The union of vision and talent: welcome to the 25th European Congress of Radiology

By José Ignacio Bilbao, ECR 2013 Congress President

It is a great pleasure and a privilege to welcome you to the European Congress of Radiology (ECR), the annual meeting of the world’s largest radiological society. The ECR has become one of the most keenly anticipated medical conferences over the last two decades, not only as a place to come and learn about the scientific, medical, and professional issues of the day, but to meet our colleagues from throughout the world of imaging, to exchange opinions, experience, and knowledge, and to enjoy the inimitable atmosphere of the ECR and its home city, Vienna.

I would especially like to address this welcome to our younger attendees, who have been appearing at our congress in increasing numbers in recent years. It is enormously encouraging to see that new generations are not only developing an interest in radiology and radiography, but that they are committed enough to make the trip to Vienna for what may well be the most inspiring experience of their early careers. I am also personally delighted that through the ‘Invest in the Young’ programme, the ECR has become one of those words that appear in every conversation about the ECR. This principle is an increasingly important influence on our work and so it is only natural that we try to reflect this at our congress. The ECR 2013 programme includes three Multidisciplinary Sessions that will show how experts from different disciplines within the same institution, interact and decide on the best way to approach specific clinical situations. In addition, it is my pleasure to welcome the European-African Hepato-Pancreato-Biliary Association (E-AHPBA), a truly multidisciplinary organisation, to the ECR. They will join us as the partner discipline in the ‘ESR Meets’ programme, from whom I believe we will learn a great deal.

I am looking forward to seeing many budding radiologists and radiographers at the Austria Center this year. Each ECR is different from the last, each has its own unique character and there are always innovations that make each congress stand out from its predecessors. But just as important as these differences are those factors that always remain: the vision and talent that we find within our community and the enduring appeal of radiological science. This is what makes the quality of our scientific and educational programme so exceptionally high, bringing thousands of visitors, who are committed to radiology and self-improvement, from all over the world to Vienna each year. On this note, I would like to offer my sincerest thanks to every member of the Programme Planning Committee for their fantastic work in assembling this programme and to the extremely capable team at the ESR Office for all their support. And to the extremely capable team at the ESR Office for all their support. And to the extremely capable team at the ESR Office for all their support.

The ECR 2013 programme includes several sessions, in many different formats, with the aim of educating and entertaining at the same time. As usual, some of the most successful and popular sessions will be repeated from previous congresses, but plenty of others will be new. The congress is constantly evolving, and the Programme Planning Committee and ESR Office strive tirelessly to stay ahead of the educational needs and demands of radiologists and radiographers.

Categorical Courses are the heart of our programme, offering the deepest exploration of any topics at the congress. At ECR 2013 there will be three of these courses: ‘Never without Arteries’ will be this year’s contribution to the recently initiated Clinical Lessons for Imaging Core Knowledge – CLEC series. ‘Onco-logic Imaging’; Follow-up of Systemic and Local Therapies’ will summarise the most recent information about how responses to therapy should be evaluated in most oncologic situations, and ‘Urogenital Imaging’ will be a continuation of the ECR 2012 session, covering the latest topics.

The programme is always prepared with a strong emphasis on interaction, since the exchange of ideas is a major way to teach and learn. This year the successful EEC – European Excellence in Education – will include fourteen 90-minute sessions, which will cover all the major aspects of radiology, with attractive titles such as ‘tips and tricks’ and ‘pitfalls’. The Foundation Course will deal with neuroimaging and, as in previous years, will be followed by a self-assessment test. There will also be two practical courses on how to ‘Update your Skills’, which will provide interactive demonstrations and opportunities for hands-on experience on ‘How to biopsy’ and ‘How to ablate’. Like interaction, multidisciplinarity has become one of those words that appear in every conversation about the ECR. This principle is an increasingly important influence on our work and so it is only natural that we try to reflect this at our congress. The ECR 2013 programme includes three Multidisciplinary Sessions that will show how experts from different disciplines within the same institution, interact and decide on the best way to approach specific clinical situations. In addition, it is my pleasure to welcome the European-African Hepato-Pancreato-Biliary Association (E-AHPBA), a truly multidisciplinary organisation, to the ECR. They will join us as the partner discipline in the ‘ESR Meets’ programme, and I am personally looking forward to strengthening our relationship with this association, from whom I believe we will learn a great deal.

continued on page 3
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as President of the European Society of Radiology (ESR), it gives me enormous pleasure to welcome you. 

As President of the European Society of Radiology (ESR), it gives me enormous pleasure to welcome you to our society’s scientific meeting, the European Congress of Radiology (ECR). Although it is an annual event, this meeting, like every ECR before it, has been much more than a single year in the making. This event is the culmination of almost two years of intense planning and hard work, by people who have brought many more years of valuable experience to the process. 

As you will see when your first session gets underway, or as you relax during your first coffee break in the ESR Lounge, the end product is well worth the great effort that has been put into it. With this in mind, I would like to extend not only my congratulations, but my heartfelt thanks, to Professor Bilbao and to all the members of the planning committees, for assembling a truly exemplary scientific and educational programme, as well as to all of the talented and dedicated ESR staff who have been involved in putting these plans into action. 

I wrote in the ECR 2013 Preliminary Programme that everyone involved in the organisation of our annual meeting was delighted and very proud that abstract submission has risen again this year. The response to the call for paper abstracts in the summer was extremely encouraging, and the continuation of that response via the EPOS submission system means we all have reason to be proud. The ESR’s members and friends have made a steady contribution to this meeting throughout the year, giving us all an ongoing reminder of the strong ties we have built up within and beyond Europe, making our society and annual meeting a real point of focus for the whole radiological world. On this note, I would like to give a special welcome to the many young radiologists joining us in Vienna, especially those visiting for the first time and those who are attending thanks to the support of the ‘Invest in the Youth’ programme. It is always pleasing to observe firsthand the growth of our community at the ECR, and it is particularly satisfying to me to be able to provide the means, in terms of travel and accommodation, with which so many of our young colleagues can experience this wonderful congress. 

Speaking of community, being involved in so many different projects in so many different areas of interest over the past year has also brought me into contact with a vast number of committed and hard working people, who have not only made it even more of a pleasure to fulfill my official functions, but who are a great source of encouragement and discipline. I would like to sincerely thank everyone who has contributed to driving our society forward over the last twelve months. Sadly, one year is far too short to achieve everything we set out to accomplish, but I am satisfied that I can look back on an exciting and very productive period. 

The ESR’s main activities this year have focused very much on emphasizing international relations, especially on a political level. We have established an office in Brussels so that we can take a proactive approach to making our collective voice heard in the European Commission on topics that affect our profession. The biggest issue on the agenda in this respect is of course the ongoing debate regarding the EMF directive. At the time of writing, we are optimistic that we will hear positive news on this matter by the time we meet at the ECR. 

On the other hand, we are also intensifying relations with Associate Institutional Members and other societies outside of Europe. We have organised an international summit for representatives of non-European partners, which we hope will strengthen our relationships with them and help us to gain a better understanding of how we can and should work together in the future. In addition, we are also bringing our Institutional Members closer to the fold, by having each one represented at ESR committee level by its president. It will be a great advantage for all concerned to have the leaders of each of these national, subspecialty and allied societies involved in strategy. Still on the subject of international relations, we are delighted with the involvement of so many groups from all over the world in the very first International Day of Radiology (IDoR), which took place on November 8. Prompted by the success of the European Day of Radiology in 2011, which proved to be a very popular event, IDoR 2012 was introduced to provide the first truly global celebration of radiology. We were very pleased to see so many radiologists join us in marking the day and helping to promote our profession. We are also extremely grateful to both the Radiological Society of North America and the American College of Radiology for their joint role in bringing this event to life; a cooperation which helped us cover every continent and include as much of the world as possible. 

Our efforts to strengthen relations with the many radiological and partner societies throughout the world will also continue at ECR 2013, in the form of the ESR’s ‘Meets’ programme. This year, along with Prof. Bilbao’s home country, Spain, we will have the pleasure of welcoming the national radiological societies of both Chile and South Africa, as well as this year’s partner society, the truly multidisciplinary Euro-African Hepato-Pancreatobiliary Association (E-AHPBA). The chance to hear from and get to know the visiting experts from these societies is one that should not be missed. 

I am personally very much looking forward to making the most of these and many other opportunities offered by our annual congress and the wonderful city of Vienna. I sincerely hope each and every one of you will enjoy this event to the very fullest. Read more from the ESR President in tomorrow’s edition of ECR Today!

ESR strengthens relations with radiological and partner societies throughout the world

By Gabriel P. Krestin, ESR President

As President of the European Society of Radiology (ESR), it gives me enormous pleasure to welcome you to our society’s scientific meeting, the European Congress of Radiology (ECR). Although it is an annual event, this meeting, like every ECR before it, has been much more than a single year in the making. This event is the culmination of almost two years of intense planning and hard work, by people who have brought many more years of valuable experience to the process. 

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Genuine medical research should be translational, states opening lecturer

By Michael Dean

In recognition of his expertise and groundbreaking work in the field of primary biliary cirrhosis and gene therapy of liver diseases, the European Society of Radiology has invited Professor Jesús Prieto from Pamplona, Spain, to deliver the opening lecture at ECR 2013. Jesús Prieto is professor of medicine and director of the department of hepatology and gene therapy at the Centre for Applied Medical Research at the University of Navarra. He also serves as a consultant internist at the University of Navarra Clinic.

An expert in the field of hepatology, Prof. Prieto is considered to be a pioneer of gene therapy in Europe. His research has focused mainly on understanding the underlying mechanisms of liver disease and on the development of new therapies for acute and chronic liver diseases. He is credited with contributing to the unraveling of the pathogenesis of primary biliary cirrhosis, where he showed that a defect in bicarbonate transport induces both bile duct injury and immune dysfunction.

“Genuine medical research should be translational. It is not enough for academic medicine to just explore the mechanisms of disease, it is also essential to direct attention to patient needs. At the end of the day the medical investigator, who combines medical care and laboratory research work, should examine whether their efforts to expand science have resulted in improved diagnostic or therapeutic procedures,” explained Prieto.

Through his research, Prof. Prieto has analysed the role of IGF-I deficiency in the progression of liver cirrhosis and has produced clinical and experimental data to show that IGF-I replacement therapy can induce regression of liver fibrosis and a reduction of portal pressure, along with a significant improvement in liver function. In addition, he has identified carboxyptidolin-1 as a molecule with potent hepatoprotective properties, making it a natural defence against apoptosis and a potential therapy for patients with acute, severe liver damage.

A member of many national and international societies dedicated to the study of the liver, Prof. Prieto has served as president of the Spanish Association for the Study of the Liver and on the Scientific Committee of the European Association for the Study of the Liver. He was made Doctor Honoris Causa by the University of Porto (Portugal) and the University Austral of Buenos Aires (Argentina).

Prof. Prieto has authored more than 300 articles, which have appeared in many prestigious peer-reviewed journals such as the New England Journal of Medicine, Journal of Experimental Medicine, Journal of Clinical Investigation, Cell Metabolism, PNAS, Gastroenterology, Journal of Clinical Oncology and many others.

Prof. Prieto’s opening lecture will be entitled ‘Promises and facts of liver-directed gene therapy’ and will be held this afternoon during the Opening Ceremony in Room A.
ESR awards Honorary Membership to renowned paediatric radiologist

By Michael Crean

In recognition of his groundbreaking work in the field of diagnostic radiology and his dedication to educating the next generation of radiologists, Professor George Simpson Bisset III from Houston, United States, will be awarded Honorary Membership of the European Society of Radiology at ECR 2013.

George Simpson Bisset III serves as chief of paediatric radiology at Texas Children’s Hospital and Edward B. Singletary Professor of Radiology at Baylor College of Medicine. Prof. Bisset began his studies at the University of Tennessee, before returning to his native Florida, where he received his medical degree from the University of South Florida in 1975. He then went on to complete his residency in paediatrics at the Children’s Hospital Medical Center, Cincinnati, Ohio, where he later carried out a fellowship in cardiology, a residency in radiology, and a fellowship in paediatric radiology. Before taking up his current post, Prof. Bisset had already built up a great deal of experience during his career, having not only worked as a radiologist in a number of hospitals, but also as a consultant cardiologist. As a result of his work in paediatric cardiology and radiology, Prof. Bisset has received a number of honours during his career. At the International Pediatric Radiology Congress in 2001, his manuscript received the John A. Caffey Award. He has also been appointed a Fellow of the American College of Radiology, an Honorary Member of the American Association of Physicians in Medicine, and an honorary member of both German and Austrian national radiological societies.

During his career, Prof. Bisset has shown a great deal of dedication to research and the development of his discipline. With a total of 125 articles published in peer-reviewed journals and more than 20 book chapters, he has written and researched extensively on the subjects of paediatrics, cardiology and radiology.

Prof. Bisset is an active member of many radiological societies, including the American College of Radiologists and the Society for Pediatric Radiology. He is a long-time member of the Radiological Society of North America and is the immediate past president of the society. In 2012, as RSNA President, he strengthened the society’s focus on patient care, choosing ‘patients first’ as the theme of the society’s most recent congress. Indeed, Prof. Bisset’s commitment to this theme was demonstrated in his presidential address when he said, “I now believe more firmly than ever that our future depends on our capacity to develop a new kind of shared ownership of our patients’ needs and expectations – along with our primary care and specialty colleagues.”

Outstanding specialist in uroradiology receives ESR Honorary Membership

By Michael Crean

In recognition of achievements throughout his career, his outstanding contributions to the development of radiology in Egypt and his dedication to fostering international cooperation, Professor Tarek El-Diasty from Mansoura, Egypt, will be awarded Honorary Membership of the European Society of Radiology at ECR 2013.

