in organs throughout the body. However, investigators need to be sure that the cells are reaching their intended targets.

At ECR, researchers have been carrying out cell imaging using a bimodal contrast agent that contains a fluorescent probe as well as a gadolinium chelate. This allows investigators to double-check their MR findings, Modo explained.

Without this back-up, researchers may believe they are tracking labelled cells when in fact they are looking at artefacts, for example, from blood or air.

He presented images from a study in which tagged cells had been injected into the brain of a stroke patient. Post-injection MRI showed the cells at the injection site. Seven days later these cells had been seen on SBE, having migrated to the infarcted brain tissue in the contralateral hemisphere. The findings were confirmed on fluorescence imaging.

Although initial attempts at clinical translation are in progress, not enough studies have been done on the long-term effects, according to Modo. He reminded delegates that labelling can alter the behaviour of cells. Cell proliferation and viability can both be reduced, and these effects can be observed just 24 hours after tagging. Researchers developing therapies that depend on transplanted stem cells being in site for long periods will need to check that their contrast labels do not impede recovery.

“We need to be mindful that we are not just developing something that is interesting for us in terms of preclinical studies,” Modo said. “We also want to develop techniques that are useful for radiologists in terms of monitoring these therapies as they make their translation into the clinic.”

Poster submissions were sharply during 2008, creating a new cases each day) and the EURORAD radiological case database.

Cases of the Day (five new cases each day) and the educational and 435 scientific exhibits, are on the scientific exhibition, has become an established part of EPOS.

Participants’ presence is more linked to the congress than the number of computer scientists.

The exhibition, located on the first level of the Austria Center, has been moved from room R2 to an adjacent, quieter room. The number of monitors has been reduced from 120 to 100, a decision that should not harm the stream of delegates.

Menu believes on the contrary, the new location, which offers more visibility and a studious atmosphere, should increase the overall value by making it easier for delegates to find a seat.

“Participants’ presence is more linked to the configuration of the room than the number of computer scientists.” Last year, some of the exhibition was obscured by pillars, and participants could not always see a free monitor. “We even had free seats at rush hour!” he said.

Along with easing access at ECR this year, Menu and his team have been thinking of ways to improve the quality of the tool itself, for instance by making the search engine more user-friendly. Progress could also be made regarding free text searches, which is still either too large or too limited.

Memos plans to tackle precisely these issues. Another idea would be to imagine a user route in a subspeciality, to increase posters’ visibility.

“Ten most widely condensed posters are usually the ten that receive a prize, which is fully justified. But it is more author than user oriented. Many other good posters would be worth seeing, so we are thinking of selecting and then recommending five posters in a subspeciality to users,” Menu explained. “We have guides for restaurants, for wines ... It would be great to have the same for electronic posters!”

But EPOS™ would be nothing without the fantastical work done by the jury, Menu stressed. “Results were remarkable this year, and I am very grateful to the jury for that. It is a lot of work in a short time, and they derive no glory for this since it remains absolutely anonymous. I thank them all.”

On Sunday and Monday, EPOS™ will open from 07.00 to 19.00. On Tuesday, it will open from 07.00 to 12.00.

Refinements bring positive results at EPOS™

By Milisandre Rouger

Created in 2003, EPOS™, the fully electronic scientific exhibition, has become an established part of ECR.

A total of 844 electronic posters, comprising 409 educational and 435 scientific exhibits, are on display at this year’s congress, in addition to 26 Cases of the Day (five new cases each day) and the EURORAD radiological case database.

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Spain takes early lead over Serbia in Davis Cup match

Novak Djokovic suffered a shock defeat to David Ferrer, as Spain surged into a 2-0 lead over Serbia in the first round of their Davis Cup defence.

Gale-force winds, reported to be up to 100 km per hr, in Bermuda had caused the tie to be delayed for 24 hours. When play eventually got underway, the hosts wasted little time in establishing a clear lead after world number one Rafael Nadal conceded only three games to Janko Tipsarevic. Nadal triumphed 6-1 6-0 6-2 to win in just 96 minutes. Ferrer enjoyed a fairly comfortable 6-3 6-3 7-6 7(4) triumph over world number three Djokovic.

In skiing, Austria’s Klaus Kröll beat his compatriot Michael Walchhofer and Canada’s Manuel Osborne-Paradis to win the men’s alpine skiing World Cup downhill in Kvitfjell, Norway.

The lead in the race for the overall men’s World Cup title is split between Croatian Ivica Kostelic and Austria’s Benjamin Raich, both of whom faded out of the running in yesterday’s competition.

Kostelic finished in 42nd place, firmly outside the points, while Raich was disqualified. Only eight points separate the leading duo from Norway’s third-placed Aksel Lund Svindal, who came in 13th here, with Switzerland’s Didier Cuche trailing by a further 74 points ahead of Sunday’s Super-G.
Come and find out more about contrast media today from some of the world’s leading experts

On Sunday 8 March please join us in Room C in the Austria Centre from 12:30

Delegates who attend these events can claim CME points

Optimising contrast media use and CT techniques to enhance image quality and patient safety

Chairman
Dr Elliot K Fishman
Johns Hopkins Hospital, Baltimore, Maryland, USA

Scientific programme
12:30-13:45

Chairman’s Welcome & Introduction
Dr Elliot K Fishman

Challenging cases in current CT practice
Dr Elliot K Fishman

Reviewing contrast media trials and examining new techniques for assessing renal function
Dr Donal Reddan
University College Hospitals Galway, Galway, Ireland

Optimising image quality in cardiac CT
Dr Filippo Cademartiri
Azienda Ospedaliero-Universitaria/University Hospital, Parma, Italy

Personalising the CT scanning protocol to enhance patient care
Dr Elliot K Fishman

Gadolinium-based contrast agents: New paradigms for patient safety and management

Moderator
Dr Robert Brasch
Professor of Radiology, Director, Centre for Pharmaceutical and Molecular Imaging, University of California, San Francisco, CA, USA

Scientific programme
14:00-15:30

Bridging the gap between gadolinium-based contrast agent structure and the mechanisms underlying NSF
Dr Ben Newton
Project Director, GE Healthcare

Understanding the risk factors to guide preventive care in renally impaired patients
Dr Steven Weisbord
Assistant Professor of Medicine, Renal-Electrolyte Division, University of Pittsburgh, School of Medicine, Pittsburgh, PA, USA

Contrast-enhanced MRI and MRA: essential and safe tools in everyday clinical practice
Dr Tim Leiner
Department of Radiology, Maastricht University Hospital, Maastricht, The Netherlands

Lunch will be provided

On Sunday 8 March please join us in Room C in the Austria Centre from 12:30
Harry’s Hot Shots from Day Two

Who and what caught the eye of ECR Today’s valiant photographer, Harry Schiffer, on the second day of the congress? On this page is a selection of what Harry saw through the lens of his camera during Saturday’s activities at the Austria Center.

Marincek promotes youth-friendly approach
Prof. Borut Marincek paid a surprise visit to the newly created ‘Residents and Students Lounge’ on the first level of the congress venue, which turned out to be a great success among ECR’s younger visitors.

Hands-on Workshops
Practical sessions held throughout ECR have been proving popular.

PR in the ER makes rapid progress at ECR
When the ESR meets Emergency Physicians’ session was wound up late afternoon on Saturday, it was being heralded as a public relations coup that would contribute to greater mutual understanding and respect between radiologists and their colleagues in the emergency room.

Something for nothing
The free publications on the first level have been disappearing fast.

ESR stages its first session at ECR
The first ever session organised by the European School of Radiology at the ECR went ahead smoothly yesterday afternoon. The main aim of the session was to provide insight into the various educational programmes established for younger radiologists during their training. ESR President Prof. Iain McCall outlined what the school means for the ESR and ESOR Scientific Director and former ECR President Prof. Nicholas Gourtsoyiannis spoke about the value of education in partnership.

Join us in Berlin, please!
CARS organiser Prof. Heinz Lemke and his team are at ECR to promote their congress, to be held from June 23-27.

Marincek promotes youth-friendly approach

Hands-on Workshops

PR in the ER makes rapid progress at ECR

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- Interventional Oncology
- Clinical Practice
- Imaging

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If radiologists could design the perfect modality for guiding interventional procedures, the resulting technology would undoubtedly produce high quality images without exposing patients to any ionising radiation. So given the widespread availability of MRI, why are so many interventions still performed in the angiography suite?

The absence of ionising radiation is one of the main arguments in favour of interventional MRI. However, even fervent supporters of this technology appreciate the many practical difficulties involved in providing real-time MR image guidance. Despite this, the potential benefits suggest that today’s interventional ‘toy’ could still become the routine ‘tool’ of tomorrow.

Speakers at this afternoon’s special focus session will explain exactly why interventional MRI is well worth the effort.

“Another point is that most interventional MRI procedures are done with a 1.5T system. If we could do them at 3T, we would have a better signal-to-noise ratio. This may be promising for interventions combined with molecular imaging,” she said.

The special focus session will contain a considerable amount of information that is not available in textbooks or published articles, Bücker said.

“This is something that is brand new, it is a hot topic, and it is going to be the future,” he said.
Practice for imaging GI/GU tracts in children

By Frances Rylands-Monk

Speed is often essential when imaging the paediatric gastrointestinal and genitourinary tracts, as CT serves as a swift diagnostic tool to answer clinical questions. However, phenomena such as over-ranging, over-sampling and over- RVF must be considered and parameters adapted to individual CT examinations and indications in children.

In terms of the abdomen, a major indication for CT is severe or multiple trauma.

“It’s fast, reveals all the therapeutically necessary information, and doesn’t miss fractures or injuries to deeper regions,” said Prof Michael Riccabona, paediatric radiologist at the University Hospital of Graz, Austria, who is speaking at this Sunday’s afternoon refresher course on best practices for GI/GU tract imaging. In some cases, abdominal collections or abscess formations and complications from other severe diseases in smaller children require CT, while in larger children, particularly above adolescence, queries such as appendicitis cannot sufficiently be addressed by ultrasound, he added.

“We should start remembering that CT is a potentially harmful diagnostic tool and only use it if there’s a valid indication. If you need it to use, then you must assure a proper protocol and precautions to avoid repeating the procedure if it doesn’t work out properly. Never fiddle around,” warned Riccabona.

In general, dedicated paediatric ultrasound answers most clinical questions in children. When CT is called for, doctors should aim to get all the information they need for therapeutic decisions, but only irradiate the body areas applicable dose reduction recommendations for these specific child sizes and body areas. The ESPR’s taskforce, which started its work last year, is also aiming to create more homogeneity in CT applications and protocols to and realise paediatric indications for CT.

Researchers at the University Hospital of Graz are trying to develop CT protocols for children with the Toshiba Aquilion One system, which has been used at the centre for children since March 2008.

At the ECR 2009 session, delegates can also learn about ultrasound, which has an accurate diagnostic tool in non-traumatic cases involving the acute abdomen, provided the technique is mastered.

“We should focus less on the number of imaging modalities used to obtain a perfect image and more on safety, faster and less expensive solutions using the ALARA (As Low As Reasonably Achievable) principle,” said the session’s co-speaker, Prof. Gloria del Pozo, paediatric radiologist at the ‘12 de Octubre’ University Hospital, Madrid. “Not all cases of acute abdomen will require imaging methods. A careful clinical evaluation is essential before imaging is demanded, and ultrasound should be used in selected patients, not as a screening test.”

In acute abdomen cases, patients will present with sudden pain onset, sometimes with associated vomiting or fever, which are very unspecific symptoms. Surgery may be the solution, depending on the condition or pathology. It is imperative to define as soon as possible whether a precise case of acute abdomen requires surgical management, she said. Knowledge is essential of the common causes of acute abdomen in different age groups. In infants, the most common surgical condition is intussusception, which has an 8–12 hour window to be managed by surgery. Rarer cases of midgut volvulus, which have a smaller time window for surgery before it becomes life-threatening. To rule out these two conditions, ultrasound is the best technique, with an almost 100% accuracy rate for intussusception, even in the hands of a trainee, according to del Pozo.

It is also important to make a differential diagnosis with other pathologies such as tumours, by assessing characteristic signs visible on ultrasound. The ‘crescent-in-doughnut’ sign is the hallmark to differentiate intussusception from other pathologies, while the ‘whorl’ sign depicts rings around the mesenteric artery for midgut volvulus.

“These findings can be rendered by all radiologists to reach an accurate diagnosis. In the case of intussusception, an ultrasound-guided saline enema can then reduce the intussusception without using radiation again following ALARA criteria,” she explained.

A dilated bowel with many loops and abundant gas may interfere with ultrasound, which may consequently not be able to depict the structures behind the gas for adequate characterization. However, if doctors know the available ‘windows’ (lateral areas of abdomen, or the superior and inferior areas), they can avoid the areas of the abdomen where the air is more densely concentrated. If ultrasound is not conclusive, then other techniques may be required to rule out the pathology.

The optimal imaging algorithm to diagnose or rule out appendicitis (the most common cause of acute abdomen in children aged over three) is still controversial. In some countries, radiologists prefer CT, but in del Pozo’s experience, it is not necessary. A normal appendix can be ruled out by ultrasound.

When ultrasound is inconclusive, which currently holds true for around 5–10% of acute abdomen cases, surgeons at the Madrid hospital prefer to wait, re-evaluate and perform repeat ultrasound or laparoscopy before moving on to more sophisticated techniques involving radiation and contrast. While the use of plain film or CT may be justified when ultrasound is not conclusive, since 2000 the hospital has only used CT as a second-line imaging technique if there is a suspicion of obstruction or perforation.

**CLINICAL CORNER**

**Debate continues over what constitutes best practice for imaging GI/GU tracts in children**

Get your tickets at the Travel Service booth located in the entrance hall, or buy it online at myESR.org.
Coughing, shortness of breath, chest pain, chest tightness, and an abnormal breathing pattern are common indications of lung disease. The question is: which one?

The list of likely diagnoses may well include a number of occupational lung diseases (OLD), depending on the patient’s history. But how many city-based radiologists have ever seen a case of Farmer’s lung? And would practitioners based in rural areas think of considering coal workers’ pneumoconiosis?