Tarek El-Diasty is professor of radiology and chairman of the radiology department at the Urology and Nephrology Centre, Mansoura University, Egypt. Born in Egypt in 1955, Prof. El-Diasty received his medical degree from the Medical Faculty of Mansoura University, Egypt, in 1979. He then completed his internship and residency periods at the same institution, receiving his master’s degree in 1986 and doctorate in 1990. Throughout his long and distinguished career, he has focused on improving urological care in Egypt and he has dedicated much of his time and effort to establishing Egypt’s first uroradiology department.

An ardent supporter of international cooperation and exchange, Prof. El-Diasty has worked hard to build closer ties between the Egyptian Society of Radiology and other radiological societies around the world. As an ambassador for Egyptian radiology, he has helped to build bridges with the European Society of Radiology and the Radiological Society of North America, to name but a few of the societies he has established links with. In addition to his clinical work, Prof. El-Diasty has also published extensively, with more than 100 peer-reviewed papers and six book chapters to his name. He has also delivered 55 invited lectures and served as chairman of the European Society of Urogenital Radiology (ESUR) Symposium, which took place in Cairo in 2006. He has actively participated in every European Congress of Radiology since 1995, as well as every ESUR meeting since 1992.

A dedicated teacher, Prof. El-Diasty has, to date, supervised more than 50 postgraduate medical students in the field of radiology during his time at Mansoura University. “I am very happy and honoured to receive this great recognition from such a prestigious society. It is indeed a huge encouragement for me to continue surpassing my expectations,” said El-Diasty.
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In recognition of his major contributions to the improvement of oncologic imaging as well as his years of work to create one of the world's foremost imaging centres, the late Professor Gary Glazer from Stanford, United States, was also the

"Gary was a fascinating and most impressive personality, and I greatly admired him. Outstanding in research and clinical radiology, he also had a unique gift for mentoring and motivating. He had a clear vision of how radiology and the healthcare systems should develop. My wife and I had the privilege to become close friends with Gary and his wonderful wife Diane. Gary had many fields of interest – arts, different cultures, sports, his family and other people for whom he truly cared. Even when he was severely ill and had to suffer from horrible pain he continued to be thoughtful and concerned about others and endured his cruel fate with exemplary courage." Maximmilian F. Reiser

Gary Glazer is survived by his wife Diane and two sons Daniel and David.

CIRSE displays continued commitment to advancing interventional radiology in Europe

By Michael Lee

In recent years, interventional radiology (IR) has been blossoming with many advances being made on both the medical and political fronts, and it is important to ensure the position it deserves within the medical community, but the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) realises that there is still much work to be done to ensure that the subspecialty reaches its full potential.

CIRSE’s key concerns are that of patient safety and good clinical practice, and numerous initiatives have been implemented to ensure that IR care is delivered safely and effectively as possible.

Training and Certification

The first issue that arises from this theme is that of training – how can we ensure that interventional radiologists have a skill-set that is both sufficient or complete, and relevant to their patients, and uniformly distributed across the different territories that IR is practiced in? looking to answer this question are many doctors training or working in a variety of regions throughout their career, and it is important to ensure that the skills they acquire are appropriate to the institute they find themselves in, and that European patients have access to consistent IR services no matter where they are resident.

As the European society of interventional radiology, CIRSE has taken the lead in formulating both curricula and examinations to help standardise IR training. The first step in this process was to introduce the European Board of Interventional Radiology (EBIR), which was formally established in 2010, although adjustments are still being made to ensure that the exam is just, objective and meets the latest scientific standards. So far, 278 interventional radiologists have attained the EBIR qualification, with 25 more candidates registered to sit the exam during the ECR.

To standardise the training that candidates for this and other exams receive, CIRSE commissioned the development of two IR curricula. One of these, the European Curricula and Syllabus for Interventional Radiology, is aimed at postgraduate students. It encompasses a wide range of procedures, not only in terms of how the procedures are performed, but also in how they are performed, and what imaging modalities and equipment to use, but also from a clinical point of view. A specially assembled team of IR educationalists worked on this project through 2011–2012, and CIRSE was proud to publish their final recommendations in December.

The undergraduate curriculum, launched last autumn, aims primarily to familiarise undergraduate medical students with the subspecialty itself. This will encourage not only a greater uptake of IR specialisation among doctors-in-training, but also means that those who go on to specialise in oncology, urology or other disciplines will be aware of the options being offered by their IR colleagues.

Radiation Protection

Safety is also a key concern for practicing interventional radiologists. As radiologists, we are ever aware of the need to ensure that ionising radiation doses are kept to a minimum, and in order to promote good practice across Europe, CIRSE has signed up to a number of initiatives, including MEDRAPET, the ALARA Network, the Referral Guideline EU Tender and the Alliance for MRI.

IR Patient Safety Checklist

More specifically to IR, CIRSE has also launched the IR Patient Safety Checklist. This is a tool to ensure that all IR centres have completed all the necessary steps to ensure patient safety for each and every procedure performed. By obtaining informed consent from all the patient, and ensuring that all relevant data is available for each patient.

A panel of experts discuss renal ablation at CIRSE 2012.

Endovascular delivery of stroke medications has been used for a number of years, but the refinement of clot-retrieval devices, combined with advances in imaging and a better understanding of stroke pathol- ogy, has led to an increased role for IR. CIRSE is keen to support this, and currently features neurointer- vention as a key track of their annual congress.

Renal denervation is a promising new therapy, and one which looks set to revolutionise the treatment of resistant hypertension. Long-term data is yet to be acquired, and CIRSE is encouraging interventional radiologists to take part in trials, and will be watching closely as the therapy develops. This is being facilitated through a dedicated task force and a number of dedicated sessions at our conferences, which can also be viewed via our online database, ESIRonline.

More information about CIRSE can be found at:

www.cirse.org/cirse2013

Thursday 7 March 2013

By Michael Crean

In recognition of his major contributions to the improvement of oncologic imaging as well as his years of work to create one of the world’s foremost imaging centres, the late Professor Gary Glazer from Stanford, United States, will be awarded Honorary Member – posthumous ESR Honorary Membership.

In recognition of his major contribution to advancing interventional radiology in Europe, CIRSE displays continued commitment to training and certification.

By Michael Lee
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Thursday, March 7th
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Friday, March 8th
12:15 – 13:30, Room D1
Interventional techniques help to improve outcomes in cases of colorectal liver metastases

By Frances Rylands-Monk

Now more than ever, imaging is the mainstay of colorectal liver metastasis management – first in terms of screening, diagnosis, characterisation and general staging, and then in terms of pre-operative and intraoperative staging to determine resectability. Post-operatively, imaging is used to monitor for recurrence and complications, and to evaluate tumour response and allow for treatment modification.

Colorectal liver metastasis presents in all hospitals, no matter the size or specialty, so general and subspecialty imagers have to be part of the game, said Prof Valérie Vilgrain, chair of the department of radiology at Paris 7/Sorbonne Cité University Hospital.

Colorectal liver metastasis is one of the most common metastatic diseases in the liver, and is usually a clear reflection of disease extent, given that the liver is the first organ of cancer migration from the colon. Between 30% and 50% of patients with colorectal cancer will have liver metastases, the latter often being diagnosed before the primary tumour. Because this metastasis compromises a major prognostic factor in colon cancer patients, management tends to be aggressive and as curative as possible.

“This curative approach requires a multidisciplinary, multimodality approach and combined treatment strategies,” said Vilgrain, who will be speaking and moderating at today’s multidisciplinary session.

Although colorectal liver metastasis is now one of the top causes of cancer death, patient prognosis has improved dramatically compared to that seen five to ten years ago, due to safer surgery and improved interdisciplinary collaboration between oncology and radiology based on more accurate characterisation and pre-operative staging.

“Four years ago, intraoperative ultrasound sometimes revealed new lesions that had been missed in pre-operative staging colorectal liver metastasis. Now with diffusion-weighted MRI and the use of hepat-specific MR contrast agents, this is possible so functional tools are coming in advance what the pathological response through imaging,” Vilgrain said. “We would also like to know to advance what the pathological response of a tumour will be after chemotherapy with or without adjuvant of targeted therapy prior to surgery.”

For pre-treatment assessment, the focus of Vilgrain’s presentation, it is essential to choose the correct treatment plan for the patient, and MRI plays a pivotal role in intrahepatic staging. CT is important for detection of extrabiliary involvement. If the metastatic liver is clearly resectable – e.g., there are only a few lesions located in a limited, superficial area or confined to one liver lobe and the major vessels are not involved – then the usual course is neoadjuvant chemotherapy followed by surgery. Imaging is still fundamental for monitoring neoadjuvant chemotherapy response, as surgery performed after no response has a poor prognosis, while even partial response to such therapy shows the prognosis for the resectable patient, she explained. If findings show a borderline case, imaging is still crucial for guiding treatment decisions and monitoring tumour response to chemotherapy.

Five to ten years ago, the rules were hard and fast: bilobar patients, or those with more than ten lesions, were considered unresectable. But now these rules are no longer quite so strict.

“In 10% to 15% of patients considered unresectable, aggressive management – such as direct ethanol injection, irreversible electroporation, laser ablation, microwave ablation, high-intensity focused ultrasound, and more recently, irreversible electroporation, according to Dr. Mohamed Abdel Rehim, interventional radiologist in the department of radiology at Paris 7/Sorbonne Cité University Hospital, whose presentation at today’s session will cover the role of image-guided treatment.

“Adding percutaneous ablation techniques to systemic chemotherapy achieves local control in a large majority of metastatic colorectal liver metastases, and new device innovations continue to allow for improved ablation zones and more durable results,” he said.

If, surgically speaking, the liver remnant volume after such procedures is likely to be too small, then techniques such as pre-operative portal vein embolisation can increase remnant size to reduce post-operative morbidity. Developments in technology, drugs, and technique mean that there are also more options for clearly unresectable patients in whom there are many deep lesions in both lobes with vessel involvement. If there is no response to second or even third line chemotherapeutic interventions, interventional techniques such as intra-arterial chemotherapy bolisation with specific drug loaded injections into the hepatic artery to target the liver, may yield better tumour control than from systemic chemotherapy, as may local internal radiation therapy, in which Yttrium-90 particles (“a pure beta-emitting isotope), are delivered to the hepatic artery for radioembolisation of the metastasis.

“The indications for such intra-arterial treatments are increasing. In less advanced, possibly borderline patients, there is growing evidence to support this view that combined with systemic chemotherapy, such interventional treatment could improve outcomes,” Vilgrain said.

While chemosembolisation is a minimally invasive, safe and possibly an effective palliative procedure due to its capacity to reduce lesion size, data suggest that radioembolisation using Y90 shows promise as a useful treatment for patients with chemotherapy resistant hepatic metastases, according to Rehim.

“The maximum range of emission allows tissue only in close proximity to the embolised microspheres to be treated,” he noted. “Studies show that with radioembolisation, overall survival in a select patient population is improved compared to best supportive care.”

Given that both general radiologists and cancer imaging specialists are concerned with pre- and post-interventional radiology procedures in imaging, his hope is that a broad range of ECR delegates will gain a deeper understanding of the different percutaneous or endovascular options available and consolidate their knowledge about the evaluation of tumour response.

Multidisciplinary Session: Managing Patients with Cancer Thursday, March 7, 1600-1730, Room E2

MS 3: Colorectal liver metastases

Chairman’s introduction

V. Vilgrain, Clch/FR

Role of imaging in the pre-treatment assessment

V. Vilgrain, Clch/FR

Surgical resection of liver metastases: when and how

J. Bolige, Clch/FR

Chemotherapy and novel therapy in colorectal liver metastases: rationale, indications and results

S. Faivre, Clch/FR

Role of image-guided treatment in colorectal liver metastases

A. Abdel Rehim, Clch/FR

Case presentation and discussion

#MS3 ECR2013E2
Emerging molecular methods provide boost for evaluation of treatment response in oncology patients

By Becky McCall

Advances in molecular imaging are making it realistic to identify differences in response of cancer cells to a specific treatment, and this information will eventually be used to better adapt therapies to a patient’s specific needs. The paradigm is becoming ‘image-drug image’ and then determination of whether the patient continues a therapy or switches, believes Dr. Ferdia Gallagher, honorary consultant radiologist and Cancer Research UK clinician scientist fellow at the University of Cambridge, U.K.

In the future we will be using new techniques with MRI to improve patient outcomes in oncology, which will be more sensitive and specific in determining whether patients are on the correct therapy, said Gallagher, who will discuss molecular imaging with an emphasis on hyperpolarisation, a technique also known as hyperpolarised carbon-13 MRI, during this afternoon’s refresher course.

Hyperpolarised carbon MRI is a technique that Cambridge-based scientists have been investigating in animals for several years. It detects cancer and early response to treatment. The first human trials took place in the U.S. in 2011, and the Cambridge group has recently acquired equipment with the aim of starting imaging trials in cancer patients.

Unlike fluorodeoxyglucose (FDG) PET imaging, which shows the accumulation of a labelled substrate, hyperpolarisation stands out because it differentiates multiple metabolites from each other. PET imaging only provides a single, less defined output.

“The beauty of hyperpolarisation is that it massively increases the sensitivity, which allows us to see metabolism, which we have previously been unable to image, noted Gallagher, who stressed that hyperpolarisation will not replace other imaging modalities but is likely to complement existing anatomical imaging with CT, MRI and existing metabolic information.

Initially, the Cambridge group hopes to use the technique on patients with lymphoma, breast cancer and glioma to determine response to chemotherapy or radiotherapy.