Knowledge of a patient’s exposure to inhalable matter can certainly help when initially diagnosing OLD. Diagnoses are not always straightforward, though. Take, for example, the case of a patient whose imaging examination reveals a singular pleural plaque. If that patient had previously worked with asbestos-containing materials, can a diagnosis of pleural disease be made? Or is the patient’s occupational history merely coincidental and the abnormal finding indicative of an entirely unrelated lung condition?

This afternoon’s special focus session will provide insight into the diagnostic dilemmas associated with OLD from a clinical and a radiological perspective. Leading experts in the field will also present the latest approaches to classifying OLD using semi-quantitative and quantitative methods.

Diseases caused by repeated and long-term exposure to inhalable irritants are also referred to as pneumoconioses. The most common of these are asbestosis, silicosis, and coal-workers pneumoconiosis, which develop following repeated exposure to asbestos, silica (quartz) and coal dust. Less common pneumoconioses include bird fancier’s lung, due to inhalation of proteins contained in bird droppings and feathers, and byssinosis, a condition linked to cotton, flax and hemp fibres.

Imaging evaluations of OLD have traditionally been performed using chest radiography. CT is now increasingly used as well to improve the accuracy of diagnoses and identify early signs of disease.

“For the last century, we have known that workers exposed to asbestos, silica and coal dust are at risk of developing related pleural disease. But how can we tell if the patient’s lung condition is related to their occupational history or is merely coincidental?” Hering said.

A second classification system, for use with high-resolution CT, is now available too. The International Classification for Occupational and Environmental Respiratory Diseases (ICOERD) was developed by experts from seven different countries, in response to the need for a more standardised approach to CT-based diagnosis. As with the ILO-2000 scheme, radiologists have access to a series of reference images.

Hering will be sharing the podium with Dr. Gerhard Motecki, professor of radiology at the Wilhelmshospitaal and Otto Wagner Hospital and Medical Centres, Vienna, who will be chairing the session.

Clinical tests, such as lung function assessments, are often unable to detect the first signs of OLD. Dr. Kurt Hering, radiologist at the Knappschaft-Hospital, Dortmund, Germany, concluded the classification and diagnostic test session with the statement: “If you only have small pleural changes and no parenchymal changes, then the patient’s lung function will not be disturbed. These changes will only be shown on high-resolution, radiological images,” he noted.

Guidance for classifying pneumoconioses from chest radiographs has been provided by the International Labour Office (ILO) since 1950. The latest guidance, ILO-2000, is accompanied by two sets of standard radiographs showing typical opacities and pleural abnormalities. The sets include some composite images made up of quadrants from full-size radiographs to highlight key findings. Debate is ongoing about the technical quality of some of these ‘reference’ images, which were acquired many years ago.

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"The incidence of bronchiolar carcinoma related to asbestos exposure and morphological changes is going up year on year. It is therefore necessary that radiologists are familiar with these findings," he said.

**Special Focus Session**

Sunday, March 8, 18:00-17:30, Room F2

**SFB 12a Occupational lung diseases (OLD)**

- Chairman’s introduction
  G.H. Mützelfeldt; Vienna/AT
- OLD: What the clinician wants to know
  C. Hagberg; Malmö/SE
- Quantitative imaging techniques in OLD
  A.A. Bankier; Baden, MA/DE
- Team teaching: All you ever wanted to know about ILO-2000 and ICOERD-HRCT classifications and never dared to ask
  K.S. Hering; Dortmund/DE
  K. Hofmann-Preiß; Erlangen/DE
- Panel discussion: The ever-increasing importance of radiology in OLD

"The incidence of bronchiolar carcinoma related to asbestos exposure and morphological changes is going up year on year. It is therefore necessary that radiologists are familiar with these findings," he said.

News from the Italian Society of Medical Radiology

By Alfredo Siani, Naples/IT, SIRM President

The Italian Society of Medical Radiology (SIRM), founded in 1913, has a unique characteristic among Italian medical societies in that it has academic, hospital-based, and privately practising radiologists as members.

SIRM owns its office in Milan and has recently established the Limited SIRM Co. for economic and financial administration.

In addition, SIRM owns the official bilingual (Italian-English) journal of the Society, Il Radiologo, which has recently been indexed and provided with its own impact factor, and is 50% co-owner of the journal of the Radiological Union, ILRADIology. SIRM also offers an e-mail account to all its members for free.

Some years ago, the society website was created (www.sirm.org) through this continuously updated website, SIRM members can find official documents and pay their annual subscription fee, as well as the professional insurance premium, which is offered under favourable financial conditions.

In order to continuously increase the scientific level and the internationalisation of Italian radiology, SIRM has focused its efforts on some major topics.

- Organisation of the biennial National Congress of Radiology, free for all SIRM members and attended by approximately 50% of all SIRM members
- Organisation of residential and travelling centre studies
- Coordination of research projects and multicentre studies
- Organisation of courses on scientific methods for radiological research
- Courses and meetings are organised through the 19 Specialised Sections, which include organ-specific and diagnostic modality-specific sections, and the 18 geographic Regional Groups of SIRM.

The most relevant documents delivered by SIRM in the last few years are: National Guidelines on Diagnostic Radiology, Methodology and Volumes of Activity, a Census of the Number of Radiologists and Situation of Radiological Technology, Telemedicine, Privacy Rules, Outsourcing, and Breast Imaging.

SIRM is ISO 9002 Board-certified and in 2009 established the Limited SIRM Co. for economic and financial administration.

The latest aim SIRM has decided to pursue is that of fostering radiological research. A liberal donation has been requested from SIRM members together with the subscription fee. These donations and a sum of money allocated by SIRM will sponsor two biennial research projects, which will be selected among the anonymous proposals sent to a committee appointed by the SIRM Board of Directors.
The Royal College of Radiologists: Delivering quality-driven radiology services in the 21st century

By Tony Nicholson, Leeds/UK

The UK has delivered health services in a tar- geted and controlled fashion for decades and it would be wrong to say that this has not been effec- tive. The recent publication of the National Health Service Review by Lord Darzi changes emphasis towards quality rather than tar- gets and those with a non-quantiﬁed outlook welcome this move. Many of the issues that currently face UK radiologists are almost certainly the same issues that face colleagues across Europe. In no particular order some of these are: the ever increasing size of the curriculum that has to be delivered within a ﬁve year training programme; the delivery of such a large quantity of information by core radiology generalist; the impact of teleradiology and out-sourcing on service delivery; and the provision of out-of-hours interventional neuroradiology services 24 hours a day, seven days a week.

Any doctors who began their careers in radiology in the 1970’s will remember a time when radiology training consisted of plain ﬁlm interpretation, along with barium screening and Mi- dlox injections into a patient’s back. Angiography was a very big deal requi- ring general anaesthesia, CT and MRI didn’t exist commercially and it made ultrasound was still in development. Training could easily be ﬁtted into three to ﬁve years. Now, with ul- trasound, CT, and MRI becoming ever more sophisticated, the irrepressible rise of inter- ventional radiology and fusion imaging, it is becoming increasingly difﬁcult to make sure every radiologist is trained in all these modali- ties. It is impossible to demonstrate competence in all.

In the United Kingdom radiology depart- ments increasingly require sub-specialists in order to provide the quality service required. Physicians and surgeons have been sub-spe- cialised for many years. To provide the sort of service that these physicians and surgeons need requires radiologists who are sub-specialised. Many radiologists, recognising this, have embraced sub-specialisation. In some cases this has been through year 6 ‘Fel- lowship’ training but more often experience has substituted for training. All big organi- sations take time to change and the Royal College is no different. The requirement to deliver increasingly complex training com- pared with the evolutionary move to sub- specialisation gives the college two choices. Either extend training to 6 or 7 years after training to deliver core radiology followed by sub-specialisation within the training period. There is a strong lobby that feels that general radiologists are still vital to the profession and the training system and that the momentum must not allow it to be seen as a way of pro- viding cheap radiologists, with cost as the only consideration.

Every country in Europe has a different system for recognising and certifying the skills and abilities of its doctors. Despite legislation it is highly unlikely that the inter- national system will apply to the whole of Europe in the foreseeable future. Doctors in the UK will soon be licensed and certiﬁed to practice by the General Medical Council. Renewal will be every 5 years and the processes are likely to be rigorous. The regulation of doctors that applies to one country gives patients in that country conﬁdence in their medical profes- sion. Such regulation should be considered a resource at the moment when each country is trying to establish a network between the communities in Europe to support and train our radiologists.

Even countries that have embraced sub-specialisation are interventional radiology posts within networks that allow physicians to practise in a sub-specialist world.

The provision of service 24 hours a day, seven days a week and 365 days a year, is increas- ingly becoming an issue in the UK. Increasingly patients and politicians demand instant access to medicine. This is right and proper and it is what we would want if we were patients. However, massive resource is required to pro- vide such services. An example might be the provision of interventional radiology out of hours. Increasingly interventional radiology is becoming an acute specialty in stopping and preventing haemorrhage. Although the Bri- tish Society of Interventional Radiologists has 500 members, only a small number of these will be interventional radiologists as images viewed and reported in the hospital where they were taken by an expert radiologist. Whilst outsourcing is necessary in hospitals where there are insufﬁcient numbers of radiologists, we must not allow it to be seen as a way of pro-

The European Society of Neuroradiology – Diagnostically and Interventionally

By Marco Leonardi, Bologna/IT, President ESNR, Pia Maly Sundgren, Ann Arbor, MI/US, Editor ESNR

During the past year there have been several developments and changes in the European Society of Neuroradiology (ESNR). Professor Marco Leonardi will be the president of the society for the coming two years and to assist him in the executive committee is a sub- committee he has a group of young, enthusias- tic European neuroradiologists to take the lead in the many tasks and issues that lie ahead.

The society has recently changed its name to the European Society of Neuroradiology – Dia- gnostic and Interventional Neuroradiology to reﬂect that it is a professional society represent- ing both diagnostic and interventional neuro- radiologists in Europe. The society continues to organise annual scientiﬁc meetings, the last of which was in Krakow, Poland in September 2008, and European training courses, and aims to be a forum for the professional development of European neuroradiologists.

One of the most important events of the past year was the annual ESNR Neurovascular Imaging and Interventional Radiology Training Dession of the UEMS Section of Radiology.

The ESNR continued to be devot- ed to education and continues to organise the European Course of Diagnostic and Interventi- onal Neuroradiology (ECIN). This course has been organised since 1984 with the precise aim of adhering as much as possible to the EC regu- lations for academic education programmes. As a matter of fact, the didactic programme provided by the course of study is intended to comply with the regulations for academic education pro- grammes, such as 3rd level master’s degree, and some European universities have already recog- nized the certiﬁed course of studies for obtain- ment of a master’s degree, as part of their own educational programmes. The cycles are struc- tured in four modules held twice a year. At the end of each module a certiﬁcate reporting CME credits is issued after completing a test. Upon completion of all four modules (one entire cycle) the participant can ask to hold a ﬁnal oral examination. If they pass a certiﬁcation is issued by ESNR that they are a qualiﬁed neuro- radiologist (European Qualiﬁcation in Neuro- radiology EQR). The 10th cycle is directed by Prof. Massimo Gallucci from L’Aquila, Italy, and Prof. Alex Rovira from Barcelona, Spain.

The ﬁrst course in the 10th cycle took place in Tar- ragona, Spain, on October 9th. Neuroradiologists registered an attendance of 70 people, an important issue for the European radiological community. The ESNR continues to be devot- ed to education and continues to organise the European Course of Diagnostic and Interventi- onal Neuroradiology (ECIN). This course has been organised since 1984 with the precise aim of adhering as much as possible to the EC regu- lations for academic education programmes. As a matter of fact, the didactic programme provided by the course of study is intended to comply with the regulations for academic education pro- grammes, such as 3rd level master’s degree, and some European universities have already recog- nized the certiﬁed course of studies for obtain- ment of a master’s degree, as part of their own educational programmes. The cycles are struc- tured in four modules held twice a year. At the end of each module a certiﬁcate reporting CME credits is issued after completing a test. Upon completion of all four modules (one entire cycle) the participant can ask to hold a ﬁnal oral examination. If they pass a certiﬁcation is issued by ESNR that they are a qualiﬁed neuro- radiologist (European Qualiﬁcation in Neuro- radiology EQR). The 10th cycle is directed by Prof. Massimo Gallucci from L’Aquila, Italy, and Prof. Alex Rovira from Barcelona, Spain.

The ESNR-ESNR exchange programme aims to support and develop mobility and communication between fellows and residents training in neuroradiology in Europe, and offers training in topics not availa- ble in home institutions. The programme supports educational and research cooperation between institutions of neuroradiology, and helps to build a network between the communities in Europe to support and train our radiologists.

The ﬁeld of neuroradiology and interventional neuroradiology is constantly increasing. The scientiﬁc research spans over a broad range of topics and uses today’s most advanced radi- ological techniques and methods. Neuroradi- ologists all over Europe continue to be at the forefront of further development of existing techniques and in the development of new imaging techniques. Advances are constantly made in areas like brain tumour imaging, in the detection of structural and biochemical changes underlying neurological diseases, in different ways to imaging treatment response, and in the development of new coils and catheters for interventional purposes and advanced interventional procedures. Awareness of the risks of radiation has resulted in ongoing research to reduce the radiation dose for some neuroradiological examinations, for example, the development of low dose CT-procedures for multi-trauma and spine imaging.
Ultrasound and MR imaging define the pattern and haemodynamics of vascular malformations

By Karen Sandrick

Patients with vascular malformations for the most part are farewell cases because they have pain and functional impairment as well as disfigurement and yet their disease cannot be cured. It can be debilitating.

“The best treatment option – removal of the vascular lesion without leaving traces behind – can rarely be obtained. Due to the morphologic appearance, especially in delicate areas like the head and neck region, any intervention can lead to severe side effects,” said Dr. Harald Kubiena, a surgeon in the division of plastic surgery and reconstructive surgery, Medical University of Vienna, Austria.

Complex vascular malformations, such as peripheral vascular malformations, are particularly debilitating.

“Suffering from a portal venous malformation leads not only to severe functional problems during eating, drinking and speaking, but can also have a tremendous psychosocial impact, especially on younger patients. Pain due to intralesional thrombosis is sometimes excessive by the burden of disfigurement,” noted Kubiena, who will discuss the indications for treatment of angiomatous lesions in Sunday morning’s special focus session on soft tissue vascular malformations at ECR 2009.

No single specialty has enough knowledge or experience to diagnose and treat vascular anomalies on its own, he explained. Diagnosticians, treatment, and follow-up must be done by members of a multidisciplinary team. As members of the team, radiologists bring a variety of imaging tools to bear on the visualisation and delineation of the nature and architecture of a vascular lesion, its prognosis, and suitability for treatment. Most relevant here are ultrasound and MR imaging.

Although ultrasound can outline the edges of a vascular malformation, Doppler ultrasound is needed to assess arterial and venous flow in real time and to measure flow velocity to distinguish low-flow from high-flow lesions. Low-flow lesions link with veins or lymphatics, and high-flow lesions connect to arteries or capillaries. Contrast-enhanced ultrasound helps evaluate low-flow malformations and monitor the effects of interventional radiology, according to Dr. Gianpaolo Cartellieri, an assistant professor of radiology in the department of human morphology, University Hospital, Varese, Italy.

MR imaging defines the full extent of vascular malformations, as well as their relationship with surrounding structures. Spin-echo T1-weighted imaging evaluates anatomy, while short T1 inversion recovery (STIR) and T2-weighted imaging focuses on the blood and depth of the malformation. Dynamic contrast-enhanced MRI differentiates low-flow from high-flow vascular malformations, and time-resolved MR angiography identifies arterial feeders, nidus size and venous drainage. MR radiologists will discuss these and other forms of imaging the haemodynamics and abnormal vascular channels of the malformations.

Patients with soft tissue infantile haemangiomas have a more hopeful course of treatment. See and Carrafiello will discuss these and other forms of vascular malformations, as well as their relation to congenital disorders, vascular anomalies, and hereditary disorders.

Cavernous haemangiomas, which are considered to be low-flow vascular malformations, are deeper and have more blood-filled vessels, but they are totally benign, said Prof. Dr. Martin G. Mack, acting director, department of diagnostic and interventional radiology, University Hospital of Frankfurt, Germany. Mack will discuss the use of ultrasound and MRI in the detection and follow-up of soft tissue haemangiomas.

After determining that a child has a true infantile haemangioma rather than a vascular tumour or malformation, the diagnostic workup seeks to identify the phase of development of the haemangioma.

“Most important tool is the history of the patient: was the haemangioma present at birth, and has there been progression or regression in size? The principal imaging tool is ultrasound or Doppler ultrasound, which is done in short intervals,” explained Mack. “The follow-up period between examinations is one week for each month of life. So if the patient is five months old, the interval is five weeks. If the patient is seven months old, the interval is seven weeks. The objective of the workup is to document the size and depth of the haemangioma, including photo documentation, which is normally done by the clinic partners.”

MR imaging is performed if the haemangioma is close to the eye or central nervous system or if infiltration of a cavernous haemangioma is not clear on ultrasound. MRI is also the imaging method of choice for surgical planning.

T2-weighted first- and second-look turbo spin echo (TSE) and contrast-enhanced MRI with fat saturation are the most effective sequences for identifying the distinguishing characteristics of haemangiomas.

“Haemangiomas have a markedly increased signal on T1 and T2-weighted images,” Mack said.

News from the Polish Medical Society of Radiology

By Jerzy Walecki, Warsaw/PL

Editor-in-Chief, Polish Journal of Radiology: Marek Graczynski, Warsaw/PL

The achievements of each scientific society are inseparably connected with the intellectual activity and professionalism of its members. This activity manifests itself in both the quality and quantity of academic publications. If a given professional group enjoys the opportunity of running their own academic journal, then it becomes the face of that society.

The Polish Radiological Review (today Polish Journal of Radiology) has existed for more than 80 years. As such distinction comes with some obligations, successive generations of radiologists have taken care of maintaining the proper scientific standard of the journal by controlling the quality of the work published. The very first issue of the Polish Radiological Review from 1926 (volume 1), contains clinical works on radiological diagnosis in gynaecology, orthopaedics, pulmonology and others. Moreover, this issue comprises a plethora of papers and studies in the relations between radiologists and clinicians that continue today – it is a part of any of the quality and importance despite the years that have passed since then.

The Polish Journal of Radiology lives now not only with its long history and tradition, but looking ahead to developing and adopting new trends and business models in modern scholarly publishing.

The most important developments have been made in the organisation of the editorial office and manuscript processing. The most important aim for the editors and the publisher is to maintain the high quality of publication, expansion of the readership and speed of service.

In order to build up and reinforce availability on the international market, the Polish Journal of Radiology has developed a web-based electronic version of the journal. For the last couple of years readers have been able to access our publication on our dedicated website www.pjrad.pl.

Editors believe in unrestricted access to knowledge, and that it is the website provides free access to all published articles – abstracts and full texts, and it is made with an easy to use and effective search engine. During 2009, the editors together with the publisher plan to enhance functionality of the web service, opening up social services, such as discussion groups and scientific blogs.

The increasing quality of the Polish Journal of Radiology has encouraged the editors to apply for evaluation at Thomson-Reuters for possible inclusion in the Science Citation Report and Current Contents database. We are awaiting an answer in 2009.
Introducing the American Association for Women Radiologists

Since the mid 1980s women have played an important role in local, state and national radiological societies and have gained significant recognition. Some women have risen to leadership positions.

In order to promote, encourage and educate all women radiologists, the AAWR was established in 1981 to address significant concerns unique to women radiologists.

At the present time, half of American medical students and 42% of radiology residents are women. Women constitute 32% of medical faculty members, 38% are assistant professors, 28% associate and only 16% of women are full professors. Of division or section chairs 19% are women, as are only 10% of department chairs (Data: AAMC 2005–06)

The missions of AAWR are:

• To provide a forum for issues unique to women in radiology, radiation oncology and related medical professions.
• To sponsor programs that promote opportunities for women radiologists, radiation oncologists, and other related specialists.
• To facilitate communication amongst members and other professionals.
• To encourage international collaboration with women radiologists around the world.

Goals:

• Advance the professional and academic standing of our members
• Identify and address gender-specific issues.
• Increase and retain active members.
• Improve visibility and communication.
• Increase involvement in leadership positions.
• Identify and call attention to less pay for women radiologists doing the same work as men.
• Establish networking to foster leadership among women radiologists.

Benefits:

• Networking with other women in radiology
• Increased visibility of women in radiology
• Representation on the ACR board
• Sponsoring of activities that impact women
• Balancing roles at home and at work through childcare services at major national annual meetings.

Activities:

• Our Program Committee develops refreshers courses at the RSNA and ACRS annual meetings.
• We hold lunchbox discussion sessions at major national annual meetings.
• Our International Committee members have travelled to Europe, Africa and Asia to international radiology meetings (ECR in Vienna, ICR in Marrakesh, Morocco, in Beijing, China) to work with women radiologists from around the world.
• AAWR has had a booth at the ECR for the last seven years in Vienna.

Publications:

• We provide members with quarterly Focus newsletters, which are available online and with publications related to radiation protection. New members receive the Pocket Mentor, a manual for radiology residents and junior faculty, which contains guidance and advice on many work-related and personal matters.
• Website & online member network: www.aawr.org

We have established a website to update AAWR members on activities of the organization, to provide electronic publications, and to offer tools for community building and networking. The members’ network section of the website includes the online membership directory, AAWR publications, and messages.

The AAWR Committee to promote the advancement of women nominates nationally recognized women candidates to hold office within major national and international radiological organizations. Prominent AAWR members include Theresa McClun, immediate past President of the RSNA; Hedvig Hricak, president-elect of the RSNA; Kay Vydareny, President of the ACRS, and others. There are at least 15 women chairs of radiology departments at present.

AAWR has addressed several gender-specific issues:

• Maternity and radiation exposure – establishment of published guidelines for radiation safety and a maternity policy for radiology residents.
• Balancing roles at home and at work through childcare services at national radiology meetings.

AAWR has by offering childcare services at national meetings.

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• Maternity and radiation exposure – establishment of published guidelines for radiation safety and a maternity policy for radiology residents.

AAWR has reached out to the global community of women radiologists by establishing an international member category. Each year, AAWR senior leaders have attended the ECR in order to recruit international members and promote the visibility of AAWR. The AAWR booth has been staffed for the past seven years by the two co-founders of the International Committee, Ewa Kudlowska, MD, Professor of Radiology at Universiteit Medisch Centrum Amsterdam, and Judy Amovosa, MD, President of AAWR 2005, Professor of Radiology, Robert Wood Johnson Medical School.

Recently AAWR has established an Annual International Award for Outstanding RSNA Presentation. AAWR has become a significant resource for women radiologists in the United States. It has the potential to become a global resource for all women radiologists in the near future.
Forensic imaging specialists put their case for mainstream recognition

By Paula Gould

Forensic radiography sessions have become a fixture at medical imaging conferences. Delegates are typically guaranteed a good visual show, with presenters displaying many novel images that would seldom be seen in clinical radiology departments. The sessions are, to some extent, radiology’s own ‘shock and awe’.

This afternoon’s session on forensic imaging could be a little different. Although attendees can still expect to see an impressive array of images, speakers will also stress the importance of organisation, training and professional recognition. The emphasis will be on a high quality service, not quirks.

The provision of forensic imaging services has traditionally been a bit haphazard, said Jonathan McNulty, lecturer in diagnostic imaging at the University of Dublin. That is now changing. Training and postgraduate education courses are being established, and local groups are banding together to form national and international organisations.

“The aim of an organised, professionally-led forensic imaging service will be illustrated by Catherine Rock, chair of the International Association of Forensic Radiographers (IAFR). The UK now has its own forensic radiography response team, composed of radiographers with accredited training and experience in forensic and mass fatality imaging. A store of diagnostic imaging equipment that can be deployed in the event of a major incident has also been funded by the UK government.

The response team received its first call-out on 7 July 2005, when bombs were detonated simultaneously in London on three underground trains and a double-decker bus. A total of 24 radiographers assisted with the subsequent forensic imaging work, imaging 41 bodies and 1,162 body parts over a 17-day period.

The aims of the imaging work were twofold: to identify victims of the bombings, and to identify foreign objects inside the body-bags that could potentially impair the pathologist or that might be relevant to the police investigation.

Whole bodies were scanned head-to-toe with fluoroscopy on arrival at the emergency mortuary, Rock said. These initial surveys were undertaken by teams of two radiographers and a pathologist. The scans showed the location of personal effects and sharp objects, as well as prostheses or implants that could be used for identification purposes. Injuries sustained by victims were documented too. Once the body-bag had been opened, intra-oral x-rays were taken to compare with ante-mortem dental records. Body parts were examined using digital and computed radiography.

“Radiographers are used to dealing with trauma, but some people would find that this wasn’t for them,” she commented. “We wouldn’t involve anyone who hadn’t been through some kind of training. You are also working within a very different kind of team, not just medical professionals such as pathologists, but the police too.”

During the session, Prof. Michael Thali, director of the Institute of Forensic Medicine at the University of Bern, will show how advanced imaging techniques can aid scene-of-crime investigations and post-mortem examinations too. The ‘Virtopsy’ system pioneered at Bern is an entirely imaging-led approach to forensic investigation. Advocates for the system believe that it may eventually replace invasive methods of forensic pathology.

A key part of the Virtopsy approach is the 3D representation of all objects involved in the incident under investigation. For example, if a patient has been killed whilst riding a bicycle, investigators will make a virtual 3D model of that bicycle, as well as the patient’s body. An optical measuring process known as photogrammetry is used to attain 3D coordinates of discrete points on the objects being modelled. Surface data are then acquired using 3D optical scanning.

Cross-sectional imaging plays an important role too. Anatomical information that would typically be collected during an invasive post-mortem examination is acquired from whole-body MRI and/or CT scans. MR spectroscopy techniques are also being tested as a way to determine time of death.

“When is the best time to perform imaging techniques? This is a very important issue, and we want to get that right. This might be 24 hours, or 48 hours, or even later. We don’t know the answer,” he said. “We have seen a real change in people’s views,” he said. “When we started showing these techniques 15 years ago, many people said ‘That’s science fiction. We are quite happy with the way we do our autopsies.’ Now the same individuals are starting to use some of these advanced forensic imaging techniques for themselves.”

Refresher Course: Radiographers

Sunday, March 8, 2009
16:00–17:30, Room L/M
RC 12/14 Forensic Radiology

Moderators:
J. McNulty, Dublin/IE
A.M.K. Thomas, Grimsby/UK

A. The Bone Detectives
(The role of medical imaging in forensic investigations)
M.D. Wran, London/UK

B. The role of forensic imaging in the aftermath of the London tube and bus bombings
C. Rock; Huddersfield/UK

C. Postmortem CT and MR imaging in forensic medicine
M. Thali; Berne/CH

AIMS, the ESOR Visiting Seminars in China, are made possible by an unrestricted educational grant from Bracco.
Stroke is the third leading cause of death in the West, after heart disease and cancer, and is responsible for 10% of deaths worldwide. It can also be extremely disabling. Many survivors of acute stroke will be left with an unwanted legacy of physical and mental impairment.

Prompt, effective management of acute stroke victims could help reduce fatalities and leave fewer patients with lifelong, severe disabilities. A state-of-the-art symposium at ECR 2009 will consider the roles that radiologists can play in diagnosing and treating suspected stroke sufferers.

The session's title, 'Stroke management around the clock', reflects an important, underlying message. If outcomes are to improve, then patients must have access to experienced practitioners who are fully familiar with stroke pathology and its implications at any hour of the day or night. A 9am to 5pm commitment to service is simply no longer good enough. Stroke is a 24/7 problem that requires a 24/7 solution.