“With conventional CT, a therapy response can be seen after many weeks and if the patient fails to respond then we switch therapies. In waiting for the tumour to grow, we might miss the boat. We want to determine if the treatment is working within hours or days,” he said. “The earlier the intervention, the better.”

Acknowledging the rapid advances in biological understanding of the cell, Gallagher thinks molecular imaging has huge scope in this new era of medicine. Diagnostics and therapy increasingly take a molecular approach, and now disease diagnosis can be stratified histologically and treatments are often highly targeted, then imaging needs to parallel this. “Imaging needs to move in the direction that other aspects of medicine are moving in order to complement that,” he commented.

Today’s session on molecular imaging in oncology will discuss the growing toolbox of molecular imaging agents for cancer. In addition to hyperpolarisation, which promises to image cancer cell activity on a new level by providing a rapid measure of patient treatment response, various PET tracers will be addressed.

Standing up for PET imaging will be Dr. Peter Choyke, head of the imaging section of the Molecular Imaging Program at the National Cancer Institute in Bethesda, Maryland, U.S., who reckons the range of new PET agents is restricted by costs and this information will eventually be Dr. Peter Choyke, head of the imaging section of the Molecular Imaging Program at the National Cancer Institute in Bethesda, Maryland, U.S., who reckons the range of new PET agents is restricted by costs and this information will eventually

In conclusion, he pointed out that the pace of clinical trials with these agents is restricted by costs and this has limited the diffusion of the technology into clinical medicine. For a variety of reasons, Europe is leading the world in the development of these agents, whilst relatively few centres are actively pursuing new PET imaging agents for cancer in the U.S., he said.

For evaluation of treatment response in oncology patients

By Becky McCall

Advances in molecular imaging are making it realistic to identify differences in response of cancer cells to a specific treatment, and this information will eventually be used to better adapt therapies to a patient’s specific needs. The paradigm is becoming ‘image-drug image’ and then determination of whether the patient continues a therapy or switches, believes Dr. Ferdia Gallagher, honorary consultant radiologist and Cancer Research UK clinician scientist fellow at the University of Cambridge, U.K.

In the future we will be using new techniques with MRI to improve patient outcomes in oncology, which will be more sensitive and specific in determining whether patients are on the correct therapy, said Gallagher, who will discuss molecular imaging with an emphasis on hyperpolarisation, a technique also known as hyperpolarised carbon-13 MRI, during this afternoon’s refresher course.

Hyperpolarised carbon MRI is a technique that Cambridge-based scientists have been investigating in animals for several years. It detects cancer and early response to treatment. The first human trials took place in the U.S. in 2011, and the Cambridge group has recently acquired equipment with the aim of starting imaging trials in cancer patients.

Unlike fluorodeoxyglucose (FDG) PET imaging, which shows the accumulation of a labelled substrate, hyperpolarisation stands out because it differentiates multiple metabolites from each other. PET imaging only provides a single, less defined output.

“The beauty of hyperpolarisation is that it massively increases the sensitivity, which allows us to see metabolism, which we have previously been unable to image, noted Gallagher, who stressed that hyperpolarisation will not replace other imaging modalities but is likely to complement existing anatomical imaging with CT, MRI and existing metabolic information.

Initially, the Cambridge group hopes to use the technique on patients with lymphoma, breast cancer and glioma to determine response to chemotherapy or radiotherapy.

“With conventional CT, a therapy response can be seen after many weeks and if the patient fails to respond then we switch therapies. In waiting for the tumour to grow, we might miss the boat. We want to determine if the treatment is working within hours or days,” he said. “The earlier the intervention, the better.”

Acknowledging the rapid advances in biological understanding of the cell, Gallagher thinks molecular imaging has huge scope in this new era of medicine. Diagnostics and therapy increasingly take a molecular approach, and now disease diagnosis can be stratified histologically and treatments are often highly targeted, then imaging needs to parallel this. “Imaging needs to move in the direction that other aspects of medicine are moving in order to complement that,” he commented.

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Europe is leading the world in the development of PET tracers for oncology, according to Dr. Peter Choyke.

In future, we will be using new techniques with MRI to improve patient outcomes in oncology, according to Dr. Ferdia Gallagher.

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Cardiac imaging in 2020: reaching new heights

By Mélisande Rouger

Over the past decade, technological improvements have led to the widespread use of imaging modalities in the prediction, diagnosis and follow-up of coronary disease. Radiologists now have the ability to obtain information on the structure of cardiac muscle with MRI and evaluate cardiac arteries with CT, while hybrid imaging will soon allow them to do both. Cardiac CT will also provide more functional information in the future, and its use will continue to grow. Experts will present the newest and upcoming possibilities of cardiac imaging today at the ECR.

Advances in cardiac CT have brought its use in clinical routine to unprecedented levels. The main reason is that image acquisition optimisation strategies allow radiologists to assess blood vessels with the same efficiency as coronary angiography, non-invasively and almost instantaneously.

“CT is considered a wonderful technique for the evaluation of coronary arteries. It is really similar to coronary angiography, but without the risks. With new apparatus, we have the ability to produce imaging very fast, reduce artefact, but especially reduce the dose of radiation in each patient,” said course moderator Professor Ernesto Di Cesare, chairman of the radiology department at L’Aquila University Hospital in Italy.

Cardiac CT use in clinical routine will continue to rise in the near future. A recent paper published by the British Cardiovascular Society predicts that the number of cardiac CT examinations carried out will increase by up to 40 times by 2020.

“The use of cardiac CT is bound to increase and, by the next decade, it could penetrate everyday work, in both specialised and non-specialised centres,” said Konstantin Nikolaou, professor of radiology and vice-chair of the department of clinical radiology at Munich University Hospital in Germany.

These projections mean that CT will also replace catheter angiography in some cases. Experts agree that CT could replace invasive angiography to rule out coronary artery disease (CAD) in selected patients with chest pain, in whom suspicion of coronary artery disease is not so strong.

“I think that CT will be used in an individual basis in patients less likely to suffer from CAD, to diagnose and characterise the atherosclerosis before the symptoms occur. At the moment, CT seems the most reliable tool for this evaluation,” predicted Di Cesare.

To become a clinical standard, CT must be backed up by solid scientific evidence, available only after randomised prospective multicentric studies. “Radiology and cardiology have to prove with large clinical trials that cardiac CT is effective and efficient, meaning it can provide the right results while remaining economically reasonable as compared to other used diagnostic work-up,” Nikolaou said.

Cardiologists and radiologists are currently waiting for the results of two large studies in particular. The Rule Out Myocardial Infarction/Ischemia Using Computer Assisted Tomography (ROMICAT II) trial aims to show that cardiac CT can be used in patients with acute chest pain, while the PROMISE trial looks at patients with stable chest pain. For the latter, 64-slice CT was tested against the conventional standard of care (ECG, lab tests, etc.), to show if a single CT examination can spare patients further tests.

By 2020, cardiac CT will have undergone further technical developments. Major advances have been made over the past five years to optimise image acquisition and reduce dose; specialised centres can now operate cardiac CT using one mAs. This dosage will become standard practice as demand for CT examinations grows, Nikolaou believes.

“I would expect that, by 2020, we will be in the range of two mAs or even less in most diagnostic cardiac CT studies. We can say it’s an optimistic way of seeing the future, but at least we should hope that, as soon as cardiac CT is used more and more frequently, any dose reduction algorithms available should be known and used by the radiologist performing the examination.”

This knowledge will be supported by increased automatic selection of technical parameters to reduce dose. Nikolaou believes. For example, automated selection of tube voltage has been introduced recently, and it already helps radiologists decide which tube voltage should be chosen in each patient, minimising radiation dose as much as possible.

CT scanners will also provide more and more functional information on the myocardium, by enabling radiologists to evaluate whether a stenosis is reducing blood flow to the myocardium or not. “Today you would normally perform an angiographic CT scan to look at the coronaries and see if there is morphological stenosis, but soon we might perform an additional type of CT scan, to assess whether this stenosis will lead to ischaemia, so whether it is reducing blood flow to the myocardium or not. This is very important information for cardiologists,” Nikolaou said.

Hybrid imaging, in particular PET-CT and the recently introduced MR-PEF, should also offer information on both the myocardium and coronary arteries by 2020. Heart MRI, the golden standard for imaging the myocardium, will undergo several transformations, but this is further down the road, according to Di Cesare.

Researchers are currently testing the possibility of evaluating the myocardium with magnetic field strengths higher than 1.5 T. “So far they haven’t been very enthusiastic about the results, but things could change soon. Heart MRI is a very fast evolving modality. In the beginning we used low field, right now we are using medium field, and I think that in the far future we could improve the evaluation with fields beyond 3 T, helped by the development of new sequences, and provide new information about the heart structure,” he said.

Refresh Course: Cardiac
Thursday, March 7, 16:00–17:30, Room D2
RC 303: Cardiac imaging: the cutting edge

Moderator: E. Di Cesare, L’Aquila/IT
A. Cardiac MRI: do we need more than 1.5 T?
B. J. Wintersperger; Toronto, ON/CA
C. Cardiac CT: technique in 2020, where to next?
K. Nikolaou, Munich/DE
D. Cardiac hybrid imaging: ‘One-Stop-Shop’
P.A. Kaufmann, Zurich/CH

Anomalous origin and course of the right coronary artery. The anomalous origin of the right artery from the left coronary sinus and the course between the pulmonary trunk and aorta are evident. The exam was performed using prospective acquisition in a single heart beat using a 320-row detector scanner. The sinotubular junction exposure was 1.1 mSv. (Provided by Prof. Ernesto Di Cesare)

Plaque of the descending coronary artery (arrows). A coronary CT (A) obtained with prospective low-dose acquisition shows similar degree of stenosis as compared to coronary angiography (B). (Provided by Prof. Ernesto Di Cesare)

MR provided information on fibrofatty (A, B) substitution of the right ventricle anterolateral (CC) arteries (C) in a suspected case of ARV. (Provided by Prof. Konstantin Nikolaou)

CT angiography (left) and CT perfusion (right, parametric colour map) in a 65-year-old patient with recurrent chest pain. CT angiography shows a stenosis in the proximal LAD (left anterior descending coronary artery) (arrow), of potential hemodynamic significance. Dynamic myocardial perfusion CT (50s dynamic acquisition) under pharmacological stress (Adenosine) shows a blue hypo perfusion in the LAD territory (arrowheads). (Provided by Prof. Konstantin Nikolaou)
Discover the ‘beauty of the head and neck: from temporal bone to oral cavity’

By Becky McCall

General radiologists often shy away from the anatomical complexity of the temporal bone, but Dr. Bart De Foer, from GZA Hospital Sint-Augustinus in Antwerp, Belgium, provides both encouragement and inspiration, noting that he finds this anatomy to be one of the most intriguing regions of the human body.

The hospital conducts around 1,000 CT scans of temporal bone per year, and an equal number of MRI examinations, and De Foer spends one and a half days a week imaging the region.

It’s generally considered one of the most difficult regions of the human body due to subtle details, but once you see through it you will see everything,” he said. “I still remember my first intracranial schwannoma that I missed at university, so you have to know what to look for and when you know, then you will find it.”

De Foer is one of five expert speakers at the head and neck mini course, which begins at 12:30 today and runs until the final day of ECR 2013. On Monday, he will discuss what, in his experience, are the most appropriate imaging techniques for particular pathologies of the temporal bone region. He will address normal anatomy, as well as pathology, and the highlight will be on routine daily clinical cases.

But to image this region of the body properly, radiologists need to be familiar with the intricate anatomy of the oral cavity, to recognize the most common routes of disease spread, to tailor imaging studies to specific clinical presentations, and to issue meaningful reports answering pertinent clinical questions.

“Imaging may be the only way to assess clinically occult lesions such as the retrotragal trigone in patients with trismus and the deep lobe of the parotid gland, therefore having a major impact on their management,” he pointed out.

CT and MR are currently the primary imaging modalities to assess the oral cavity. CT is preferred in patients presenting with infectious/inflammatory syndrome. According to Borges, in patients presenting with oral cavity cancer, the use of dental CT software with the acquisition of paraaxial and parasagittal high-resolution images in bone modulation is most valuable in the depiction of early cortical bone erosion. MRI provides better soft tissue resolution and is first choice in the evaluation of the deep extent of tumours, and in the management of patients presenting with submucosal lesions.

Referring to the choice of imaging technique, she highlights the importance of considering different patients’ specificities. Heavy smokers and drinkers prone to salivary stasis, difficulty in swallowing and dysphonia are not good candidates for MRI as this technique is very prone to motion artefacts, and patients with many dental fillings and/or dental implants may do better with MRI than with CT, she explained.

In terms of technical issues to note when imaging the oral cavity, Borges has plenty of good advice. She points out that dental-related artefacts can be avoided by angling the axial sections parallel to the dental fillings on CT or to opt for MRI. When lesions are located in the gingival sulcus, jugal or palatal mucosa or in the oral tongue, cheek puffing is very helpful to clearly depict the full extent of the lesion and to separate the lesion from the adjacent mucosal surfaces, she noted.

Whenever imaging a malignancy, the full extent of the neck should be imaged for nodal staging. Bone windows are required for all cases of cancer staging and whenever dento-maxillary pathology is suspected. Finally, she emphasised that when using MRI, it is crucial to instruct a patient not to swallow, and to breathe quietly during the entire examination. The use of surface coils can be very helpful for the imaging of superficially located lesions such as the parotid and submandibular glands and the floor of the mouth. Borges has a wealth of further material to discuss in her 60-minute lunchtime slot. She will also take the opportunity to present the most common pathological processes as clinical cases highlighting the main differential diagnoses and the most relevant information that should be included on the imaging report.
Radiologists need more time and know-how to train doctors of tomorrow

By Simon Lee

Postgraduate radiology training is high on the agenda in Europe, with a great deal of attention in recent years being given to the harmonisation of educational standards across the continent, but there is a growing feeling within the discipline that radiology should not lose sight of the equally important issue of undergraduate education. Exposing undergraduates to radiology not only serves the obvious and vital purpose of inspiring potential radiologists, but also ensures that students who go on to follow careers in other disciplines are well versed in what radiology can offer and how it operates. In broad terms, the net result is a combination of helping to secure the discipline’s future and making life easier for its practitioners.

However, making sure under-graduates are given sufficient contact with radiology is no easy task. The competing clinical, managerial and academic demands on radiologists’ time and skills, which increase with every year, mean that any additional activities run the risk of being excluded. The time and resources needed, not just to teach, but also to carry out the necessary preparation for effective teaching, can often make it impossible to fit in to an already hectic schedule.

Despite the obstacles, there are still those who are passionate enough about teaching medical students to make it a priority. Unsurprisingly, the nature of teaching across Europe is inconsistent, but at a large proportion of educational centres there is at least one person teaching radiology to undergraduates, as discovered by a survey carried out by the ESR Education Committee’s Working Group on Undergraduate Education, in 2010. The working group itself was initially proposed by a collection of motivated educators, and its conversion into a formal ESR Subcommitte in 2012 further demonstrates that the issue is being taken increasingly seriously.

Following a successful introductory session held by the former working group last year, the new subcommittee will host a Professional Challenges Session at ECR 2013 under the title ‘Bringing radiology to undergraduates’. The session, which is chaired by Dr. Stephen J. Golding, from the University of Oxford, UK, who is also the chairman of the Undergraduate Education Subcommittee, will look at undergraduate teaching from a variety of angles, addressing the major challenges in providing good radiological education and offering some potential solutions.

‘Undergraduates are going to be the doctors of tomorrow; we need them to practice effectively and efficiently and we preferably need them to use radiology effectively,’ said Golding. ‘We want physicians to be enlightened as to the possibilities of radiology for their patients and how best to use the radiology service, and that means they have to have that training. Some of them are also going to be the radiologists of the future, so undergraduate exposure gives us a chance to impact on them at a time when they are thinking about their careers.’

‘Unfortunately the pattern of teaching activity is very variable, there is very little in the way of teacher training available, especially that which is specific to radiology, and of course finding time is a major problem in the working lives of most radiologists. We very much see this session as tackling some of the major difficulties that the teaching radiologist may have, especially in terms of the rising demands on radiologists. Inevitably we have to concentrate on clinical demand and training our juniors and there is a real risk that there is very little time left for anything else.’

Before time, resources, and methods come into the equation, radiology must first have an established place in the undergraduate curriculum, which relies on representatives of the discipline being involved in or influencing the management structure of medical schools. This means the degree to which radiology is present in curricula usually depends on the commitment of radiologists to the cause – often the same radiologists who will actively participate in teaching – but the strength of the subject is that it has so much to offer in supporting the teaching of other subjects in the curriculum, such as anatomy. Ideally, the teaching radiologist needs a comprehensive understanding of the overall needs of the undergraduate, as well as the skills to teach efficiently and knowledge of the available educational methods that are appropriate to the specialty.

All of these issues are currently the responsibility of the individuals or groups who take on the task of teaching or planning undergraduate radiology education in their own institutions, but one way to make things easier in the future may be through networking and cooperation.

‘As long as you have someone in the department who has the insight that this is good work and worth-
Basics of imaging MSK injuries

By Mélisande Rouger

Sophisticated tools enable imaging of the human body with unprecedented levels of precision, but radiologists should not forget the basics. For the third year in a row, the ECR will feature a series of Mini Courses to remind radiologists of the value of basic knowledge. This year a course is dedicated to musculoskeletal (MSK) imaging which starts today.

Diagnosing MSK injuries, resulting from everyday activity or sport, is routine work for radiologists. But to understand these injuries, radiologists should have a basic understanding of anatomy and biomechanics. Once they do, they can look beyond the obvious or primary injury, and search for commonly-associated injuries. These may be subtle and are often overlooked, which may have significant clinical implications. "We need to look for other injuries because sometimes we get excited about discovering the first injury and forget to look for others, and that can have a significant impact on the treatment of the patient," said Dr. Ara Kassarjian, a consultant musculoskeletal radiologist working at Corades S.L., a consulting company with a medical subspeciality in Majadahonda, Spain.

The term trauma covers a very large number of injuries. The course will focus on injuries of the upper and lower extremities and explore the biomechanics, pathophysiology, and constellation of injury patterns as seen through imaging. Dr. Kassarjian will present delegates with some common clinical scenarios and the appropriate ways to image them, be it with magnetic resonance imaging (MRI), ultrasound (US), computed tomography (CT) or conventional x-rays.

Sprains and strains are the most common injuries, with a twisted ankle being one of the most common joint injuries in younger patients, followed by knee injuries. Most of these injuries are minor and do not need to be imaged, whereas serious injuries, which are often related to sports practice, require imaging.

Radiologists should especially watch out for joint injuries, as the anatomy of joints is very complex. "Joints have a complicated structure and the injuries can be extremely varied: it can be the bone, the muscle, the tendon, the ligament, the cartilage or the capsule. Some of them are acute injuries. They occur and hurt right away. Others are more chronic. For instance if you play tennis quite often you may have pain in your elbow from overusing it," Kassarjian explained. Overuse, as well as poor technique, may cause the injury, and a previous minor injury can become serious when too much stress is applied, he added.

Selecting the right imaging modality depends on the clinical situation, the actual presenting signs and symptoms, as well as the activity, and its intensity, during which the injury occurred.

Each joint has a different protocol, and the choice depends on where the referring clinician and radiologist think the problem is. "For instance if you think the problem with the shoulder involves the tendons, some would initially start with a US examination. But some people will immediately choose MRI because you can see anatomy with MRI that you cannot see with US. And if you had an acute injury, you would probably choose x-ray to see if it's a fracture or dislocation. It really depends on the joint and the mechanism. That's why you need to have a good consultant that can guide the proper sequence of imaging," he said.

A good consultant doesn't necessarily have to be a musculoskeletal specialist. Every radiologist should be able to carry out the proper examination and correctly interpret the images once they have proper knowledge. Delegates will certainly learn a thing or two during the course, Kassarjian believes. "We should all be general physicians and general radiologists first and then subspecialised radiologists. The idea of the course is to insure that radiologists have a basic understanding of some of the most common MSK pathologies that we are going to see in the trauma setting," he concluded.

Insights into Imaging

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Clinical Corner

Thursday 7 March 2013

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Ultrasound elastography, contrast-enhanced digital mammography, MR spectroscopy: Which offers most promise?

By Rebekah Moan

Mammography is an imperfect modality – more so than many others – so it makes sense that radiologists are on the lookout for something better, or at least something to supplement the technique. This afternoon’s refresher course covers functional imaging of the breast and goes into detail about ultrasound elastography, contrast-enhanced digital mammography, and MRI diffusion, perfusion, and spectroscopy, which may supplement mammography or replace it altogether.

Ultrasound elastography has been around since the 1980s and emerged as a complementary technique to estimate local tissue stiffness. There are two main types: strain imaging (externally applied compression using the probe and creating a local tissue deformation) and shear wave imaging (no external compression, shear wave emission, and propagation through the tissue is responsible for local tissue displacement). Its utility has already been established for use in liver cirrhosis, as well as breast, prostate, and thyroid lesions.

“Breast elastography is indeed helpful in providing further information about breast lesion stiffness, the point being that cancers are stiffer than benign lesions and lesions having a similar B-mode appearance could be further differentiated as benign or malignant according to their stiffness (i.e., their elastic values),” noted Dr. Alexandra Athanasiou, from the radiology department at the Institut Curie in Paris.

Numerous studies have already been published to validate breast elastography, and further research is ongoing in order to define elastography criteria, she added. It’s important to note breast ultrasound elastography will be part of the new edition of the BI-RADS lexicon for ultrasound.

Strain elastography provides qualitative or semiquantitative information, whereas shear wave imaging provides quantitative values of elasticity and is more operator independent, she explained.

“Breast imagers will have to be familiar with ultrasound elastography – new BI-RADS criteria will enhance this necessity,” Athanasiou stated. “A good understanding of basic physics is important in order to correctly perform elastography – whether strain or shear wave – and correctly interpret findings.”

ECR delegates will get exactly what during her presentation. She aims to cover basic physics, along with the clinical applications and pitfalls of breast ultrasound elastography. Attendees will also receive information on how to perform and interpret findings.

“A review of literature will also be provided in order to give clear messages on what to expect from breast ultrasound elastography in the actual technical and clinical setting,” she added.

In the same session, Athanasiou’s colleague, Dr. Corinne Balleyguier, from Institut Gustave Roussy (IGR), in Villejuif, France, will present on contrast-enhanced spectral mammography (CESM), which was highlighted at the 2012 RSNA congress, when German researchers suggested symptomatic women could be spared from unnecessary radiation by skipping regular mammography and going straight to contrast-enhanced spectral mammography.

The technique combines digital mammography and injection of an iodinated contrast agent. Mammography images are acquired at high temporal resolution dynamic contrast-enhanced imaging (DCEI) and perfusion and MRI diffusion, perfusion and spectroscopy (fMRI).

“Contrast-enhanced magnetic resonance imaging promises further quantitative insights into the pathological characteristics of neoplastic vasculature, diffusion-weighted imaging (DWI) and fMRI,” Balleyguier, who promises to outline the clinical case is of a small infiltrating ductal carcinoma coded as red, i.e. elevated elasticity value. The resolution of the technique is 1 mm. (Provided by Dr. Alexandra Athanasiou)

Delegates can also expect to learn about MRI diffusion, perfusion, and spectroscopy from Dr. Pascal Baltzer at the University of Jena in Germany.

“Dynamic contrast-enhanced MR mammography is the most sensitive method for detection of breast cancer,” he said. “Diagnostic results using this technique may vary due to reader experience as image interpretation is to some degree a subjective task.”

“While MRS is a molecular imaging technique able to quantify biochemical-tissue properties, DWI is influenced by microstructural tissue changes,” remarked Baltzer, who promises to outline the concepts of perfusion, DWI, and MRS, to provide knowledge to implement these techniques into clinical practice, and to critically discuss the possible diagnostic benefit of doing so.

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Today, diagnosing cardiac patients has become routine for many radiologists, with a number of advantages. It has been used for over 20 years to provide noninvasive examinations of the coronary arteries. Traditionally, CT's two main applications in cardiac imaging are calcium screening, which measures the amount of calcium in the arteries, and coronary CT angiography, which can reveal the degree of stenosis of the vessels. CT angiography actually goes beyond risk assessment, and is typically carried out in a symptomatic patient with suspected coronary artery disease to exclude stenosis for instance in a patient presenting with chest pain, but not a typical angiography. In such cases, the radiologist might be asked to perform a coronary CT angiography, to prove or exclude the existence of stenosis and further characterise potential disease of the coronary arteries. In addition, researchers have started to use CT to differentiate between non-calcified and calcium plaques in the vessel wall not only consists of calcium, but also other tissues such as fibrotic, fibro-fatty and necrotic core tissues, all of which may have a predictive value for the patient. "Today, we would hardly make a clinical decision based on CT plaque imaging alone, but it is one of the important topics in cardiac CT research," Nikolaou said.

Current scientific studies have also been focusing on a more detailed analysis of the myocardium, i.e. applying CT techniques instead of MRI to the depiction of myocardial perfusion defects, in order to gain time in the diagnostic process. Pathological conditions are sometimes referred to nuclear medicine, or for an MRI scan for perfusion tests, when CT angiography results are inconclusive. We now try to get information on perfusion during the CT examination, by adding a CT perfusion scan to angiography," he said. "This would potentially enable us to get the whole picture in one examination and make a better clinical decision, based on the functional relevance of a given stenosis. Whether these rather new CT techniques will be used in everyday clinical routine is still not clear," he added.

Study results indicate that researchers will probably soon be able to find the perfusion defect caused by a stenosis with CT, the radiologist believes. "Depending on correct patient selection in accordance with cardiologists, I think that we will, in a few years, start to use CT perfusion or CT dual imaging of the myocardium for the assessment of functional relevance of a coronary artery stenosis detected in CT angiography," he said. MRI and nuclear medicine test results still set the standard for the assessment of the myocardium in ischemic heart disease, as both of these imaging modalities can provide very detailed information on the ischemic myocardium. For instance, in a patient with suspected ischemic heart disease, MRI can reveal typical lesions in the myocardium, bypass surgery, suffered known infarcts or underwent coronary interventions (e.g. with stent implantation). "CT is good for assessing ischemic heart disease at an early stage or for a first diagnosis, but MRI does a better job if it is a more complex case. It gives information on the perfusion defect, old events, if the stent is still patent, etc.;" he concluded.