The role of radiology in stroke management has changed significantly over the past 10 years, according to Prof. Dr. Rüdiger von Kummer, head of neuroradiology at Dresden University Hospital, Germany. In some European countries, suspected stroke sufferers were not imaged at all a decade ago. Patients were recommended for treatment on the basis of clinical symptoms alone.

Today, the situation is very different. Studies showing that pre-treatment CT scans can improve patients' prognosis have been taken on board, and imaging has become part of the routine, diagnostic workup. The question now is not whether to image, but which modality to use, and how exactly to use it.

Von Kummer will address these issues by illustrating the differing strengths of CT and MRI. Most patients will be examined with CT. The scanners are more widely available than MRI systems, and CT examinations are easier for sick patients to tolerate. An MRI scan will show the brain pathology in broader detail, but this is not always necessary. CT perfusion is also a more robust technique than perfusion MRI.

The biggest advantage of MRI is the ability to perform diffusion-weighted imaging (DWI), he explains. DWI is highly sensitive to the signs of brain haemorrhage that are related to the stroke being investigated, or occurred previously in the patient's history.

CT and/or MRI results are increasingly being used to decide how to manage acute stroke patients. The manner in which these imaging findings are applied, however, is an area of some controversy. It is generally accepted that patients should not receive clot-busting drugs more than three hours after the onset of stroke symptoms. But this recommendation is based on studies that only used brain haemorrhage and major infarction as contraindications to drug therapy. Had evidence of reversible injury been used to guide patient selection, then the efficacy window for thrombolysis may have been extended to well over four hours.

Given the question marks hanging over the efficacy of thrombolysis, von Kummer recommends that the angiography suite is also prepared for endovascular intervention when drug-based stroke treatments are to be used. If thrombolysis is not successful, then intra-arterial recanalisation can begin almost immediately.

"The prognosis for these patients is very, very poor if thrombolysis fails," he said. "If there is no recanalisation, the patient will get big infarctions and disability."

Endovascular recanalisation can be performed up to six hours after symptomatic onset of acute stroke with good results, said Prof. Dr. Gerhard Schroth, director of diagnostic and interventional neuroradiology at Bern University Hospital, Switzerland. Recanalisation rates now approaching 80%, every three procedures saves one patient from severe disability.

"Whenever we succeed in recanalising an occluded blood vessel supplying the brain, then the outcome of that patient is significantly improved," he said.

Procedural details have changed very little over the years. The main difference is that interventional radiologists now inject a clot-busting drug directly into the thrombus rather than just in front of the occlusion site. If this strategy is unsuccessful, then the next step may be to perform percutaneous transluminal angioplasty (PTA) with a balloon catheter or stenting. The thrombus may be retrieved mechanically using a variety of specially designed instruments.

Referrals for endovascular treatment from the stroke team can come at any time, Schroth stated. The faster interventional radiologists can respond, the more likely is a positive outcome.

"If a patient comes in the early morning, the late afternoon, or during the middle of the night, we have to be prepared," he said. "This is one of the most cost-effective treatments in healthcare, given the high rates of handicap associated with stroke."
MR vendors look for a patient-focused route to success in MR imaging

By John Bonner

In the gleaming technical exhibition at ECR 2009, vendors of MRI systems are showing just how their latest innovations will help to turn the imaging examination into a faster, less claustrophobic and altogether more pleasant experience for the patient.

Philips is unveiling its new Achieva 3.0T TX unit, which it describes as one of the most powerful systems currently available, enabling clinicians to obtain high-quality results across a wide range of applications and patient sizes.

Guide Stomp, director of the Philips Healthcare MR business line, explains that the improvement in performance with the new model has resulted from a change of emphasis from the RF signal receiving technologies to the signal transmission side. The product is equipped with a multiple transmission source that allows a uniform distribution of signal across the part of the body under examination. By adjusting the RF signal, the system is able to eliminate the dielectric shading artefacts that remain a major problem with 3T MRI.

“This means that we have far fewer repeat scans. The patient spends less time in the scanner and there is a faster throughput of cases,” he noted. “But there is not just a reduction in the number of retakes. The actual scan time can be up to 40% faster, which will make a considerable difference in situations like spinal imaging, where there is normally a need for high signal intensity.”

Improvements in the consistency of the images created will broaden the clinical utility of 3T systems. Stomp points out that three Tesla machines have proved their worth in neuroradiology and abdominal imaging. He hopes that this ability to adapt to patients with wide variation in fat and fluid distribution will bring new opportunities for hospitals away from the main academic centres, which need to carry out larger numbers of breast, liver and abdominal examinations.

The clinical potential of the Achieva 3.0T TX is being assessed at the University of Bonn, Germany, and the machine will become commercially available later this year.

Part of Siemens’ strategy for making examinations more comfortable has been to design systems that look less intimidating. Its latest product is the Magnetom Espree – Pink. This dedicated 1.5T MR breast system combines the open-bore design of the Magnetom Espree with the Sentinel Vantage, a coil for breast imaging and biopsies.

Allowing for both feet-first and head-first positioning, the new unit is 125 cm long and has a 70 cm open bore to enhance patient comfort and allow easy access for biopsies. It also offers a comprehensive portfolio of routine and advanced applications for breast care, including syngo VIEWS for routine imaging, syngo CRACE for spectroscopy, and syngo BLADE for motion-free imaging results.

On its booth, Siemens is also showing its innovation for oncology imaging, Tim (total imaging matrix). Its features include syngo Tissue 45, which offers dynamic evaluation with quantification of tumour tissues in organs such as the prostate and liver. This provides two evaluation workflows: standard and pharmacokinetic modelling (PKM). The latter function quantifies the uptake of contrast medium and can be used for oncology workflows and follow-up studies.

GE Healthcare is showcasing the Signa MR750 3.0T, launched in Paris last October. This product reportedly delivers up to 60% additional anatomical coverage and resolution compared with conventional systems, but the emphasis in the design process has been as much on simplicity as its technical performance, according to Stefano Vaglione, GE’s general manager for MRI technologies in the European region.

“It has a console on the machine itself, which enables radiographers to carry out many of the actions that they would normally have to do outside the room,” he said. “They can stay with the patient while they set up the exam, and our new software also simplifies the set up, which means they can concentrate on looking after their patient.”

The new system can also reduce the time spent by the patient in the MRI suite. Its new RF Transmit system maximises performance with a 17% gain in scanning efficiency, while the Optical RF technology allows up to a 27% higher signal to noise ratio. This reduces the number of acquisitions needed for a comprehensive breast examination from four to two, and will cut the time needed for a full liver study from at least 25 minutes down to 15 minutes, he noted.

Hitachi Medical Systems has also made patient comfort a priority in designing both the Oasys 1.2T and Echelon XII 1.5T machines. These products feature a new number of applications, including high-resolution dynamic breast imaging with TGIKE, comprehensive motion-compensated free-breathing abdominal studies with RADAR, non-contrast MBA with VASC, brain ischaemia assessment with Advanced Neurosuite, and white matter disease assessment with Diffusion TensorSuite.

The technical exhibition area is open today from 10:00 to 18:00.

Oasis incorporates a 1.2T vertical field magnet designed to meet the demands of today’s advanced studies and image quality requirements. Its unobstructed viewing angle puts even difficult patients at ease, which decreases scan time and increases throughput.
Biomedical imaging advances in the Netherlands

By Bart M. ter Haar Romeny, Eindhoven University of Technology, the Netherlands

The research group Biomedical Image Analysis (BMIA) at Eindhoven University of Technology, the Netherlands, is part of the Department of Biomedical Engineering. It has 500 students, making it the largest such institution in the Netherlands.

The group, headed by Prof. Bart ter Haar Romeny, focuses on the development of efficient diagnostic workstation applications for diagnostic radiology, image-guided surgery and the life-sciences. To benefit from a multi-disciplinary approach the research and education is divided into a chain of 5 areas:

1. Algorithm Design for Medical Image Analysis
   Powerful and smart algorithms form the core of effective quantitative and CAD medical image analysis tools. Many new methods are being developed, using state-of-the-art mathematics, in close collaboration with hospitals and industry. One focus is the analysis of tensor-valued images for diffusion tensor imaging applications, heart motion analysis and surgical navigation. Another focus is trying to bio-mimic the segmentation and recognition mechanisms of the spectacular human visual system. This led to many new and unconventional algorithms, such as for catheter detection at much lower x-ray doses than current clinical practice, heart motion quantification and image retrieval.

2. Multivalued Image Analysis and Visualisation
   Nowadays, 3D medical imaging techniques allow complex measurements such as diffusion or flow. This data are difficult to understand without any processing. To convey the information that the radiologists and physicians need to analyse complex medical imaging data, advanced visualisation and image analysis techniques are developed by the group. A strong focus is the development of techniques for Diffusion Tensor Imaging data (DTI). The interactive visualisation tool (i.e. DTI-Tool, developed in-house) allows the visualisation of DTI data. Techniques to visualise and analyse High Angular Resolution Diffusion Imaging (HARDI) are now incorporated. HARDI allows the distinction of intra-voxel fibre crossing. As applications, the methods are applied to the brain white matter, as well as to the heart and muscles.

3. Cardiac Image Analysis
   Here it is all about quantitative image analysis: study of the detailed local deformation of the left ventricular wall during systole and diastole, with high-resolution deformation analysis from tagged MR for non-invasive infant assessment. Another focus is the segmentation of the cardiac left atrial myocardium with deformable models, to measure local atrial wall thickness. This application should serve as a guide for electrophysiologists during catheter ablation of atrial fibrillation.

4. Computer-Aided Diagnosis
   New quantitative CAD methods are developed for dynamic contrast-enhanced MR images of the breast, in collaboration with Philips Healthcare and the University of Chicago. Static and dynamic MR images are acquired during diffusion of a contrast agent in the breast tissue, exposing cancerous disorders by means of characteristic spatial and temporal enhancement patterns. The team exploits pharmacokinetic multi-compartment modelling and pattern recognition techniques. Other projects include the automated detection of pulmonary emboli, and polyp detection in low-dose virtual endoscopy.

5. Image-Guided Surgery
   Located in the Maastricht University Hospital, the Image-Guided Surgery group closely collaborates with the neurosurgery department. Together the focus is on a variety of research topics. Currently a software tool is being developed for Deep Brain Stimulation procedures to accurately locate the stimulation target and the safest entry path. For tumour resection surgery the work is focused on (GPU-based) multi-modal (mix of MR, CT, BMRI, DTI) planning tools. For the study of the mobility of the cervical spine the vertebra movements are analysed through x-ray video sequences and with newly developed software, interfaced with Medtronic’s Stealth Station and Medtronic’s intra-operative MRI scanner, the Polestar N20.

Meet this interesting group at the IMAGINE exhibition (ACV second level, opposite room B). All the research topics described above (and more) are demonstrated and carefully explained by a large crew. The Netherlands has a strong tradition in medical image analysis; come and see the revolutionary developments and find out how they can improve your workflow.

Web: www.bmia.bmt.tue.nl

Visit the IMAGINE Area on the 2nd level
Improving early detection and diagnosis of breast cancer

The project HAMAM - Highly Accurate Breast Cancer Diagnosis through Integration of Biological Knowledge, Novel Imaging Modalities, and Modelling - is funded by the European Commission within the Seventh Framework Programme with a total of 63.6 m. The 3-year project started in September 2008 and consists of 9 international scientific partners from seven countries (listed at www.hamam-project.eu), with EIBIR as coordinating partner. Despite tremendous advances in modern imaging technology, both early detection and accurate diagnosis of breast cancer are still unresolved challenges. Unnecessary biopsies are taken and tumours frequently go undetected until a stage where therapy is costly or unsuccessful. HAMAM will tackle this challenge by providing a means to seamlessly integrate the available medical images and the patient information on a single clinical workstation.

HAMAM is a successor of the very successful EU-projects SCREEN and SCREEN-TRIAL, which brought major advances in European breast cancer diagnosis. With HAMAM, Europe has the potential to strengthen its leadership in the whole area of image-based breast cancer diagnosis.

We are pleased to provide you with an overview of the scientific progress achieved at work package level during the first months of the project.

**Work Package 1**

**Clinical and diagnostic requirements**

This work package is led by MeVis Research GmbH. The overall objective is to bring together scientists, clinicians, and engineers in order to review the relevant existing knowledge and data sources and to prioritise the specific requirements of the project.

The clinical project partners together with the clinical advisory board members will define detailed requirements from a clinical perspective regarding the role of the different modalities for specific clinical questions, the tools needed for multi-modal breast diagnosis, and the clinical workflow represented by a set of use cases. Based on this, software engineers and IT researchers will specify the architecture as well as relevant interfaces of a software prototype for multi-modal diagnosis of breast cancer.

Finally, the work package comprises the design and definition of a database for anonymised clinical data including lifestyle risk factors, histopathology, family history information and genetic test results. The database of known high penetrance breast cancer genes and polymorphisms at loci known to predict breast cancer risk in this end, a workshop will be held back-to-back with ECR 2009.

**Work Package 2**

**Development of multi-modal environment**

This work package is led by MeVis Medical Solutions. As part of the specification of the multi-modal work environment for breast cancer diagnosis to be developed by MeVis Medical Solutions, efforts in Task 2.1 and Task 1.3 have been focused on evaluating what extent the project specific requirements are already fulfilled by the software modules which are part of the proprietary application platform MeVisLab.

Based on the requirements for the clinical scenario identified in WP 1, a meeting in Bremen, missing software components providing basic functionalities such as data import and standard visualisation and interaction techniques have been identified, primarily in the context of the new modalities like tomosynthesis, PDM (Positron Emission Mammography) and 3D breast ultrasound. Missing software components and their integration for the clinical environment have been scheduled for development.

During a meeting with the partner Eidgenössische Technische Hochschule Zürich in Bremen, topics related to the data connection between the workstation prototype and the HAMAM database were discussed, including the type of data that has to be exchanged, data formats as well as interfaces for software interfaces. The results of this discussion have to be worked out in greater detail jointly by all project partners.