Cardiac imaging under scrutiny at ECR 2013

By Melisande Rouyer

Thursday 7 March 2013

Mini Course: Organs from A to Z: Heart
Moderator: A. de Roos, Leiden/NL
A. Anatomy: too many details in cardiac imaging? A.J.B.S. Madureira, Porto/PT
B. Examination protocols for imaging the heart: CT H. Alkadhi, Zurich/CH
C. Examination protocols for imaging the heart: MRI D. N.L. Reeks; Athens/GR
Interactive case discussion A. de Roos, Leiden/NL

A. de Roos, Leiden/NL

A. Congenital heart disease
G. Roditi; Glasgow/UK
C. Cardiomyopathies
P. Sipola; Kuopio/FI
B. Valvular disease
J. Bogaert, Leuven/BE

#MC322 #ECR2013LM
Friday, March 8, 08:00–10:00, Room 1/M

A. Congenital heart disease
H. Alkadhi; Zurich/CH
B. Valvular disease
J. Bogaert, Leuven/BE
C. Cardiomyopathies
P. Sipola, Kuopio/FI

#MC422 #ECR2013LM
Friday, March 8, 16:00–17:30, Room 1/M

MC 422: Non-ischaemic heart disease
Moderator: V.E. Simtov, Moscow/RU
A. Aortic valve disease
A. de Roos; Leiden/NL
B. Mitral valve disease
A. de Roos; Leiden/NL
C. Cardiomyopathies
V.E. Simtov, Moscow/RU

#MC422 #ECR2013LM
Friday, March 8, 08:00–10:00, Room 1/M

MC 322:  Non-ischaemic heart disease
Moderator: C. Catalano, Rome/IT
A. Imaging of the coronary arteries: the Holy Grail
G. Roditi; Glasgow/UK
B. The ischemic myocardium: what to do?
C. Lowie; Venna/AT
C. The ischemic heart after treatment still painful?
G. Bazanika, Pamplona/ES
Interactive case discussion
C. Catalano, Rome/IT

#MC322 #ECR2013LM
Thursday, March 7, 16:00–17:30, Room 7/L/M

MC 722: Ischaemic heart disease
Moderator: C. Catalano, Rome/IT
A. Imaging of the coronary arteries: the Holy Grail
G. Roditi, Glasgow/UK
B. The ischemic myocardium: what to do?
C. Lowie, Venna/AT
C. The ischemic heart after treatment still painful?
G. Bazanika, Pamplona/ES
Interactive case discussion
C. Catalano, Rome/IT

#MC722 #ECR2013LM
Ultrasound’s versatility and cost-effectiveness invigorate sector during tough economic times

The main difference between ultrasound and other wireless communication is the huge amount of data that must be transmitted to provide real-time images. However, even before the data transmission stage, there was an equal challenge in reducing the volume of data that must be sent, and therefore Siemens has developed technology that ensures most of the image processing occurs in the main unit, based on the raw data generated by the transducer, he explained.

"Getting the data right down, creating a wireless link with a sufficiently high data rate and then designing and miniaturising the electronic components in the probe itself - they were the three main hurdles that we had to blast our way through," Cannon commented.

Underpinning the device is a technique called synthetic processing, which helps to maintain the necessary image quality while reducing the volume of data transmitted. The second is a novel 7.8 GHz ultra-wideband radio technology that provides good reception over the short distances needed for medical applications without causing, or being susceptible to, interference from other equipment. The technology has applications in any medical situations, but has been designed especially for therapeutic and interventional applications, he remarked.

"Ultrasound is being used more and more in point-of-care and bedside applications to guide interventional procedures," said Cannon. "Separating the probe from the rest of the system really improves working practice in that environment and is effective in controlling the patient’s exposure to infection. A cordless transducer makes the procedure easier to set up, the work can be carried out more quickly and the equipment is easier to clean when you have finished." Another important feature of the system is that the operator can adjust most of the operational parameters using controls on the transducer itself. Previously, if the operator has ‘scrubbed up’ (or prepared) for a sterile procedure, he or she would have to ask someone else to make the changes to depth or gain control on the main unit before continuing, he explained.

The Acuson Freestyle is available with three wireless transducers covering general imaging, vascular and high-frequency applications such as musculoskeletal and nerve imaging. The console has a 38 cm high resolution LED display and can be mounted on a lightweight cart.

Throughout the ultrasound sector, there is an emphasis on producing a new generation of smaller units that are easy to transport and use wherever they are needed, while still retaining the full range of functions that are available with traditional systems.

In its first venture into the portable ultrasound market, Hitachi Aloka Medical Systems has developed the compact Noblus machine, designed to provide the same image quality and functions available with its range of premium cart-based machines. "When the portable systems were first introduced, the onus was on making them easy to use. All you had to do was switch them on, press a couple of buttons and then you could get an image," said Ellison Bibby, European product manager for the company’s ultrasound business. "But those doctors that are experienced in using larger systems and knew what they can do, soon became disappointed by the limitations of the compact units. Now we are entering a new era where the performance of the small machines is just as good."

The Noblus system offers the same image quality as high-end platforms, as well as the same features, such as elastography, contrast enhancement and 4-D imaging. The new unit is roughly the same size as a laptop computer and can be used alone or with an optional cart. The screen can both swivel and tilt to allow it to be used in a range of clinical situations, and offers simple touch-screen parameter adjustment. Hitachi lists a wide range of potential clinical applications, noting that while Noblus is available with a range of standard probes (abdominal, cardiac, small parts and endocavity), most of the specialist probes available with the established Hi Vision units (e.g., urology, intra-operative, laparoscopic, dedicated biopsy, and endoscopic probes) are interchangeable with the new scanner.

Philips is also demonstrating a compact ultrasound system with improved functions for use throughout the hospital. Its CX50 CompactXtreme unit reportedly delivers good image quality so that clinicians can feel confident about their examination data, irrespective of the location. The unit is being promoted as a versatile platform suitable for a broad range of clinical applications, including abdominal, contrast, interventional, musculoskeletal, obstetrics/gynaecology, paediatrics, neonatology and surgical.

For surgery, the system is available with three new transducers: the L1S-7x1o, which provides easy...
access during vascular surgery and can be used directly on vessels to assess vascular repairs; the C9-3sio, which is shaped to fit a surgeon’s hand and can be used to image deep within incisions during surgery; and the L10-4lap, designed for renal and hepatic laparoscopic surgical procedures.

Meanwhile, GE Healthcare is introducing a new version of its general ultrasound platform, Logiq E9. This features its new X-Deflex technology in the C1-6 and C2-9 transducers, which offer increased beam penetration of 2 to 4 cm while simultaneously providing high definition resolution throughout the image, the company stated.

The new unit also features the B-flow imaging capability, which uses non-Doppler technology to display true haemodynamics and enables direct visualisation of blood-flow without the limitations of Doppler. In addition to a larger, adjustable monitor, a faster computer and enhanced ergonomics, the new system provides novel features, including Compare Assistant and both breast and thyroid productivity packages. Compare Assistant helps streamline comparison examinations, while the productivity packages help ease the burden of measurement-heavy studies.

“Because ultrasound imaging is one of the pillars for disease assessment and determining treatment options, image quality, clinical capability and procedure accuracy are paramount. In the Logiq E9, we have added innovative capabilities to help address the ultrasound exam volume and imaging challenges that clinicians face every day,” explained Brian McEathron, general manager of general imaging ultrasound with GE Healthcare.

**New technology essential to boost growth in ultrasound market**

*By Carly Reed*

Ultrasound technology has continued to evolve in recent years, providing new solutions that enhance imaging techniques, increase workflow and improve ease of use. Cost-effective and time-saving solutions are becoming increasingly important to physicians; therefore systems that meet these needs are essential to sustain growth in developed healthcare markets. Despite this, the concept of ultrasound technology remains relatively unchanged and global market growth is forecast to remain between 5 and 6 per cent from 2013 to 2016, unless a brand new technology or application is released. We have assessed the most recent advances in ultrasound technology and projected their current and future impact.

**Fusion Imaging**

The increasing number of new ultrasound products featuring fusion imaging techniques has created a strong interest in this technology over the last couple of years. Fusion Imaging allows physicians to superimpose real-time ultrasound images with pre-taken MRI or CT images and is increasingly used to provide real-time feedback of needle position during interventional procedures, such as in biopsies. There have been a number of advances in this technology that have helped drive the use of ultrasound by radiologists, such as the addition of software and visualisation packages that allow automatic alignment between the ultrasound and CT or MRI image. This is particularly important as in the past the technology was complicated and difficult to use which often deterred many radiologists from using it. Further improvements in workflow will continue to drive increased use of this feature, however the initial impact of fusion imaging on the ultrasound market may have already passed.

**Ultrasound Transducer Technology**

The evolution of transducer technology is continuous in the ultrasound market. In recent years, notable progress has been made, including making the shape more ergonomic, moving the position of the beam-former and increasing the number of channels to improve image quality. The new Acuson Freestyle™ ultrasound system from Siemens Healthcare, featuring wire-less transducer technology, is the most recent development to improve transducer handling. The maximum impact of wireless technology on the ultrasound market may still be to come; the lack of cables can help reduce infection risk during interventional procedures and improve ease of use, however, the rate of data transfer may continue to limit the use of this technology for high-end performance.

**Ultrasound used in Breast Cancer Screening**

More recently, ultrasound is increasingly being used to supplement mammography in detecting tumours that may not be visible with mammography alone. The use of elastography to ‘type’ cancer is increasingly common, assisting in pre-diagnosis before biopsy.

While advances in elastography now allow tumour stiffness to be measured, a lack of harmonisation of the measurement scale used, and limited automation, has hindered ultrasound being used as an exclusive screening method. Automated breast volume sonography (ABVS), released in the last few years, is another option. With ABVS, the field-of-view is larger and the exam provides reproducible and standardised images. The recent FDA approval for the U-Systems sono-v ARUS device, for use in combination with mammography in women with dense breast tissue, may drive increased interest from physicians in the use of ultrasound as a screening tool. Furthermore, the recent acquisition of U-Systems by GE Healthcare may increase interest among other ultrasound manufacturers creating more competition in this market. Despite the strong opportunity in this market, it remains a niche speciality. In the future, the level of impact on the global ultrasound market may be dependent on how efficiently manufacturers can scale ABVS and importantly, if widespread reimbursement can be obtained.

All 3 of these developments discussed have significantly helped to improve the technology available in ultrasound systems, and driving demand from both new and existing ultrasound users. However, can these solutions alone continue to drive strong growth in the global ultrasound market? InMedica projects that a new technology or application will be needed to give the ultrasound market a renewed boost. Given that the ultrasound market has progressed significantly over the last ten years, this new concept could be a long-term development.

Carly Reed is a market analyst in the medical imaging research group at InMedica, a division of IHS (NYSE:IHS). InMedica is a provider of market research and consultancy in the medical electronics industry [www.in-medica.com](http://www.in-medica.com).
Modern targeted therapies play an increasingly important role in the treatment of cancer patients in the era of personalised medicine. Clinical studies have already demonstrated considerable tumour response (increased overall survival) to treatment with new agents such as Sorafenib in HCC and RCC, and Imatinib in GIST. In the face of these modern targeted therapies and increasingly multimodal therapy approaches, new challenges and opportunities have arisen for oncological procedures and image-based radiological diagnoses.

A major pitfall in tumour response monitoring is the increasing incidence of mixed response in targeted therapies. A typical example is the treatment of metastatic melanoma with specific B-RAF mutation with Vemurafenib. Response to Vemurafenib does not typically last as result of suddenly developing resistances. Early detection of disease progression provides improved outcome of subsequent therapies, e.g. with the monoclonal antibody Ipilimumab.

A 44-year-old patient with metastatic melanoma treated with Vemurafenib was radiologically assessed according to the RECIST 1.1 guidelines. An initial follow-up CT scan eight weeks after treatment started (baseline) showed mixed response, a radiological status where both regressive and progressive lesions coexist. One target lesion (T01) indicated good treatment response, while two further target lesions (T02, T03) displayed a significant increase in size (c.f. Table 1). The overall response according to RECIST criteria is ‘partial response’, due to a target sum decrease of more than 30 percent. After another six weeks of treatment, however, the second follow-up CT examination showed rapid progression in all target lesions, overall response was now ‘progressive disease’. In the example above, the strong regression of a single lesion may have misled the reader into assessing the treatment as partial remission, or the overall disease as stable. In this case, a strict application of RECIST may also have reassured the reader. Nevertheless, disease progression was assessed using RECIST six weeks too late. A different selection of RECIST targets and non-targets at baseline might have resulted in an earlier assessment of disease progression.

Radiological therapy response assessment is challenging, particularly in cases like the above, but proper response assessment and reporting are crucial. An incomplete assessment or a delayed assessment of disease progress can result in a late change in therapy, which in turn might lead to serious consequences for the patient. Bearing in mind challenging cases such as mixed responders, and, more generally, the sustained development towards targeted therapies that make cancer an increasingly chronic disease in the long run, an obvious question is: how should radiologists deal with this?

A computer-guided, standardised workflow can address these new demands, for instance, by automating routine tasks and improving team collaboration in longitudinal reading workflows for therapy monitoring. Surveys show that the overwhelming majority of both oncologists and radiologists believe that quantitative tumour assessment is important for oncologic patient care, but that formal response assessment is often not conducted due to cumbersome and inefficient workflows. The vast majority (86%) of surveyed radiologists agreed that providing tumour measurements shows workflow, and that they would be more likely to do so if they had software to simplify the procedure.

In 2009, radiologists and computer scientists at the German Cancer Research Center (DKFZ) began work on designing and developing a workflow software solution named mint Lesion, which is now commercially available from a DKFZ subsidiary called Mint Medical. The mint Lesion software is specifically designed to streamline the reading process: it covers management of patient cohorts in terms of disease and treatment, assessment of lesions with respect to the overall patient treatment course, statistical response evaluation in line with response criteria, and consistent and comprehensive automated reporting. Figure 1 illustrates the longitudinal assessment of the example patient case by means of mint Lesion. Apart from the reproducible measurements, assessment notes, treatment outcome statistics for patient cohorts and individual patients, mint Lesion provides an automatically generated, consoli- dated visual and textual overview of a single treatment course (c.f. Figure 2). Graphical charts help to identify the dimensions of tumour load change with respect to baseline, nadir and previous exams, and the prevalence of mixed response, like in the above case example. By such means, the standardisation of the read workflow contributes to the assessment quality of longitudinal follow-up sequences, and provides comprehensive information for an interdisciplinary assessment of the therapy response by a tumour board.