**Work Package 3**

**Imaging spatial correlation**

This work package is led by the University College London. The aim of this work package is to establish spatial correspondence between regions of the breast acquired by different image modalities to enable effective synthesis and visualisation of the multi-modal data for the detection and diagnosis of breast lesions. Intra-modality image registration will be provided for intra-modality fusion of 3D ultrasound images and for the alignment of the DCE-MR images. Temporal registration methods will be developed to support the detection and diagnosis of lesions as well as the estimation of therapeutic response.

**Work Package 4**

**Model-based analysis of integrated imaging data**

This work package is led by Radboud Universiteit Nijmegen (RUNMC). The overall objective is to research image-derived quantitative diagnostic-tissue model parameters focused on breast cancer detection, discrimination and therapeutic effect. A multi-modal strategy will be followed integrating results of work packages 3 and 5 into the research. The results of this work package will be added to other patient-specific multi-disciplinary data and used to define an integrated measurement in work package 5.

To carry out the tasks, two researchers were recruited who both started in November 2008. Preparations were made to collect cases and literature. Research was performed to learn about the most recent developments in the field. It was decided to first focus on research and development of breast MRI parameters, because MRI data is readily available at RUNMC. For reliable and automated feature extraction, segmentation of the various tissues encountered in breast MRI has to be performed.

A whole breast ultrasound unit is planned to be installed at RUNMC. At MeVis Research GmbH, some preliminary work with 3DBUS has started. Initial experience with a few cases that are available indicates that stitching of different views and correction of motion artefacts are relevant issues to investigate.

**Work Package 5**

**Integration of multi-disciplinary data**

This work package is led by Epidemiologische Technische Hochschule zuerich. The principal objective is to centralise the heterogeneous data collected by all partners in a structured fashion, and fuse this multidisciplinary information for extracting new insight about breast cancer diagnosis and detection.

The first step towards this goal is to define a common representation for the multidisciplinary data which is compatible with both clinical requirements and objectives, and machine learning methods that shall be employed for extracting useful associations from the database (February 2009). Consequently, visits are being scheduled with all partners in order to collect the specific types of data they produce as well as their own needs, in order to reach a consensus.

In parallel, data transfer agreements will be set up with the clinical partners, so that ethical and legal issues, related to the hosting of sensitive data in the centralised database server, are solved before the data collection phase begins.

**Work Package 6**

**Technical validation and verification**

This work package is led by MeVis Research GmbH. The objective of this work package is the validation and verification of the software application, algorithms and project database developed in HAMAM. The official start date of WP 6 is September 2009. Nevertheless, single work will start as soon as preliminary results are obtained in the tasks of the other work packages.

**Work Package 7**

**Clinical validation and verification**

This work package is led by eidgenoessische technische hochschule zuerich (ETHZ). The HAMAM project is very strongly clinically oriented and is not intended to be an engineering solution to the wide variety of challenging problems often solved using complex technical solutions. Validation will include usability (responsiveness, time gain, learning curve) in a clinical setting, the effect on diagnostic accuracy, confidence of visual and quantitative output. Activities in this work package will start in September 2009.

Portraits of dedicated staff as well as updates on progress reports are available at the HAMAM project website www.hamam-project.org.
**Stereotactic radiofrequency ablation of liver tumours proves effective**

By Reto Bale, SIP - Microinvasive Therapy, Department of Radiology, Medical University Innsbruck/AT

Radiofrequency ablation is an effective technique for resectable tumour destruction. However, the size of the ablation zone is limited and depends on the RFA probe technology used. Desperate local tumour recurrence rates in large liver lesions require modifications of the conventional US and CT-guided approach. We present a novel method of radiofrequency ablation of large liver lesions by stereotactic placement of multiple RFA probes in order to achieve an overlapping ablation zone including a sufficient safety margin.

**3D navigation system**

Navigation systems show the actual position of the probe with respect to cross-sectional images of the preoperative CT/MRI dataset(s) in real-time. Instruments and anatomic structures are assumed as rigid bodies. The key step is the registration, during which the spatial configuration of the real patient is correlated with the preoperative images of the patient. This is done by indicating the reference points (e.g. skin fiducials) on the patient with the navigation probe, thereby assigning each fiducial its corresponding position on the reconstructed 3D-data set.

**Procedure**

**Imaging**

After oral intubation the patient is rigidly immobilised on the CT table by a vacuum mattress (Medical Intelligence, Schwabmünchen, Deutschland). After placement of skin markers, a contrast-enhanced helical CT scan (Somatom Open, Siemens, Erlangen, Germany) with a slice thickness of 2 mm is obtained with respiratory triggering. The CT data are sent to the navigation system in the CT room.

**Virtual planning of 3D – distribution of RFA probes**

Pathways for multiple probes are planned on the 2D and 3D reconstructions of the CT data in order to cover the whole tumour volume by overlapping necroses. Once the trajectory is planned, the path of the probe in the patient can be visualised virtually and changed according to the anatomy of the patient. The trajectories for the different RFA probes are optimised to a minimum distance of 2.5 cm and a maximum distance of 1.5 cm. In addition, the ribs and vital structures, including vessels, bile duct and surrounding organs, have to be protected.

**Planning CT: S.p. left hemihepatectomy with two recurrent HCCs (3 cm and 10 cm).**

**Registration**

After sterile washing and draping, registration is performed by indicating the skin fiducials on the patient with the navigation probe, thereby assigning each fiducial its corresponding position on the reconstructed 3D-data set.

**Placement of RFA probes**

The Atlas needle holder (Medical Intelligence, Schwabmünchen, Deutschland) is attached to the fixation system and adjusted using the Treon navigation system for every path. One after another coaxial needle is removed with tract fusion, a maximum of six RFA probes with an active tip of 3 cm are introduced into the coaxial needles to the pre-planned depth.

**Control CT immediately after RFA**

After RFA a contrast-enhanced CT scan is obtained with the coaxial needles in place, in order to compare the size of the induced necrosis with the original tumour size. After verification of the necrosis covering the tumour and a safety margin of approximately 1 cm, one after another coaxial needle is removed with tract ablation.

**Verification of correct needle placement**

A native CT with the needles in place is obtained with respiratory triggering and the dataset is sent to the navigation system. After verification of correct needle placement by means of image fusion, a maximum of six RFA probes with an active tip of 3 cm are introduced into the coaxial needles to the pre-planned depth.

**Ablation**

Thereafter, the coaxial needles are retracted in order to avoid contact of the active uninsulated tip of the RFA probe with the coaxial needle. Depending on the RFA technology used, a maximum of six electrodes are simultaneously activated. An empirically calculated amount of RFA energy is applied at every probe position. In the case that the required necrosis is larger than the active tip, step-by-step retraction and ablation is performed according to the virtual plan.

**Control CT 2 years after stereotactic RFA does not show any recurrence.**

**Resovist-enhanced MRI 2 years after stereotactic RFA**

Stereotactic RFA in the first 100 patients are shown. Interventional radiologists may try to plan a virtual stereotactic RFA of a large tumour, based on anonymous datasets from patients with liver tumours who have been treated previously.**
Vessel analysis techniques multiply and begin to enter routine clinical use

By Javier Oliván Bescós, Joost Peters, Raymond Habets, Jeroen Sonnemans, Marcel Breeuwer, Philips Healthcare Best, The Netherlands

Current vessel analysis applications in the market offer a range of tools such as segmentation, path-tracking and different 2D and 3D visualisation modes. These applications are often perceived as rather heavy and complex, needing a time-consuming sequence of pre-processing steps before getting to the diagnostic task at hand: measuring the vessel lumen to characterise the vascular pathology, such as stenosis or aneurysm. Although today the pre-processing is more and more automated, the user still needs to check the results and edit these if necessary.

At this year’s IMAGINE exhibition we show a 3D CT/MR vessel analysis prototype based on our innovative Vessel Explorer approach. Vessel Explorer aims to provide fast and robust techniques to analyse vessels locally, minimising the required user interaction at the same time.

Our Vessel Explorer offers a lightweight user interface aimed at direct and easy measurement of vessel diameter, area and lengths in 3D CT and MR angiography images, without any pre-processing steps. Although the intuitiveness of the application is hard to capture in one image, we explain its basics in Figure 1, which shows a screenshot of the application.

In Figure 1, we inspect an MR angiogram of the carotids. The user may employ any type of rendering mode (MPR, MIP, volume rendering) to inspect the data (in this case, a 10 mm thick coronal slab).

The Vessel Explorer should be considered as an advanced magnifying glass applied to a structure of interest. When the user needs to inspect a particular location, a single mouse click computes a local vessel centreline and segments the vessel lumen at the cursor position. In the example given, the user clicked at a location just above the right carotid bifurcation. From the locally estimated vessel orientation, we subsequently derive an MPR perpendicular (top right) and parallel (bottom right) to the vessel, that allows detailed inspection of the vessel. Next to that we provide an initial vessel diameter and cross-sectional area measurement from the lumen segmentation, which can be edited by the user.

When necessary, the user can easily navigate along the selected vessel by hovering the mouse along the vessel in any of the views or by pressing the up/down keys. During navigation, the user may select different vessels with a single mouse click at any time.

Fast and robust visual inspection of the coronary arteries based on live path tracking

In Figure 2 we show an extension of the Vessel Explorer concept applied to a coronary artery. Here, a local centreline is computed on the fly and it is used to compute a local curvilinear reformatted image at the bottom left. Using the mouse scroll wheel the local centreline and curvilinear reformat can be extended or shortened.

A major achievement is that the local path tracking algorithm is very fast, taking only tenths of a second including the generation of the visualisations. The user thus receives live feedback about the local coronary anatomy. The fact that all visualisations are automatically properly aligned decreases the inter-user variability associated with manual interactions. When different users click at about the same location, the same renderings will be generated.

For the coronary arteries the local path tracking has been validated on 11 MR data sets used in the work presented in [1]. Four image processing experts were asked to manually delineate the centreline of the coronary arteries in these 11 data sets. For each coronary artery, the four centrelines were averaged with the Repeated Averaging Algorithm [2]. The averaged line was considered to be the gold standard. Local centrelines of 5 cm were computed with the local path tracking algorithm at the middle point of each golden standard path. Each local path was compared to the golden standard using the Repeated Averaging Algorithm [2]. The mean error was 0.32 mm, with a standard deviation of 0.88 mm. Currently our algorithms have been validated and parameterised not only for coronary MR angiography but for all vascular anatomies in contrast-enhanced MR and CT angiography. As shown in Figure 3, the local path tracking also works in stenotic cases.

For more information about our research and demonstration of the algorithm, please visit us at the IMAGINE exhibit.

References


Figure 1: MR angiography of the carotids.

Figure 2: This image was captured after the user clicked at the location marked by the arrow. Based on the local centreline, a slab volume rendering (left), a cross section (top right) and a curvilinear reformatted image (bottom right) were generated.

Figure 3: The method applied to a stenotic coronary artery.

TECHNOLOGY FOCUS

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* depending on anatomy scanned and the diagnostic requirements
Chest imaging experts confront hot issues

By Edwin J.R. van Beek, Iowa City, IA/US; Jürgen Biederer, Kiel/DE

There are a number of ‘hot’ issues in chest imag- ing that are currently taking centre stage. First, the issue of how to deal with acute chest pain is increasingly being met by chest CT methods, including CT pulmonary angiography, CT coro- nary artery angiography and CT sartigraphy. With advancing CT technology, the triple rule out study is taking the spotlight. Coupled with these changes, there is the realisation that more appropriate triage of patients that are considered candidates is essential, as the radiation dose is significant and the easy availability of CT in the emergency setting has led to an increased use and decrease in prevalence of disease.

Nevertheless, CT pulmonary angiography and CT coronary angiography have proven to be very robust tests in adequately selected patient popula- tions. What transpires is that the management of acute chest pain is being reviewed as part of dedicated patient care pathways, which includes other diagnostic tests and also allows for dedi- cated protocols for CT applications. For instance, in patients in whom pulmonary embolism is more likely, clinical decision rules, plasma D-dimer and (in some situations) ultrasonography or perfusion scintigraphy are deployed prior to CT pulmonary angiography. In patients with sus- pected coronary artery disease, calcium scoring CT, stress echocardiography and stress MRI may be used, whereas in acute settings CT coronary angiography is proving particularly useful in patients with a low to intermediate likelihood of significant coronary artery disease (a large pro- portion can have this excluded, and thus avoid invasive catheter angiography or multiple tests delaying the final diagnosis).

Second, there is the increasing demand for more accurate and quantitative imaging to detect disease earlier and allow for monitoring of chang- es using sophisticated software. This demand is part of the pharmaceutical industry’s interest in developing protocols to test safety and efficacy of new drugs without having to wait for the (often late or inconsistent) onset of clinical changes, such as events or changes in pulmonary function tests. Furthermore, with the awareness that lung disease is often inhomogeneously distributed, drug delivery is being reassessed, requiring more focused assessment of disease distribution. CT (and to a lesser extent MRI) are subject to continuous development to meet these demands.

Third, with this extensive use of CT for an increas- ing number of clinical applications, radiation exposure has become a most relevant issue. Tech- nical developments (attenuation-corrected dose modulation, shutters to eliminate over ranging in multiple row detector CT (MSCT) with large z-coverage and improvements in detector accu- racy) allow for routine dose reduction of chest CT to 60%. However, by far the largest potential to reduce radiation exposure down to less than 10% is related to the right choice of protocol.

Unfortunately, an increasing variety of CT scanners with different imaging geometry and diverse protocol recommendations of the ven- dors for chest imaging makes a consensus dif- ficult. A schematic set of protocols for CT of the chest suggests adapted parameters for four differ- ent groups of indications. Tumour staging and any unclear situations call for the workflow: a contrast-enhanced helical scan with sufficient, but not necessarily maximum spatial resolution and an effective dose of 2.0-4.0 mSv. Single row detector CT (SCT) range at the lower end and MSCT at the higher end of the scan (scanners without the option to reduce collimation may require higher tube currents for the standard protocol). A refinement of this protocol with maximum spatial resolution would be dedicated to vessel imaging (including triple rule out in the ER). Depending on the z-coverage and collimation, this infers a higher radiation exposure (Heff 4-10 mSv). However, many indications such as short- term follow-up of lung parenchymal disease, eval- uation of ICU patients or lung cancer screening can be sufficiently covered with a non-contrast- enhanced helical scan at tube loads of 20-40% compared to the standard scan (Heff 1.0-1.5 mSv for SCT, 1.5-2.0 mSv for MSCT). This is still suffi- cient for computer-aided (CAD) module detec- tion or volumetry. Diffuse lung disease can be assessed with classic HRCT and small types. Volume coverage is incomplete, but radiation exposure is less than 1 mSv. Volumetric helical HRCT can be obtained with a limited reduced dose (Figure 1), with satisfactory image quality. Thus, a smart selection of suitable protocols can reduce radiation exposure to less than 10%.

As a contribution to the discussion and a basis for ongoing development and continuous improvement, protocol suggestions at the current state of discussion are available at http://www.earm-connect.de

ePACS@ECR 2009 – Train your reporting skills for CT and MRI

By Thomas Moritz, Vienna/AT

Most of our medical knowledge derives from our radiological training, but it also comes from the daily routine, from patients left in our hands and from our experienced colleagues and mentors who we seek in doubt. E-learning is an advancing new field in all medical specialties. It enables to present daily work to some extent for all provides us with web-based tools, a place to learn and a platform to examine them.

E-learning is increasingly being integrated into our daily practice and therefore e-learning has to be more than classic learning. It is known that a great deal of learning is a social process, a matter of interaction, observation and imitation. Michael Keren defines learning as "learning where digital media is used to present and distribute content and to provide interpersonal communication." E-learning applications try to accommodate these learning aspects. Some of the techniques needed – some of the concepts of the so-called Web 2.0 – have evolved over recent months and years, and only some have been used and tested systematically in an e-learning context. The interaction within a forum, for instance, or the concept of ‘blended learning,’ a combination of virtual and physical teaching - both promising approaches to social e-learning.

ePACS is a radiological e-learning project developed at the Medical University of Vienna (MUV) with the support of the European Society of Radiology. It combines computer-aided education records, a medical content management system, and a large collection of CT cases, comprising a cardiac and an acute abdomen course. Moreover, this year’s collection will be enhanced by a new musculoskeletal MRI course seeking to convey basic and advanced MRI knowledge of the musculoskeletal system to all interested radiologists.

On once again the ePACS team is proud of having convinced first-class experts in the respective fields - a large collection of CT cases, comprising a renal and an acute abdomen course. Moreover, this year’s collection will be enhanced by a new musculoskeletal MRI course seeking to convey basic and advanced MRI knowledge of the musculoskeletal system to all interested radiologists.

E-learning applications try to accommodate these learning aspects. Some of the techniques used – some of the concepts of the so-called Web 2.0 – have evolved over recent months and years, and only some have been used and tested systematically in an e-learning context. The interaction within a learning forum, for instance, or the concept of 'blended learning,' a combination of virtual and physical teaching—both promising approaches to social e-learning.
Automated spine assessment becomes feasible

By C. Lorenz, T. Klinder, T. Blaffert, S. Kabus, S.P.M. Dries; Philips Research, Hamburg/DE

Due to clinical demand and advances in imaging equipment technology, ever increasing amounts of image data set the stage both for adjunct and core automated processing applications. Probably the best example of clinical demand is the ambition to plan and follow-up therapy like interventions and surgery according to criteria measured with imaging. As an example, spine assessment typically involves calculation of derived metrics, like vertebral or intervertebral height, foramenal width or area, angulations, offsets, density in ROIs, ideal access or fixation paths, etc. Once the anatomy is identified, these derived metrics can be calculated simply by a computer system, and comparison of cases based on anatomic correspondence can be facilitated. But which human reader wants to input his or her fast anatomy identification through not-so-fast computer user interfaces on a regular basis?

Automated recognition of organs and tissues is referred to as segmentation, and its output is inherently feasible to facilitate calculation of derived metrics and therapy plans. Segmentation can be further divided into detection (of the location of the object), segmentation (in the strict sense of shape recognition) and identification (of nomenclature, e.g. vertebral numbering). A reliable segmentation of the vertebral column is deemed essential for numerous orthopaedic, neurological, and oncological applications. In the context of computer-aided spinal surgery, exact knowledge about the shape of individual vertebrae is of great importance, e.g. for biopsies, augmentation or implants like artificial discs or fusion instrumentation. Additionally, the vertebral column may serve as a reference structure, supporting the localization of other organs. In most cases not only a precise shape segmentation but also an identification of individual vertebrae is needed, e.g. to assure that the correct vertebra is addressed by therapy.

Since bony structures show high contrast in CT, this imaging technique is the modality of choice for developing and demonstrating spine segmentation. However, in spite of high contrast, an exact segmentation of vertebrae still remains challenging due to sampling or reconstruction artifacts, noise at object boundaries, similar structures in close vicinity, or pathologies.

Another key issue for automated image processing is the shape complexity of the objects to be segmented and their inter-patient variability. Although several vertebrae show typical characteristics, e.g. thoracic vertebrae have articulations with the ribs, the shapes of neighbouring vertebrae are typically very similar, so that automatic sequence identification is generally difficult to obtain. In clinical practice, the identification problem is solved by searching for characteristic vertebral traits, e.g. the first cervical or first thoracic vertebra, and subsequently labelling the individual vertebrae iteratively. In many cases, labelling can be facilitated by the use of reference structures, which again is impeded by reconstruction limited to a focused in-plane field of view, and of course clinical question limited axial coverage.

Methods

Our method allows the automatic detection, identification, and segmentation of individual vertebrae in arbitrary CT scans (cervical, thoracic, and lumbar, but also whole-spine images) even with a limited in-plane field of view, since it does not require any reference structures. As output, it provides a segmentation represented as labelled vertebrae in the form of triangulated surface meshes. The individual components of our framework are outlined as follows (see Figure 2):

Spine Curve Extraction: Based on a progressive adaptation of small tube-shaped segments represented as triangulated surface meshes, the spinal canal is extracted. Since bony structures show high contrast in CT, this imaging technique is the modality of choice for developing and demonstrating spine segmentation. However, in spite of high contrast, an exact segmentation of vertebrae still remains challenging due to sampling or reconstruction artifacts, noise at object boundaries, similar structures in close vicinity, or pathologies.

Vertebra Detection: In order to simplify the detection, a curved planar reformation (CPR) is at first applied on the volume based on the extracted spine curve. Detection is carried out in the reformatted image.

Vertebra Identification: For identification, a similarity measure is evaluated between the local image patch around the detected candidates and earlier trained models that contain typical gray values of the individual vertebrae and their local neighbourhood.

Vertebra Segmentation: The final segmentation is carried out by adapting triangulated shape models (see Figure 2) of the individual vertebrae. The adaptation algorithm uses additional features designed for the segmentation of model ensembles.

Results

Evaluation is performed on 64 test image data sets in order to draw reliable conclusions. The test image set did not include the learning images used to create the models. The spine curve detection was successful on all data sets. The vertebra detection step had a success rate of 92% (59 out of 64 data sets), and the vertebra identification had an isolated success rate of 95% (56 out of the remaining 59 cases). The final segmentation step resulted in a mean vertex-to-surface error of 1.8 mm as compared to ground-truth segmentations, where vertices (points) are base elements of the triangulated surface descriptions.

References


Figure 1. Block diagram of framework. Based on the spine curve extraction, a curved planar reformer is applied and the vertebrae are detected in the reformatted image. Found candidates are transformed back to the original image – visualised as spheres located between each vertebra. Afterwards, candidates are identified – visualised as pre-positioned models; colour coding illustrates labels of vertebra meshes. Finally, meshes are adapted to the respective image structures.

Figure 2. (a) Illustration of a vertebra surface model showing the sixth thoracic vertebra. (b-d) Invariant features of vertebrae are used to define a vertebra coordinate system: Vertebral foramen (b), middle plane of upper and lower vertebrae body surfaces (c) and sagittal symmetry planes (d). (e-f) Spine model as ensemble of mean vertebrae models. Each shape model carries its own local coordinate system. Lateral (e) and ventral (f) views of the spine.
Experimental radiology flourishes at Medical University of Innsbruck

By Wolfgang Recheis, Innsbruck/AT

The Experimental Radiology team at the Medical University of Innsbruck, consisting of four physicists, one mathematician, two computer scientists and three students, is currently pursuing two main topics:

1. Custom implant design of large bone defects
2. Texture analysis of the pulmonary parenchyma

In the following draft we would like to describe our work.

Custom Implant Design for Large Bone Defects in Cranial Surgery

Large skull defects (~100 cm²) are common sequelae of trauma, cancer, stroke, and re-constructive surgery. Aesthetically complete reconstructions of the defect remains challenging because the majority of current implant design techniques are dependent on subjective processes. We currently transfer existing anthropological methods to neurosurgical planning in order to reduce the dependence on subjective skills and improve the implant form. The suite of methods of 3D geometric morphometrics (GMM) aids us in the design task. We are using a database comprising over 200 CT scans of the human skull.

One specimen is selected as a template and landmarks and semi-landmarks are set on the segmented outer surface of the skull. The template is used to perform thin plate spline warps to the patient’s skull. To guarantee matching, we specify a reduced number of landmarks in the target specimens.

Using this procedure all the landmarks of the specimens in the database can be obtained. The landmark sets are then taken to compute a Procrustes average shape. After these pre-processing steps we can then apply the methods to the patient data. We warp the landmarks to the region without defect. In the defected region missing landmarks are obtained using the Procrustes average shape. We consider additionally some landmarks on the skull as missing to correctly compute the boundary. This works well but the main challenge is to calculate the inner surface and thus the thickness of bone. Currently we use the average thickness of the unimpaired part of the skull.

We are still optimising the boundary algorithm. In the future we will design the inner surface, connect both surfaces for the final implant, and evaluate the quality of the implants. Currently we use an in-house rapid prototyping machine to create negative models of the implant as a moulding tool. We are still optimising the boundary algorithm. Finally we set up a collaboration with Definemed (Team Prof. Zompatori) was established.

In this project the texture analysis algorithm 3D-AMFM (Adaptive Multiple Feature Method) contained in the software PASS (University of Iowa, Physiologic Imaging, Head: Prof. Eric Hoffman) was applied to patients with interstitial lung diseases. A fruitful and effective collaboration with the University of Parma and Bologna (Team Prof. Zompatori) was established.

In this project the texture analysis algorithm 3D-AMFM (Adaptive Multiple Feature Method) contained in the software PASS (University of Iowa, Physiologic Imaging, Head: Prof. Eric Hoffman) was applied to patients with interstitial lung diseases. The basis of the system is a Bayesian classifier, which needs to be trained by experienced radiologists. The sometimes tedious training is based on setting volumes of interest (in the size of 15x15x15 voxels) and labelling them with disease patterns such as honeycomb- ing, ground glass opacity, normal lung, emphy- sema, tree-in-bud, etc. We established a disease pattern database of several thousand VOIs thus allowing us to quantify the extent of disease with high accuracy. The continuing development of the feature database and the inclusion of further pathologic texture patterns will improve quantification of disease and provide objective measures of disease progression and possible healing effects.

Finally we set up a collaboration with Defini- med in order to have a new impact on analysing medical imagery such as shape analysis of diseases (differentiation between malign and benign tissue).
Continuing its series on emergency departments, ECR Today visited the Wiener Allgemeines Krankenhaus (AKH), Vienna’s General Hospital, and discovered that things are not always what they seem ... 

By Melisande Rouger

Wednesday, 2pm. The emergency department of the AKH is a model of tranquillity. Four people sit quietly in the waiting room; a patient who has been reuscitated earlier during the night is not sitting in the intensive care unit, doctors noiselessly flipping through his charts. Softly walking nurses disappear through doors three times their size while occasional phone rings hardly disturb the almost respectful silence of the place.

But then again, appearances can be deceptive.

"Nothing is predictable here, everything comes as a surprise," said Prof. Anton Laggner, director of the emergency department, which is located on ward 6D of the AKH. "What you see in shows like 'Emergency Room' or 'Scrubs' is quite representative of our work. Huge burdens can come all at once. I would say things become chaotic then, but when you're not used to it, it certainly looks like it!"

In 2007 84,668 patients received treatment in an emergency department; an average of 232 visits per day. On weekends, up to 260 admissions can be registered daily, with a peak between 5pm and noon. In May 2008 alone, a record 8,042 patients, almost 200 per day, were admitted to the department. Enough to keep the 30 doctors and 60 nurses of the team busy, running in all directions.

Accident or sports injury victims receive treatment in a dedicated department on ward 6C, and the emergency department provides all other care from maxillary, orthopaedics, light surgery, urology, ear, nose and throat, dermatology, gynaecology, ophthalmology and neurology. Most cases are organ-related, 70% of which are cardiovascular, including heart attacks, angina pectoris and strokes. Other frequent cases involve poisoning, inflammation (gallstones, pancreatitis and abscesses), and acute neurological conditions ranging from loss of consciousness to coma, epileptic episodes and headaches.

Most of these problems can be diagnosed and cared for thanks to radiology. The emergency department is equipped with mobile chest x-ray machines and ultrasound (US) devices, which can be carried directly from one patient’s bed to another. US enables the detection of kidney and gall stones as well as fluids in the abdomen, acute appendicitis and ovarian cysts in the lower abdomen. Emergency echocardiography is also widely used to observe pericardial and pleural effusions, as well as heart and valvular functions.

Usually the emergency physician performs these examinations alone but depending on their experience and/or the complexity of the clinical case, they might need radiological expertise. In the AKH, help isn’t far from reach. A two-minute walk separates ward 6D and ward 6E, one aisle of the radiology department led by Prof. Christian Herr. "We have a very close cooperation with Prof. Laggner and his team; it’s very important to have a close relationship between our specialists," agrees Dr. Ahmad Bu-Salaham, radiologist in charge of the AKH magnetic resonance imaging (MRI) unit.