The project will be showcased on Thursday, March 7, 14:00 - 15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

By Matthias Baumhauer, Mathias Settel, Marika Ganten

Table 1: Mixed Response of a melanoma patient under Vemurafenib treatment.

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<tr>
<td>T01 Large HtHt</td>
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Figure 1: The mint Lesion Read Module. (Provided by Matthias Baumhauer)

Figure 2: An automatically generated, consolidated overview of patient treatment course illustrates significant image instances, measurements, and the contribution of each RECIST target lesion to the overall tumour burden. (Provided by Matthias Baumhauer)

Efficient workflows and reporting compliance with RECIST and other quantitative imaging standards in cancer research and clinical practice

Technology Focus

EBIR presents IMAGINE

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

Modern targeted therapies play an increasingly important role in the treatment of cancer patients in the era of personalised medicine. Clinical studies have already demonstrated considerable tumour response (increased overall survival) to treatment with new agents such as Sorafenib in HCC and RCC, and Imatinib in GIST. In the face of these modern targeted therapies and increasingly multimodal therapy approaches, new challenges and opportunities have arisen for oncological procedures and image-based radiological diagnoses.

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Improving dynamic contrast-enhanced MRI data analysis

By Manav Bhushan

A standard protocol for colorectal cancer is 6–12 weekly cycles of chemoradiotherapy (CRT) prior to surgical resection. Approximately 30 percent of patients show no response to CRT, while 15 to 20 percent respond completely, but still undergo surgery. Unfortunately, it remains extremely difficult to distinguish responders from non-responders. To that end, dceMRI is increasingly attractive, not least because it does not require ionising radiation. The time-intensity curves obtained for each location in the image volume during a dceMRI scan can be correlated with physiological information using pharmacokinetic (PK) models. However, analysis of dceMRI data is confounded by patient motion, which makes PK model-fitting problematic. This is especially so for colorectal tumours, since motion due to peristalsis and breathing cannot easily be constrained.

We have developed a probabilistic algorithm for model-based registration and parameter estimation (MoRPE) of dceMRI. For each motion-corrupted dceMRI scan, the algorithm computes the most probable set of deformations and PK model parameters that would be required to generate the ‘ground-truth’ data. That is, MoRPE estimates the most probable position of the patient at each time point, as well as the values of the PK parameters at each location in the tumour region which would best explain the data. MoRPE enables integration of any PK model; though it currently employs the Tofts model parameters: (1) Ktrans – a measure of vessel permeability at the location; (2) ve – the proportion of extra-vascular space (EES); and (3) T1 – the time at which the tracer contrast agent reaches the location. In practice, the main challenge in PK analysis of dceMRI data is to get an accurate and reliable estimate of each of these model parameters across the entire tumour region. Patient motion is not the only challenge in estimating the model parameters accurately. PK analysis also depends on accurate estimation of the arterial input function (AIF), and the T1 relaxation-time at each location in the tissue (i.e. the T1 map). We have also developed a graphical user interface (GUI) which allows the user to provide different flip-angle images and the dceMRI data, and obtain the T10 map, as well as the PK parameters as an output. In addition, the GUI is designed to perform flip-angle correction for each flip-angle image when supplied with the B0 inhomogeneity map, which is particularly useful for clinical or preclinical data acquired with high-field MRI. The GUI also allows the user to either use a population-averaged AIF, or to estimate the AIF from the data using an expectation-maximisation algorithm.

We first compared MoRPE with other motion correction algorithms on simulated dceMRI data. Tests on simulated dceMRI data for 20 colorectal cancer patients. Patients were at recovering both the PK parameter maps, as well as the simulated motion. Since the ultimate goal of PK analysis is to distinguish between responders and non-responders to CRT, the percentage of complete responders is thought to be about 15 percent. However, with rapidly improving clinical protocols for CRT, the percentage of complete responders is bound to increase, and thus it is imperative to develop non-invasive methods of determining the extent of response to CRT. Our GUI and MoRPE algorithm provides such an analysis method for clinical dceMRI data, while the generic probabilistic framework provides several avenues for future extension and development.

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The author works at the Department of Biomedical Engineering at Oxford University, UK.

ECR 2013 March 07-11, 2013
Booth 630 - Austria Center Vienna, First Level-Gallery
Integrating imaging biomarkers in radiological workflow: an optimised approach

By Angel Alberich-Bayarri, Roberto Sanz-Requena, Gracín García Martí and Luis Martí-Bonmatí

Quantitative imaging has attracted interest from researchers and clinicians in recent years as scientific and medical evidence need to be supported more and more by robust and reproducible data. In this context of evolution towards more scientific-based medicine, imaging biomarkers represent the spearhead of quantitative imaging.

Although there are a huge number of medical image processing techniques and imaging biomarker developments, more efforts towards integration into clinical routines and radiological workflows need to be made to increase their use in validation studies and clinical trials. Quantitative imaging comprises highly heterogeneous aspects, from image acquisition to data analysis and presentation. This management is not straightforward and the more complex an image biomarker is the more biases need to be handled and standardised. Therefore, a trade-off needs to be established between the added clinical value and the technical difficulties associated with the use of an imaging biomarker.

From our experience we found that there was a clear gap between the radiologist’s predisposition to use imaging biomarkers and the actual use and availability. We found that this was often due to high care burdens, limited technical knowledge or a lack of specific software tools and funding for the incorporation of biomedical engineers into departments. To assess these obstacles in the clinical application of imaging biomarkers we developed a software platform that manages patient data for image post-processing and quantification, and sends the results to the PACS as structured reports. Any software can be installed in the platform to obtain a specific imaging biomarker, following ‘a from head-to-toe’ philosophy. With this approach it is possible to handle heterogeneous software tools from different manufacturers or developed in-house. The platform behaves as middleware that connects the RIS and PACS to the different image workflows following standard communication schemes and ensuring the integrity of the quantitative reports.

The software platform was written with a Java programming language, using the open-source NetBeans IDE. The user interface contains a list of patients that require some kind of post-processing, a list of the processes with their current status (pending, working or finalised) and a DICOM viewer. The user interface also includes several buttons for performing query/retrieve for different DICOM nodes, initiating different post-processing pipelines and printing or sending the structured reports to PACS systems. The post-processing workflows comprise both in-house developed tools and commercially available software. The software platform stores all relevant patient and biomarker data in a MySQL database ensuring any process or result can be tracked or retrieved in the future. The unique hardware requirement is a workstation connected to the hospital network.

The data pipeline consists of several steps. First, input data reach the post-processing platform from one of three ways: external storage devices (e.g. CD or DVD), PACS or image acquisition devices. Once on the server, the data is automatically stored in a directory tree structure, according to the information from the DICOM headers. At this point, the platform sends an alert indicating that a new job has arrived and allows the user to launch several post-processing software routines, which are automated to minimise user interaction. Some of the available post-processing pipelines are the pharmacokinetic analysis of perfusion images, intravoxel incoherent motion analysis of diffusion images, trabecular bone microarchitecture studies in osteoporosis, brain morphometry and volumetry, functional MRI, tractography, spectroscopy, flow analysis, iron deposition, cardiac function, cartilage thickness, T1 and T2, and emphysema volumetry. Post-processing results are used to automatically generate structured reports, which are distributed and sent to the PACS to be used by the radiologist. Any relevant information for further statistical analysis or research is stored in the MySQL database.

Our imaging biomarkers information system for medical image post-processing and structured reporting has provided an innovative service that allows all the advantages of imaging biomarkers to be brought into the radiological workflow, providing additional quantitative information to the radiologist for a more accurate diagnosis. The system is being evaluated in a radiology department with a high number of examinations, and the initial results show that it is a very useful tool for boosting the use of imaging biomarkers in the daily routine.

The project will be showcased on Thursday, March 7, 14:00–15:30 in the EIBIR IMAGINE Theatre next to room U on the second level.

The authors are from Quirón Quantification, Grupo Hospitalario Quirón, Valencia/ES.
National breast cancer screening programme in Austria: new approach to early detection

By Oswald Graf

Although there has not been any organised mammography screening in Austria to date, breast cancer mortality has significantly decreased since the 1990s. With the exception of some local pilot projects, early breast cancer detection has depended upon opportunistic breast cancer screening in individual radiology practices. In October 2013, organised mammography screening will be introduced in Austria, utilising the robust existing infrastructure of local radiology practices. Performing screening exams in locations distributed all over the country should help achieve high rates of participation among the female population. Participating institutions will have to meet specific qualifications, similar to those in other European countries.

Women aged 45 to 69 years will receive an invitation for screening, women aged 40 to 44 years, and 70 to 75 years may opt in for screening. Invitations for screening and evaluation of the entire programme will be carried out using central data management, provided by government healthcare authorities.

The upcoming Austrian National Screening Programme will have some specific features. Only digital mammography equipment will be used and, in addition to mammography, ultrasound will be added as an adjunct test in women with dense breast tissue. This approach is supported by multiple studies, amongst them the powerful multicentre ACORN 6666 study from the American College of Radiology, which showed that ultrasound is able to find a significant number of invasive cancers in dense breasts, which would otherwise remain undetected with mammography.

In Austria, ultrasound has been widely used for opportunistic breast cancer screening in the past, and radiologists are quite experienced using this technique. However, the impact of supplemental ultrasound for early detection has not been systemically evaluated throughout the country. The practice of double reading screening mammograms—intended to reduce the number of false negative results due to human error, and widely used in many other countries, has only been applied in some Austrian institutions.

The first ever screening programme of its kind, the Austrian National Screening Programme will see mammography carried out alongside ultrasound in women with dense breasts by the first-line radiologist. A second reading of the mammograms will be performed by another radiologist. Despite the limited value of mammography in dense breasts, as well as the influence of human errors in reading screening mammograms, the combination could increase the overall sensitivity for early breast cancer detection.

This combined approach is a major logical and scientific challenge. Most Austrian radiology practices in remote areas only have one radiologist, with groups of radiologists found mainly in larger urban areas. Therefore, the process of double reading requires some logistical effort. Teleradiology networking should facilitate the double reading process and help compensate for the shortage of radiologists, which is a familiar problem in many other European countries.

Austrian radiologists are very well aware of the fact that we are pioneering new methods in breast cancer screening and that our experience may serve as a pilot project for screening programmes in other countries.

More information about the ÖRG can be found at www.oerg.at

Dr. Oswald Graf from Steyr, Austria, heads the Breast Imaging Task Force at the Österreichische Röntgen- gemeinschaft (ÖRG).

Spanish society seeks to increase visibility of radiologists

By Joaquín Forte

Spanish Society of Medical Radiology (SERAM) members are proud of its sustained growth, which last year took the form of a record number of scientific activities.

A look inside

Last year was a very important year for SERAM. We hold our national congress every two years along with elections, where we change half of our executive board. Our 31st congress took place in Granada, May 25–28. We had close to 2,000 attendees from all over Spain, with numerous international lecturers and abstract submissions.

The main topic of the congress was ‘Functional Imaging in Oncology’, with two pre-congress monographic sessions: head and neck radiology course; technologists course, with subjects related to quality control, dose management, image post-processing techniques, education and training.

SERAM is committed to the training of technicians, as they play an important role in the whole process. Future congresses will include these courses, as participation has been increasing since 2010, when they were introduced for the first time.

The last congress hosted the European Diploma in Radiology examination, with a pass rate of 83%, reflecting the high level of the candidates.

International presence

SERAM will highlight its increased visibility and cooperation with international societies like the European Society of Radiology (ESR), American Roentgen Ray Society, Radiological Society of North America, and those of Latin America.

Our ‘International Affiliates Meeting’, which takes place every Monday at the Instituto Cervantes, Chicago, during the RSNA’s congress, is a well-established event and a popular meeting point for Spanish-speaking radiologists. SERAM also has a strong relationship with the ESR, particularly this year, where we are participating in the ‘ESR meets programme’ as a guest country.

We feel really proud of Professor José Ignacio Bilbao’s ECR 2013 presidency, which makes Spanish radiology even more visible in Europe.

International affiliates

SERAM is broadening the number of its international affiliates, offering them quite a lot of advantages in the form of scientific papers, web access, publications and travel grants. We offer our societies our ‘Visiting Professors Programme’ where SERAM is willing to participate in scientific activities abroad.

Scientific work

As an ongoing activity, SERAM combines its work in the form of research grants, collaborative projects with the industry, courses and publications. Among other things, we would like to mention the third edition of the ‘Imaging in Oncology’ course, which is a strategic area for us.

This year the course has two main topics: thoracic and neurological imaging and the scientific programme was developed together with two of our sections, SERCAT and SENR, to whom we would like to express our gratitude.

Publications

Our peer-reviewed journal, Radiología, is gaining visibility and becoming the Spanish radiological magazine of reference. As we are aware of the importance of scientific publications, we will continue SERAM’s editorial grant, introduced last year.

Education and training

We have a programme of well-established educational courses which also include specific ones aimed at residents. As an ongoing project, we are developing a powerful e-learning platform.

We would also like to mention the activities of the Spanish Foundation of Radiology, with its commitment to education in the form of annual grants: the special grant in cooperation with the European Society of Radiology (ESOR) and the International Course of Radio-pathological Correlation. This year we will host the 24th edition of this classic course for residents in our country, with professors coming from the AIRP.

Scientific societies

We participate in collaborative projects and agreements with Spanish societies in the areas of cardiology, nuclear medicine and radiological protection. SERAM will also sign an agreement with the Spanish Society of Oncology.