Close contact between both disciplines is even more important when there could be a discrepancy between images and clinical information. For instance, in a case of acute abdominal pain, emergency physicians could assume either cholecytitis or gastritis, whereas the images could show pneumonia of the lower lobe of the lung. These potential errors mean that the radiologist should be more involved in the diagnosis of emergency patients, Bu-Salaham believes. "There should be more quality control from radiologists. We work with images first, so we are not biased by the clinical information," he said. This is even more important for US, since images are, unlike computed tomography (CT) or MRI, not standardised and one can take the picture shot whenever one wants.

Between 20 and 30 emergency patients are sent to the radiology department daily for further examination, about 15 for a CT scan and 5 for an MRI scan, Laggner estimates. CT is particularly useful in detecting pulmonary embolism, aortic dissection, undetermined abdomen processes and sub-arachnoidal bleeding (SAB). MRI is mainly used to monitor neurological processes.

It is more appropriate than CT for visualizing stones in the biliary system, gallbladder and liver, and it is also quite efficient in imaging the pelvic region in cases of ovarian torsion. In this phenomenon, common among young women, the ovary rotates on itself, causing a halt of blood supply. Patients present with acute pain in the lower abdomen and it is crucial to diagnose the problem as early as possible to operate. Finally, MRI is often favoured in children and young patients because of its low radiation exposure.

The accidents department is equipped with its own traumatology centre with a ray, US, CT and angiography scans, all of which are taken charge of by a radiologist on duty. If communication is flawless, some team members say, it may be more difficult to get hold of Prof. Vítomos Vences, who wards ward 6C. "Prof. Vences is an emergency surgeon, so he spends most of his time in the operating room. We see him less. This is normal," Bu-Salaham explains. "Still, for us, it would be better if both emergency and accidents would merge; it would improve communication a lot!" This will eventually happen, as the split model only exists in the German speaking world, and trauma surgeons are unable to find work anywhere else in the European Union or the world.

Communication, if excellent, can always be improved, and an initiative such as ESR meets Emergency Physicians’ will certainly help to do so, both physicians believe. "Interdisciplinary work is very important, especially in the case of emergency medicine: It will always benefit the patient," Bu-Salaham concludes.

The Viennese AKH: the fire under the ice

Continuing its series on emergency departments, ECR Today visited the Wiener Allgemeines Krankenhaus (AKH), Vienna’s General Hospital, and discovered that things are not always what they seem ...
In Croatia, radiology is becoming more and more popular and advanced but faces numerous challenges, including a lack of teachers in new modalities, insurance companies seeking a quick profit, and turf battles. The new President of the Croatian Society of Radiology (CSR), Prof. Boris Brljacić, explains, in collaboration with his predecessor Prof. Ratimira Klarić-Custovic, how the CSR is dealing with those issues.

By Milisande Rouger

EKR Today: How is Croatian radiology doing and how does it position itself in Europe?
Boris Brljacić: Croatian radiology is doing relatively well. Over the last few years the number and quality of radiological equipment has increased considerably, and new equipment is installed in hospitals and other medical institutions in all Croatian regions. In 2007, 11 1.5T MRI units were installed in seven large university hospitals, and one 3T MRI scanner was installed at the Medical Faculty of the University of Zagreb. There are many multi-detector row CT scanners, even in small and remote hospitals, and the quality of ultrasound imaging is quite high. Public–private partnership initiatives were legalised last year, and the first PET-CT system was installed in November 2007.

The recent ESR survey has demonstrated that regarding the number of radiologists per number of inhabitants, as well as regarding the number of radiologists per number of inhabitants, Croatia has a higher ratio than many other transitional countries, and even better than some established EU countries. Radiology has become quite a attractive specialty for young Croatian doctors. For example, we currently have two residency positions in our hospital, and we received 36 applications, while surgery received only 16 applications. This may have been because we have been inconceivable ten or fifteen years ago.

ECRT: How many radiologists are currently working in Croatia? What is the proportion of men, women and young people? What is the ratio of radiologists to inhabitants?
BB: Currently we have 330 board-specialised radiologists, including approximately 15 radiologists who retired from academic hospitals, but who still work in some private practices. All radiologists are members of the Croatian Society of Radiology, which was formed in 2002. In the recent phase of training, the proportion of male/female radiologists is 60% men and 40% women. However, among residents and younger radiologists 60% are women, reflecting the ever higher proportion of young women among medical students in Croatia, since we now have women comprising approximately two-thirds of medical students. At present, there are more than 1,000 confirmed cancers, but the data is a few months old. Regarding the number of women getting breast cancer, and we may expect that the number of women getting breast cancer will increase with the ageing of the population. The problem is that mortality is still relatively high compared to very developed countries, and we presume that the introduction of screening, together with better oncology care will reduce the mortality considerably.

ECRT: What are the main challenges faced by radiology in Croatia nowadays and what are the strategies developed by your society to cope with them?
BB: One of the problems is the education of radiologists for some new imaging modalities, where we lack experienced teachers. This is a particularly prominent problem in cardiac imaging, where radiological training is insufficient, and there is currently not a structured programme for subspecialty training. Luckily, through CSR programmes, one young radiologist was trained in cardiac imaging, and this situation will hopefully steadily improve. The problem is also in the training for PET-CT applications.

Anoher major problem is turf battles. More and more radiologists and surgical specialists want to participate in and take over endovascular procedures, like EVAR, peripheral arterial interventions, etc. The Section of Interventional Radiology is facing these tendencies vigorously, but the position of radiology is quite strong, since we are a smaller society than the cardiologists and we do not have beds for patients. Turf battles will present a major challenge to radiology in general, and the situation in Croatia is more or less similar to that in other countries.

EKR Today: How do you see the demography of your profession evolving in the near future?
BB: Over the last 7–8 years the number of radiologists in Croatia has been increasing slightly over the last few years, but we still lack radiologists, and good radiologists can easily find positions in major hospitals. The lack of radiologists is particularly noticeable in small provincial hospitals that many doctors find unattractive in career terms. In spite of the fact that radiology is an attractive specialty for young doctors, we will have great difficulties in the near future, because the number of medical students is too low for Croatian needs.

The average age of board-certified medical doctors in all specialties in Croatia is now 55 years, and we still need to import doctors very soon. Most probably we will import doctors from Bosnia, Serbia, Macedonia, and perhaps other eastern European countries first, since salaries in Croatia are considerably higher than in these countries (although the cost of living is also much higher).

ECRT: What is your presentation you mentioned that this programme already shows promising results. Could you be more specific?
BB: 580,000 women were invited in the first two years of the programme. The participation rate on the national level is 56%. However, there is very large variability in the participation rate in different counties, ranging from 30% to 63%. The idea was first raised by the Ministry of Health back in 2002, to promote national programmes of mammography screening, a very good programme that targets women in the age group of 50–69 years, who are invited for mammography screening biannually, free of charge. Costs are covered by the state budget through the National Health Insurance Fund (which is responsible for 80% of the costs). The rest comes from the savings and the state budget. About 1,700 centres have organized screening. The idea was first raised by the Ministry of Health back in 2002, to promote national programmes of mammography screening, a very good programme that targets women in the age group of 50–69 years, who are invited for mammography screening biannually, free of charge.

ECRT: What are the demographics of breast cancer in Croatia? How does it compare to the rest of Europe?
BB: In 2007 some 2,250 women were diagnosed with breast cancer, and 860 women died from breast cancer. Currently one in 10 women in Croatia gets breast cancer. This is less than in the most developed countries where 1 in 8 women get breast cancer, and we may expect that the number of women getting breast cancer will increase with the ageing of the population. The problem is that mortality is still relatively high compared to very developed countries, and we presume that the introduction of screening, together with better oncology care will reduce the mortality considerably.

ECRT: Why did you choose to present sessions on endovascular intracranial procedures and endovascular aortic repair (EVAR)?
BB: In the ‘ESR meets’ sessions at the ECR, the best radiologists practice are usually presented. We are very proud to have two excellent interventional radiology centres. One is in Split, where they have been performing EVAR procedures for a long time, and have much experience and many patients. The most prominent young interventional radiologist from Split, Liana Cambl-Sapunar, will present their results. The best centre for neurointerventions is in Zagreb University Hospital Centre, and the pioneer of endovascular intracranial procedures in Croatia, Marko Radić, will present their excellent results.

ECRT: Is interventional radiology a popular subspecialty in your country? How does it compare to other subspecialties?
BB: Interventional radiology is becoming more and more popular, and we have a few very good centres in Zagreb, Split, Rijeka, Osijek and Slavonski Brod. Many young radiologists are interested in this subspecialty and more and more vascular and non-vascular interventional procedures are being performed.

ECRT: What are the main challenges faced by radiology in Croatia nowadays and what are the strategies developed by your society to cope with them?
BB: One of the problems is the education of radiologists for some new imaging modalities, where we lack experienced teachers. This is a particularly prominent problem in cardiac imaging, where radiological training is insufficient, and there is currently not a structured programme for subspecialty training. Luckily, through CSR programmes, one young radiologist was trained in cardiac imaging, and this situation will hopefully steadily improve. The problem is also in the training for PET-CT applications.

Another major problem is turf battles. More and more radiologists and surgical specialists want to participate in and take over endovascular procedures, like EVAR, peripheral arterial interventions, etc. The Section of Interventional Radiology is facing these tendencies vigorously, but the position of radiology is quite strong, since we are a smaller society than the cardiologists and we do not have beds for patients. Turf battles will present a major challenge to radiology in general, and the situation in Croatia is more or less similar to that in other countries. PET-CT is currently performed by both radiologists and nuclear medicine, but we presume that turf battles with nuclear medicine will not be the major issue, unlike with cardiologists and vascular surgeons. Despite our efforts the prospects do not seem too good for interventional radiology, and our society is ready to implement all the strategies recommended by the ESR to cope with those challenges.

One very important problem is that a few insurance companies have formed their own imaging centres, with very good equipment, and even plan to create small private hospitals. They attract radiologists to these centres, offering them much higher salaries than in academic institutions. It could potentially have a very negative impact on the development of radiology, since academic institutions are the major sites where state-of-the-art radiology is practiced, while private institutions have profit as their major goal, and tend to perform primarily lucrative examinations, often exposing the population to unnecessary procedures. This is both a political issue, and we are fighting this through all possible legal ways, but the outcome does not look too good.
ECRT: Skilled staff are a prerequisite for the implementation and maintenance of high-quality radiological services - what do you do to promote postgraduate education and train in modern imaging methods?

BB: The CSR in cooperation with Croatian Medical Faculties, and particularly with the Medical Faculty of the University of Zagreb, introduced structured compulsory professional education for residents, who get 400 hours of structured education in all fields of radiology, and have to pass oral examinations in several areas to become eligible to stand for the board exam. The board exam is still practical and oral, held by the commission of three examiners, but the CSR is working hard to introduce the written exam, as well. The CSR strongly supports the educational activities of ESR. Two young residents underwent ESR training in cardiac and imaging breast and imaging 2007, and many residents attended Galen courses. One Galen course was held in Dubrovnik, in October 2007. The CSR has introduced an exchange programme between many Galen courses and many Adriatic meetings, annual Adriatic Vascular US Society meetings, bilateral educational radiology section meetings, and national radiology congresses every four years.

ECRT: How is Croatian radiology meeting the multidisciplinary approach in radiology? Is radiology a large field with various specialties? Or is it a small and economically less-developed country? Or is it just another country?

BB: The multidisciplinary approach is necessary and this process seems to be regulated mostly spontaneously in various hospitals on a local basis. In many hospitals there are good and close cooperations with surgeons in many procedures (vascular and endovascular, radiofrequency ablation, etc.), with nuclear medicine, gastroenterology, interventional radiology courses and many possible problems exist with cardiology. The CSR is ready to follow all the guidelines set by the ESR.

ECRT: How would you judge the importance of the exchange of knowledge between Croatian radiologists and the rest of the world? Is Croatia's place at the centre of Europe an important factor for our radiologists, especially young ones, to see any need that radiographers would or could spontaneously in various hospitals on a local basis?

BB: Croatia is a very small country, and our influence on European radiology is very small. However, we have several very good radiologists, the quality of radiology has increased considerably in the last few years and we are very honored that the ESR has chosen Croatia for this year's ESR meets programme. This will be the opportunity for Croatia to present its radiology to the European scene. It may also be the incentive for our residents, especially young ones, to submit many more papers for ECR and for publication in international magazines, because our scientific output is very low and does not reflect the relatively good general quality of radiology in Croatia.

ECRT: Do you expect a significant turnout from Croatian radiologists at ECR 2009 as a result of the CSR's participation in ESR meets?

BB: The turnout of Croatian radiologists at the ECR is always quite good, because Vienna is very close (the distance from Zagreb to Vienna is only 370km). We do expect that this year the turnout will be somewhat larger than usual.

ECRT: What future trends and challenges do you foresee in radiology?

BB: It seems that technological advances are becoming faster and faster. Molecular imaging will probably play an important role in the future, and radiology research is very wide. Many new, fascinating things (equipment, new contrast media, etc.) are not within the reach of Croatian radiologists, as well as cutting-edge research. As a small and economically less-developed country we can only follow major countries with a few years delay in the purchase of equipment and endorsement of new methods. Sometimes it could be an advantage, as some methods that seem to be promising in the beginning do not prove their worth after the proper research and clinical evaluation.

ECRT: What was your main motivation for choosing your profession?

BB: After graduating I was most interested in internal medicine, just by chance during the internship 1 year later I had to be in an intensive care with ultrasound, and prior to residency started to work in the nuclear medicine department for one year. After that I wanted to go into clinical diagnostics, but was 'led astray' as he reports. ‘You are persuaded by those that teach you with enthusiasm or those who speak to you about their profession with passion. A four-hour conversation on radiology was enough to change my mind. The pivotal role of radiology in medicine, the technological implications, and the feeling that radiology had a high component of intellectual work, provided me with sufficient reasons to take one of thebest decisions in my life.’ His participation in ECR meets comes from the belief in its benefits for people in training. 'A wide variety of well presented clinical cases, quickly available online, is always a good education opportunity. Many young radiologists enjoy the quiz cases or find useful information and knowledge provided by short and well-explained cases. And this is what ECR meets is.'

Modern education and the presence of English as our daily life have almost repressed communication difficulties. Still, scientific language is different and even if medical terminological is unambiguous, translations in radiology – and all other specialties – is usually conducted in the mother tongue, therefore, not only the professional but also the linguistic education for residents is essential and a core aim of EURORAD. Scientific English is one of the main education and training courses, at which the time no problem for readers, ‘Maybe scientific English could be a problem for a number of radiologists from Spain twenty to thirty years ago, but it is now hard to find young professionals in my country who could not correct a paper published in English,’ explains Prof. Garcia Santos.

Nevertheless, "it sometimes represents a considerable effort for them, especially for those in remote areas of the country, especially for the young people," explains Dr. Alguersuari. "The fact that valuable information is available on the internet, and that some circles have even conceived a radiology virtual website," adds Dr. Alguersuari. "Many radiologists are a lot greater when it comes to writing or speaking in English," Dr. Alguersuari adds. Also the international exchange in meetings and educational programmes are of major importance for young doctors, therefore SERAM as well as ESR connects with other societies worldwide. "SERAM participates in the organisation of several international courses and congresses, and has several international courses and congresses, including towards virtual, ‘Radiología Virtual’, and annually awards scholarships to residents to attend the ECR and the RSNA,‘ stresses Dr. Alguersuari. Furthermore, ‘SERAM has signed agreements with South American radiological societies and has an educational vocation focused on the Spanish speaking radiological community,’ explains Prof. Garcia Santos.

The team of translators is a well composed group of residents from various institutions around Spain. ‘Most of the translators and proofreaders are residents in their third or fourth year of training, or young radiologists that have recently finished their residency,’ explains coordinator Dr. Alguersuari. Every month, a batch of cases is sent from the EURORAD office to Dr. Alguersuari, which allocates the cases to the translators. Translation work is then performed, and, once finished and approved, sends them back to the office. As mentioned before, all people involved are given the chance to participate in ECR, including registration, accommodation and travel. Financial reward is not their main motivation, but practice in language skills, participation in a beneficial scientific meeting and being part of an international exchange. Dr. Alguersuari also underlines that ‘actually, a few of them that will not be able to come to Vienna will also willing to carry on with the project next year.’ The commitment of the translators is really outstanding, as much so that the end of the project could be reached ahead of schedule. The first Spanish translations will be published under www.esram.org after ECR 2009.

German Radiological Society: Careers in radiology become increasingly popular

Recent Surveys of the German Radiological Society show that taking a career as a consultant radiologist is becoming increasingly popular. Equally for women who get to keep the option of combining professional and family life, the concept of a radiologist's profession is growing more attractive. A shortage of consultants, caused by recruitment problems and disadvantageous age distribution, as observed in other fields of specialisation, seems to be a problem that doesn't concern radiology. About 750 radiologists who are licensed to train young physicians as residents took part in the survey. Its results showed that there are approximately 7,000 practising radiologists in Germany. Within the following ten years almost 1,400 radiologists will retire from service for age reasons. On the other hand there are about 1,600 up-and-coming radiological residents who are expected to pass the examination to become a consultant radiologist within the next six years.

What makes a young physician choose a radiology residence program? Considering the results of a survey on young assistant physicians, many young doctors underline the great diversity of their profession/field and the key role it plays in clinical procedures. Additionally the compatibility of family and profession – due to well-organised working conditions in radiological units – represents an incentive for junior consultants. The majority of interviewees could imagine themselves working in a medical practice after finishing their residency.

The survey gives us a positive notion of our profession's future in terms of personnel,” confirms Michael Lannado, MD, University of Dresden, President of the German Radiological Society. “We are especially pleased by the high quota of future women consultants, which has been increasing during the last couple of years. In some age-groups of advanced medical education it represents almost 50 percent.”

The German Radiological Society online: www.drg.de

90th German Congress of Radiology in Cooperation with the German Oncological Society – Deutsche Krebsgesellschaft e.V.

The 90th German Congress of Radiology has found its own special way to account for the outstanding role that medical imaging plays in diagnosis and therapy of oncological diseases. For the first time, the well-established congress, taking place in Berlin from May 20–23, is going to proceed in cooperation with the Deutsche Krebsgesellschaft, i.e. the German Oncological Society. Cancer diagnosis is the main issue of this year's congress of the German Radiological Society. In accordance with the growing influence of imaging in oncology, radiologists and oncologists will deal with a variety of oncological diseases in a total of 14 interdisciplinary sessions. In doing so, they will not only discuss the diagnostic potential of radiology but will also focus on minimally invasive treatments and radiotherapy.

For Congress President Claus D. Claussen, MD, University of Tübingen, the cooperation with the largest oncological society underscores the close collaboration in research and practice. “Cancer Diagnosis is one of the most important fields in medical imaging. Nowadays radiologists undertake tasks that surpass the simple first recording of oncological diseases by far. Accompanying the patient through the whole therapy sets up the frame for oncological imaging. Particularly in success control radiology grows more and more important.”

Cancer diagnosis is the main issue of this year’s congress of the German Radiological Society.
Distinguished expert in gastrointestinal radiology presents today’s Honorary Lecture

In recognition of his crucial contribution to the development of gastrointestinal imaging, Professor Carlo Bartolozzi from Pisa, Italy, will present the Josef Lissner Honorary Lecture ‘Ode to the liver’ at ECR 2009.

By Melisande Rouger

Carlo Bartolozzi was born in 1947 in Jesolo, Italy. He obtained his medical degree from Padova University in 1972. After completing his residency in 1977, he became Radiology Assistant at the University of Florence and was promoted to Associate Professor in Radiology in 1980. A decade later, he obtained full professorship from the University of Pisa, and was appointed Director of the Chair of Radiology and Chairman of the Radiology Residency Programme, positions he has held since.

Prof. Bartolozzi's main interests are oncology and gastrointestinal and abdominal radiology. He has experimented and developed innovative techniques such as microbubbles in ultrasound, perfusion imaging in MSCT and MRI elastography for liver imaging. He was Director of the Department of Oncology, Transplant, and Advanced Technologies in Medicine of the University of Pisa from 1999 to 2007.

An eminent researcher, Prof. Bartolozzi was appointed President of the European Society of Gastrointestinal and Abdominal Radiology (ESGAR) in 2005–2007, and preceded over the annual ESGAR Meeting in Florence in 2005. He is also a Member of the Steering Committee of the EUSOMA Course on Magnetic Resonance Imaging, and was President of the European Society for Magnetic Resonance in Medicine and Biology (EUSMRMB) in 2000–2001.

His involvement in international radiology has gained him Honorary Membership of the Belgian Radiological Society and Austrian Radiological Society, and Corresponding Membership of the Swiss Radiological Society and Turkish Radiological Society.

Prof. Bartolozzi is the 'Telepatobilia-Pancreas' Section Editor of the journal European Radiology. From 2000 to 2004, he was the ‘Liver, biliary system, pancreas and bilomas' section editor of EURORAD, a broad online teaching database of peer-reviewed case studies. A prolific writer, he has authored 12 monographs and co-authored or co-authored over 250 papers.

He is married to Stefania, an Internal Medicine Professor, and has three children, Riccardo, a mechanical engineer, and Sveva and Costanza, both university students in foreign languages. His personal hobbies include the study of history and art and the use of radiological investigations in these fields, which he describes as a bridge between his radiology passion and humanistic interests.

By Monica Dvorath

During the second half of 2008 there were no significant developments in respect of the revision of EU Physical Agents Directive 2004/40/EC on electromagnetic fields. The work of the European Commission and the social partners to prepare an amendment is getting underway only now in 2009. The meeting in Rome allows working with the Alliance members to ensure that the future of MRI is fully safeguarded in the forthcoming proposal.

The Alliance for MRI is a coalition of European Parliaments, patient groups, leading European scientists and the medical community, who together are seeking to avert the serious threat posed by EU health and safety legislation to the clinical and research use of Magnetic Resonance Imaging (MRI). The Alliance was launched on the occasion of ECR 2007.

Activities of the Alliance for MRI July–December 2008

Meetings with key stakeholders

The Alliance has sought to develop informal dialogues with key stakeholders in view of the preparation of an amendment to the Directive to protect the future of MRI.

MEPs and Unions

Meetings have been held with some key parliaments, including Dr. Peter Liese (EPP/DE) who has been supportive and sought clarification of the scientific detail. We have also met with representa- tives from the smallest European country to ensure a balanced view of the concerns on the issue. In addition, informal meetings have been held with the European Fede- ration of Public Sector Unions (EPSU) to discuss the application of the Directive to MRI workers.

Commissioner Spidla and the Commission services

A meeting took place on 10th December with Commissioner Spidla. An Alliance delegation led by Prof. Gabriel Kerotin, Mary Baker from the European Federation of Neurological Associations (FENA) and Dr. Stephan Kervé met with the Commissioner and his services in order to discuss the revision of the Directive. The Alliance raised concerns regarding timing issues and re- spected the likely publication in 2010 of ICRP’s guidelines on extremely low frequen- cy (ELF), which it is supposed, will inform the content of the revised Directive. The meeting was very constructive and one outcome was the decision to re-establish the MRI expert working group to consider the need for limits in respect of MRI. The Commissioner emphasised that he is currently still investigating the various options for review and in principle welcomed the esta- blishment of social dialogue on the healthcare part of the directive.

Next Steps in 2009

Commissioner Spidla made clear to the Alliance that he hopes to prepare a solid text for a revised Directive before the end of his tenure (end 2009). In line with social policy legislation under Artic- le 153 of the Treaty, two rounds of consultation will be undertaken with social partners (i.e. employees and unions) before a proposal is formally adopted. The new Commission will then be in a position to adopt a proposal for an amendment early in 2010.

It is envisaged that the text of the amendment, if unanimously adopted, will then be adopted (under co-decision) by April 2011, allowing one year for the contractors of the impact assessment report by the end of December 2009.

Unusually, due to time constraints, the first consultation with social partners will be undertaken at the same time as the impact assessment.

We very much look forward to hearing from you if you have any ideas as to how you can assist us in our member state or at EU level.

Further information on the Alliance for MRI is available at www.alliance-for-mri.org

ECR TODAY 2009 Sunday, March 8, 2009
COMMUNITY NEWS

"I have been involved in every previous ECR held in Vienna, and I have witnessed during the years its spectacular improvement in terms of scientific content and a tremendous growth in international participation. I believe that ECR has a key educational role and my co-workers regularly choose this congress to present their research and to update their knowledge. This year, it is a great honour and privilege for me to deliver a lecture named after Joseph Lissner, one of the founding fathers of European radiology, to whom we all owe gratitude for his pioneering vision of a ‘common house’ for all radiologists in Europe. Today, in my opinion, Vienna represents our ‘home sweet home’ that allows us to meet in the scientific environment of the congress as well as more informally outside, creating new acquaintances and reinforcing many deep friendships, which represents the very texture that unites all of us throughout Europe."
What’s on today in Vienna?

**Theatre**

Please note that all performances are in German!

- **Akademietheater**
  - 1030 Vienna, Lisztstrasse 1
  - phone: +43 1 51444 4145
  - www.burgtheater.at

- **Burgtheater**
  - 1010 Vienna, Dr. Karl-Lueger-Ring 2
  - phone: +43 1 51444 4145
  - www.burgtheater.at

- **Schauspielhaus**
  - 1090 Vienna, Porzellangasse 19
  - phone: + 43 1 317 01 01
  - www.schauspielhaus.at

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

- **Volkstheater**
  - 1070 Vienna, Neustiftgasse 1
  - phone: 43 1 52111 400
  - www.volkstheater.at

**Concerts & Sounds**

- **Musikverein (Classical Music)**
  - 1010 Vienna, Bösendorferstrasse 12
  - www.musikverein.at

- **Porgy & Bess (Jazz)**
  - 1010 Vienna, Riemergasse 11
  - www.porgy.at

**Opera & Musical Theatre**

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

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

- **Raimundtheater**
  - 1060 Vienna, Wallgasse 18-20
  - www.musicalvienna.at
Celebrate the 200th anniversary of Joseph Haydn’s death

This year marks the 200th anniversary of the death of Joseph Haydn. It may seem paradoxical to speak of celebrating the anniversary of somebody’s death, but in the case of Joseph Haydn, who was without a doubt one of the most positive and life-affirming composers of all time, there is no paradox about it.

Visit www.haydn2009.at and find out more!
Facts and Figures: European Radiology in numbers

By Simon Lee

European Radiology, the flagship publication of the European Society of Radiology, has come a long way since its foundation by Prof. Josef Linser in 1991. Now in its 19th year, the journal is published twice as frequently, its content is accessible from any point on the globe, and it maintains a proud position as the leading European general radiological journal. The past two years have seen some significant changes for European Radiology, as Prof. Adrian K. Dixon has built upon the solid foundations laid by his predecessor, Prof. Albert L. Baert. With a gradually expanding editorial office now firmly established in the ESR Office in Vienna, and with further staff assisting Prof. Dixon in Cambridge, incremental changes have been made in the average time between submission and publication, largely helped by the Editor-in-Chief limiting the time that papers spend going through the peer-review process.

Aside from such editorial intricacies, the journal has also reached new heights during 2008, the number of papers received by the editorial office also reached new heights during 2008, and of course to provide authors with rapid feedback. Due to a tightening of deadlines for reviewers in early 2008 the average time between submission and an editorial decision was reduced from 49 to 38 days, and thanks to the increase in submissions, Prof. Dixon assessed and made decisions on an impressive 1,806 manuscripts in 2008 (roughly five each day), which goes to show how much work is involved in narrowing the high volume of work down to the best and most innovative contributions.

One of the aims of the editorial team for 2008 was to reduce the time spent in review, along with the average turnaround time between submission and the editor’s final decision, so as to publish topical findings as fast as possible, and of course to provide authors with rapid feedback. Due to a tightening of deadlines for reviewers in early 2008 the average time between submission and an editorial decision for an original article tumbled from 49 to 38 days, and thanks to the increase in submissions.

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

Manuscript submissions received in 2008: by country.

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