Industry, quality

Apart from the scientific activities developed in close cooperation with the industry, SERAM is represented at FENIN, the Spanish association of healthcare companies. A ‘guidance protocol for quality control and acceptance of radiological equipment’ developed with assistance and sponsorship from SERAM will be launched soon. The latest edition of the book: Spanish protocol in quality control in radiodiagnosis was published last March, which SERAM was involved in from its inception.

More information about the Spanish Society of Radiology can be found at www.seram.es

SERAM and patients

One of our objectives is to foster the visibility of radiology, and show what radiology and the radiologist can do for the patient.

We started with the Day of Radiology in 2009, on a local basis and we welcome initiatives to make it global. Naturally, we chose to participate in the first ‘International Day of Radiology’, with several events: TV interviews, press conferences and releases, in both local and national newspapers.

With oncologic imaging as the main theme of the day, we celebrated an open day at the head-quarters of ‘Asociación Española Contra el Cáncer’. The main events gave a general overview and there were lectures about the role of imaging in three areas, breast, colon and lung. There were also conferences for patients, explaining their point of view, and how they feel imaging helped them with their illness.
The Russian Association of Radiologists to take centre stage at next ECR

By Nadejda Rozhkova

The history of Russia’s national radiological society has its roots in the beginning of the 20th century. As a result of Russia’s history, over the past century it has changed its name several times. After the disintegration of the Soviet Union in 1991, the society was finally renamed the Russian Association of Radiologists (RAR). Coincidentally, the RAR was established at the same time as the modern European Congress of Radiology (ECR) in Vienna.

The RAR is a multifaceted organisation that unifies not only radiologists but also nuclear medicine ultrasound specialists, medical physicists and mammologists. Today the RAR has about 1,000 active members.

The RAR’s main tasks are to improve radiology in Russia and bring it closer to international standards. It pays special attention to problems in the training and education of radiologists, as well as to the creation of professional guidelines and standards. An important part of the RAR’s activities is its cooperation with the ESR. In 1995, the RAR joined the European Association of Radiology (EAR) and in 2005, after the European Congress of Radiology (ECR) in Vienna, the RAR was admitted to form the European Society of Radiology (ESR). Russia became a national member of the ESR. It means that the RAR has voting rights, actively participates in Annual Leadership Meetings and ESR representative committees on the Scientific, Educational and Professional Organisational Committees of the ESR. Unfortunately, radiology training in Russia still differs from ESR guidelines. The RAR is going to improve this situation in the near future.

Professor Pavel Vlasov was the first president of the RAR. He was followed by Professor Vladimir Kharchenko who for many years directed and improved our professional organisation. He still plays an important role in the Executive Board of the Society. Professor Alexander Zubarev, a well-known Russian specialist in ultrasound, served as president of the RAR in 2007–2011. In 2011, Professor Nadejda Rozhkova was elected as president of the RAR. Under her guidance the society has expanded its activities and launched some new initiatives. Many well-known Russian radiologists serve as members of the Executive Board of the RAR. One can mention names like professors A. Granov, G. Karmazynov, V. Kharchenko, V. Kornienko, V. Kosunski, V. Mudrynko, N. Nudnov, S. Proskopenko, N. Rubtsova, V. Solodki, V. Serpinko, Z. Shvariadze, V. Sainysyn, L. Surm, A. Vashchenko, V. Uvarov, A. Zubarev and many others. The RAR has an annual meeting, which usually takes place in December. But from 2013, RAR annual meetings will be held in early November in order to coincide with the International Day of Radiology.

On top of this, the RAR organises multiple teaching and scientific meetings in different formats all over Russia. In 2012, the most important event prepared and conducted by the RAR was its annual congress, which was dedicated to two leading figures in Russian radiology. Professors Leonid Lindemnaten and Alexander Pavlov. These two outstanding teachers and scientists, whose names are known to every Russian radiologist, are still active professionally and continue to share their enormous professional experience with residents and fellows. Three young radiologists, who received awards for the best scientific papers presented during the RAR annual meeting, have been awarded grants to attend ECR 2013.

The RAR pays special attention to its relationships with the ESR. Every year more than 400 Russian radiologists visit the Austria Center in Vienna for the ECR. Our goal is to increase this figure even further and to bring more members from Russia to the ESR. It is important to note that over the last few years more and more Russian radiologists have been paying their ESR membership fees through their national society (RAR). More than 600 Russian radiologists have become ESR members with help from the RAR, which paid their annual membership fee. Every year the RAR traditionally has a nice and attractive society booth in the entrance hall of the ECR. It is used to promote both the national and international activities of the society, and for informal meetings with colleagues.

Looking back over recent years, it is important to remember that ECR 2006 was an especially memorable congress for the Russian radiological community. For the first time, Russia was among the guest countries of the ESR. Many Russian radiologists still recall the ‘ESR meets Russia’ session during ECR 2006, which was chaired by the congress president Andy Adam (UK) together with Prof. V. Kharchenko, who was president of RAR at the time, and Prof. S. Ternovoy.

The year 2014 will be even more challenging for the RAR. For the first time the ECR is going to have a president from our country. In 2011, Professor Valerion Sitiven, who since 1999 has worked in different ESR committees and served as coordinator of the first ‘ESR Meets Russia’ session, was elected 2nd Vice-President of the ECR. He is going to serve as president of ECR 2014. The Winter Olympic Games will take place in the Russian city of Sochi just a month before ECR 2014, making it a particularly exciting year for Russia. The RAR has already been involved in preparing the new ‘ESR meets Russia’ session for ECR 2014.

Professor Nadejda Rozhkova, president of the RAR, together with Professor Igor Turin, chief radiologist at the Russian Ministry of Health will chair and moderate this session together with the congress president. We hope that our colleagues from the ESR member countries will find this session interesting and worth visiting.

The RAR would like to wish all participants an interesting and enjoyable ECR and invites all of you to ‘ESR Meets Russia’ in 2014.

More information on the Russian Association of Radiologists can be found at www.russian-radiology.ru.
The year 2012 was a very busy one as EIBIR finished some of its initial research projects, and supported EIBIR members with applications for new research initiatives. Over 100 Network Members continued to support EIBIR during the year with bottom-up initiatives and active involvement in ongoing and new activities. In 2012, the last Health Call under FP7 was published with a couple of topics of relevance to the biomedically imaging community. It was a highly competitive call, EIBIR supported members with the drafting and submission of proposals, and was happy to announce that some of them have been invited to submit proposals for the second round. The beginning of 2013 has been busy as EIBIR, coordinator of the invited submissions, has guided the consortium through the final preparation phase.

The Scientific Advisory Board (SAB) continued to follow, with great interest, preparations in the European Union for Horizon 2020 and it encouraged the community to join EIBIR’s activities in the field of biomedical imaging research. In response, EIBIR endorsed and disseminated the European Society of Radiology’s (ESR) statement on Horizon 2020 with a particular view to the role of medical imaging. Investing in and developing medical imaging could have a tremendous impact on patients in the future and make medicine towards a tailored approach, which would benefit the patient, as well as reduce healthcare costs. To achieve this, clinicians, basic researchers and engineers need to join forces in a collaborative effort, which should ideally be supported through European cooperation and multidisciplinary funding schemes.

In addition, EIBIR participated in a consultation on the envisaged inclusion of public-private partnerships in Horizon 2020, welcoming this initiative as an important step towards overcoming fragmentation and a lack of coordination in biomedical imaging research, as well as emphasising the need for stronger involvement from academia in defining Europe’s strategic research agendas. Such a joint programme with industry could also potentially open up a new window of opportunity for EIBIR’s Industry Panel members to shape Europe’s research agenda and join forces with academia.

In 2012, EIBIR also began supporting an industry-initiated investigation of MRI as an initiative of EuroAIM and hopes that other industry partners will follow suit with similar projects. EIBIR has also put forward a proposal to the Innovative Medicines Initiative to consider image-guided drug delivery for its future research agenda. As a powerful tool it could help combine diagnoses and therapy, as well as improve clinical care and foster drug development.

As Europe’s research funding is likely to be cut in the future, given the current economic situation, EIBIR continues to plan a strategy that will allow the network to thrive, and the activities of its multi-disciplinary thematic working groups to continue, independent of EU funding. This certainly continues to be a major challenge. The support provided by EIBIR’s Industry Panel and Network Members has been gratefully acknowledged, which has allowed EIBIR to invest in some new initiatives and to support the application phase for new projects. EIBIR is grateful to the European Society of Radiology, which once again contributed significant funds to EIBIR over the past year, as support and commitment from shareholder organisations have not yet developed to their full potential.

One change that EIBIR has been looking forward to is the update of the EIBIR website. Not only has it been improved aesthetically, but the content has been reorganised and restructured, fully capturing all the services that EIBIR offers and making navigation easier. We encourage you not only to visit www.eibir.eu, but also to contribute content and information of interest to the biomedical imaging research community.

EIBIR will be involved in five sessions taking place during ECR 2013. The IMAGINE workshop takes place today, followed by the EIBIR/EORTC Symposium on March 8. Euro-BioImaging and EuroAIM will both hold events on Saturday, and the final session on Horizon 2020, the upcoming European Union research programme, will wrap up EIBIR’s events on Sunday. You will find more details listed on this page.

Please visit the EIBIR Booth in the entrance hall to learn about EIBIR’s services and activities, as well as get your own personal copy of the EIBIR Annual Report 2012. We hope that you will feel encouraged to join EIBIR’s activities in the field of biomedical imaging research.
By Mélisande Rouger and Simon Lee

Radiologists from all over the world celebrated the first International Day of Radiology (IDoR) on November 8, 2012, as scientific societies sought to highlight the role played by imaging in modern medicine on the date commemorating the discovery of X-rays.

The day was marked by events such as public lectures, departmental open days, exhibitions, national meetings and international conferences organised by a multitude of societies. In total, 42 European national radiological societies and 14 European subspecialty & allied scientific societies responded to the invitation of the European Society of Radiology (ESR), the Radiological Society of North America (RSNA) and the American College of Radiology (ACR) to commemorate the discovery of X-rays by Wilhelm Conrad Röntgen on November 8, 1895. Many societies outside Europe also joined the initiative with, for instance, 20 North American radiological societies supporting IDoR, put forward by the American College of Radiology (ACR) and hosted, together with the Spanish Society of Radiology (SERAM) and the Slovak Association Against Cancer, an international press conference and a series of lectures on the role of imaging in oncology. The Japan Radiological Society printed a pocket calendar, which attracted a round table discussion entitled ‘Open the door for the future of radiology’ and in the French Society of Radiology (SFR) and created two very popular publications: ‘The Story of Radiology’ and ‘Making Cancer Visible: The Role of Imaging in Oncology.

In addition, the ESR produced several videos to promote the International Day of Radiology and encourage participation. IDoR also benefited from a large presence on social media channels. The IDoR Facebook page gained 1,417 ‘likes’ between its creation and November 8, with its posts reaching the news feeds of more than 870,000 people. The ‘Give us a hand initiative, which attracted more than 200 submissions, and the Facebook promotion of this initiative reached the news feeds of more than 1,355,000 people.

With IDoR, the organisers wanted to inform the public about the benefits of medical imaging, as their value is not widely understood yet, and raise awareness of the essential role the radiologist plays as part of the healthcare team in countless medical procedures. The first IDoR focused on oncologic imaging, to reflect the important role radiology plays in all stages of cancer management, from early detection and prevention, to treatment and monitoring and follow-up.

“Radiologists have developed special competences in these fields and shown how screening programmes can detect early-stage tumours and save lives. They have invented new minimally invasive treatments as well as new ways to follow up the response to the most advanced therapies,” said Professor Lorenzo Derchi, ESR Communication and External Affairs Committee chairman.

The day also has long-held significance for radiographers, who use their expertise and knowledge of radiological physics to help diagnose and treat patients. Therefore, the European Federation of Radiographer Societies also chose to support IDoR 2012.

The International Society of Radiology (ISR) and umbrella organisations from other continents also embraced the initiative. The International Society of Radiology (ISR), the Asian Oceanian Society of Radiology (AOSR), the Colegio Intera-americano de Radiología (CIR), the Royal Australasian and New Zealand College of Radiologists (RANZCR), and the Radiological Society of South Africa (RSSA – which also represents neighbouring countries) gave their full support to IDoR 2012.

The organisers look forward to celebrating the International Day of Radiology again on November 8, 2013, together with the global radiological community. IDoR 2013 will focus on the role of imaging in the treatment of lung diseases.

European Society of Radiology’s commitment to EU politics

By Javier Hemetsberger

The ESR EU Affairs Subcommittee is closely monitoring and analysing political and legislative developments within the European Union which affect the radiological profession.

The aim of the group is not only to foster continuous dialogue, but also to develop and strengthen relations with key politicians and policymakers within the European and national level. Therefore, the EU Affairs Subcommittee is active in several different policy areas.

One of the first policy areas the ESR became actively involved in was the EMF Directive (2004/40/EC) on protecting workers from electromagnetic fields, which would, if the limits laid down in the Directive were applied to MRI, pose a serious threat to patients with magnetic resonance imaging (MRI). In order to address this dossier adequately, the European Parliament formed the Alliance for MRI, a coalition of patient groups, scientists, the medical community and Members of the European Parliament (MEPs) with the aim of obtaining a derogation for MRI.

As a result of the Alliance for MRI’s strong efforts, the European Commission published a proposal including a derogation for MRI, which led to prolonged discussions within the European Parliament and Council leading to a delay in the implementation deadline of more than five years.

On December 6, the European Parliament’s Employment and Social Affairs Committee stated that a majority of its members recognised the importance of MRI for patients in Europe and are willing to take the necessary legislative steps to ensure that this technology will remain available to patients today and in the future. However, it is important to continue the Alliance for MRI’s efforts as the discussions between the European Commission, the European Parliament and the Council have started, and the European Parliament will hold its plenary vote in either May or June 2013.

The ESR EU Affairs Subcommittee is also actively engaged in the modernisation of the Professional Qualifications Directive (2005/36/EC). With this proposal, the European Commission has put forward a European Professional Card, which foresees the automatic recognition of seven professions (including doctors) within the European Union. The ESR welcomes the European Commission’s initiative to harmonise the European labour market, but emphasises the need for a harmonised training curriculum within radiology.

The ESR proposed a number of amendments to the rapporteur and shadow rapporteurs of the leading Internal Market and Consumer Protection (IMCO) Committee. In October, the IMCO Committee published more than 700 table amendments including the ESR’s proposals regarding language assessment, partial access and the harmonisation of training standards. The IMCO Committee will vote on January 22, 2013.

The ESR is currently assessing the possibility of gaining recognition of the European Diploma in Radiology (EDiR) by the European Commission, a meeting between the European Commission and ESR representatives took place at the end of January. Another dossier the ESR is actively involved in is eHealth. The ESR is a member of the eHealth Stakeholder Group, established by the European Commission and representing several different stakeholders such as health professionals, patient groups and industry in order to provide expert input into the different policy areas of eHealth. On December 7, the European Commission published the so-called ‘eHealth package’ comprising three major documents. Besides the eHealth Action Plan (eHealth) and the staff working document on eHealth, the package contains the long-awaited ‘Staff Working Document on Legal Aspects of Telemedicine’.

The ESR’s experts have carefully analysed the document in order to continue its cooperation with the European Commission.

Apart from the ESR’s active engagement with the dossiers mentioned above, the ESR EU Affairs Subcommittee is closely monitoring several other policy areas such as the European Commission’s proposals on medical devices and clinical trials, and has developed a statement on proposed European data protection legislation, as well as Horizon 2020, the EU’s framework programme for research and innovation.

For more detailed information, please visit the ESR’s EU Affairs website: www.myESR.org/EU Affairs

European Society of Radiology’s commitment to EU politics
EUSOBI: small society begins to mature

By Michael Fuchsjäger

The European Society of Breast Imaging (EUSOBI) can look back on a very successful year with numerous innovative initiatives. After years of being closely associated with the European Congress of Radiology, EUSOBI held an independent annual meeting in Barcelona in October, 2012. This meeting was highly successful in every respect and served to promote our society. Furthermore, its success demonstrated that there is a need in Europe for an independent breast imaging conference.

Prof. Michael Fuchsjäger conducted an interview with Prof. Francesco Sardanelli, president of EUSOBI, and Prof. Thomas Helbich, past president of EUSOBI.

Michael Fuchsjäger: What were the critical success factors in planning the EUSOBI Annual Scientific Meeting 2012?

Thomas Helbich: The Annual Scientific Meeting in Barcelona last October was held in conjunction with the Spanish Breast Imaging Society (SEDIM). There were lectures on the entire spectrum of breast imaging, from new applications in digital mammography, MRI or US to assessment of DCIS, new guidelines on risk stratification, biomarker imaging and other new techniques that move breast imaging from diagnosis to molecular prediction. Other highlights were the lecture, which was given by Prof. Robert Brach (USA), the world renowned pioneer in molecular imaging of tumour angiogenesis. One session was based on a joint initiative of EUSOBI and the Society of Breast Imaging (SBI) with a keynote lecture given by Prof. Edward Sickles (USA), one of the founders of the BI-RADS lexicon. In addition Dr. Ritsie Mann (Netherlands), one of the rising stars in breast imaging, was awarded the Carla Bootes Young Investigator Award.

MF: What were other contributing factors that made the EUSOBI Annual Meeting 2012 such a big success?

TH: EUSOBI introduced the European Diploma in Breast Imaging (EDBI) in 2012, at the Annual Meeting in Barcelona. Nine radiologists from Europe and Asia successfully passed the EDBI exam. In 2013, the EDBI exam will be held at the ECR and EUSOBI annual meetings. The EDBI will become a standard European qualification for breast imagers and will help to standardize training and expertise in breast imaging across Europe. The EDBI certifies specific competence for radiologists to perform, interpret and report mammography, US, MRI and breast interventions. The EDBI will also assist breast imagers in the promotion of their skills and expertise in breast imaging when dealing with other clinical colleagues and the general public.

MF: Has EUSOBI recently experienced considerable growth?

TH: Indeed, yes, the Annual Meeting in Barcelona was attended by 551 radiologists, more than twice as much as the year before in Vienna. Within less than two years we have increased the number of our members from 200 to 336. Charles Darwin once said that beneficial mutations are necessary. EUSOBI has mutated beneficially, as stated above, with numerous changes and innovations. Breast imagers around the globe have recognised this and have helped us grow. We are proud of our society.

MF: In 2012, EUSOBI started to offer high-end breast MRI training courses with great success. These courses are in great demand and are oversubscribed. What is the formula behind the success of these postgraduate courses?

Francesco Sardanelli: At EUSOBI, we have a number of the most experienced and well-known experts in breast MRI. Thus, it was easy to compose a panel of speakers who covered all the topics for such a course, including detailed and experienced clinicians who practically invented breast MRI, like Sylvia Heywang-Köbrunner, Werner Kaiser, Christiane Kuhl, and many others. Moreover, the formula of general lectures and small workshops was highly appreciated by the attendees. Now the Colegio Interamericano de Radiología has invited EUSOBI to hold this course in Cancun (Mexico) in June 2013. This is an aspect of international relations which EUSOBI is extending to other breast societies outside Europe.

MF: Besides the EUSOBI Annual Meeting and MRI training courses, how about further courses with different topics for postgraduate education, i.e., on digital breast tomosynthesis?

TH: The successful breast MRI training course, which was limited to 100 participants, was sold out within days and therefore held several times. In addition, EUSOBI will launch a digital breast tomosynthesis training course in spring 2014. For more information on EUSOBI and all EUSOBI initiatives, as well as conferences and workshops, please visit our website www.eusobi.org.

MF: You are the principal investigator for the MIPA (Multicenter International Prospective Meta-Analysis of Individual Woman Data) trial on preoperative breast MRI in clinical practice. This study is conducted by EUSOBI in cooperation with EIBIR in 37 centres around the world. What is the specific study design? What are the timelines? What are the expected results?

FS: MIPA is an intriguing observational study. The simple idea, suggested to me by Nehmat Houssami from the University of Sydney (who is on the MIPA Steering Committee) is to prospectively compare surgical and long-term outcomes of two very large concurrent groups of women recently diagnosed with breast cancer, who receive or do not receive preoperative MRI according to the usual local criteria. EUSOBI/EBIR EuroAIM launched an international call in July 2012. A total of 96 applications were received from all over the world. A total of 37 centres from Europe, North America, South America and Asia have been selected and will contribute to the study. Enrollment will start very shortly after the ECR. We hope to clarify the much debated topic of patient outcome in breast MRI.

MF: In November 2012 an article published in the New England Journal of Medicine on ‘Effects of Mammography screening’ (Bleyer A, Welch G; Effect of Three Decades of Screening Mammography on Breast-Cancer Incidence. N Engl J Med 2012;367:1998-2005) has shocked the breast and breast imaging communities. This study suggests that screening mammography has only marginally reduced the rate at which women present with advanced cancer, ‘there is substantial overdiagnosis and that screening is having, at best, only a small effect on the rate of death from breast cancer’. What is your and EUSOBI’s opinion here?

FS: I can report here the evaluation of colleagues from the Society of Breast Imaging (SBI), with whom we have a close relationship. The authors claimed that breast cancer, in the absence of screening, should have increased by 0.25 percent per year, when there are robust data showing that the actual rate is 1.0 percent per year. Thus, the over-diagnosis that the authors claim is markedly overestimated. A letter commenting on the study should appear in the New England Journal of Medicine. We agree with colleagues from the U.S. that we cannot suspend common sense when results and conclusions could have serious implications for tens of millions of women. In an issue where the stakes are high and the implications wide, the analysis should be based on real data, not theoretical models based on assumptions and statistical manipulations.

MF: Professor Sardanelli, are you the current president of EUSOBI and you will also be the president of the EUSOBI 2013 Annual Scientific Meeting in Rome, October 11-12, 2013. What are your plans for this conference in cooperation with the Italian Breast Imaging Society? How will it differ from the highly successful EUSOBI 2012 Annual Scientific Meeting in Barcelona?

FS: We will continue on the path already taken for the Barcelona Conference. In 2013, there will be a presentation of first clinical results of cone-beam breast CT by Dr. A. O’Connell from Rochester/US, a session entitled ‘EUSOBI Meets’ dedicated to Chile and Egypt, a session on breast MRI from diagnosis to prognosis, exploring the meaning of MRI biomarkers of breast cancer; a talk on ethics, regulations, and advocacy regarding the breast density issue given by Dr. Nancy Cappello, founder of the U.S. association. Are you denise, a session on radiological treatments in the breast cancer patient, headed by Prof. Christiane Kuhl; and a session on overdosage with a talk given by Prof. Debra Monticciolo from Houston, current president of the Society of Breast Imaging.
ECR supports young radiologists, says rising star

By Mélisande Rouger

Dr. Alexander Sachs, the Rising Stars representative on the ESR’s Undergraduate Education Subcommittee, talked about his numerous projects and his passion for teaching in an interview with ECR Today.

ECR Today: When did you first take part in the Rising Stars programme?

Alexander Sachs: I first took part in the Rising Stars programme last year. I applied to present SonO4You, an ultrasound peer-teaching student project, which I had become involved in. It was the first time I gave a presentation in front of a large audience, but I thought I would just give it a try and so I took a practical approach.

ECRT: It seems it paid off since you were elected best student presenter.

AS: Yes, it did have some positive effects. The year after, the ESR asked me if I wanted to coordinate the Hands-on Ultrasound Workshops at ECR 2013, which are strongly connected to the SonO4You tutorials. It was a great opportunity. It was not only required but it was repeating the experience this year, with one advanced session and three basic workshops.

I like the idea of raising young people’s interest in radiology. In doing so, I would think that many people internationally, be they students or teachers. I really enjoy meeting people with different ideas; it is quite interesting to see what happens, how they connect, and the results of their cooperation.

ECRT: Can you please tell us about some main initiatives of Rising Stars at ECR 2013?

AS: The SonO4You workshops will offer more advanced content to students and, as far as I know, no other congress has this setup.

The first is that you have the opportunity to practice. Ultrasound training is more practical than theoretical. You can test your knowledge. During my months in the conference hall, to give a practical approach, I and a few other doctors had gained so much that they had trouble switching back to their native language. Students came from Austria, Switzerland, France, Hungary, Romania, and discussions were very interesting since everyone had a different way of doing things.

The workshop consists of four different stations. The station on organs and intervention promises to be fun, since we will use self-made vegetable phantoms to practice with needles (NB: we have also ordered biopsy needles). It is really easier to learn when you have fun. Other stations will focus on vascular topics, echocardiography and musculoskeletal ultrasound (MSK US).

ECRT: In addition to this workshop, you wrote a guide book on ultrasound for students (Studenten-coach – Ultraschall Abdomen University Publisher 3.0). What do you find so interesting about this modality?

AS: With ultrasound, you just need a good introduction and the right image, so even a third-year student can teach a fifth-year student who is specialised in another area. In our workshops, the students are third to sixth-year students and they present the regions for which they have been trained.

This book is a compilation of the experience I gained with students through this project. Ultrasound is my main field of interest and I wrote my thesis dissertation on its use in MSK.

ECRT: Why should a medical student or radiography trainee take part in the Rising Stars programme?

AS: There are many benefits if you do. The first is that you have the opportunity to attend unique sessions. These are dedicated lectures for students and, as far as I know, no other congress offers that. The ESR is genuinely interested in supporting young radiologists.

The second benefit is that you can see if radiology is interesting for you. If not, you can also find out why you were interested in imaging in the first place, and how you can use it in your career. The programme offers relevant basics sessions and practical courses.

Visiting the technical exhibition is also impressive, especially in such a huge congress. You can discover machines you’ve never heard of. Another point is the language. Taking part in Rising Stars gives you an opportunity to practice medical English. It is also an opportunity to write your first abstract and take your first steps towards a scientific career. You get a chance to present your project, and you can really try to do a good job and make everyone benefit from it.

Last but not least, the free registration for students is such a rare opportunity as congresses are not really enough. Where else are you going to get all this? These are the reasons why it’s worth trying, even if you don’t want to become a radiologist. I wasn’t addicted to radiology from the very beginning, it came later.

ECRT: How did you decide to become a radiologist then?

AS: I did my diploma thesis in radiology. I was interested in musculoskeletal ultrasound, and I was also interested in other modalities that it made sense to build further on this knowledge. But I also think the Rising Stars programme had an influence on my decision. It was a combination of different factors: my international activities, my thesis, my interest in imaging modalities and computers.

Altogether, I thought it could be a good thing for me. What I also like about radiology is that you don’t work alone. You have to work in teams with other specialties. I’m a team player; I enjoy talking to other physicians.

Finally, radiology is a good job for the future. In other fields you often have to work beyond your physical limit with lots of night shifts and exhausting work schedules, but with ultrasound, you can work a normal life, you can do other things. It is more structured than other disciplines. 

ECRT: What are your plans for the future?

AS: I would like to specialise in musculoskeletal radiology. I graduated last summer and now I’m waiting for a free place to start my residency. I am very interested in teaching. For instance, I have a few other students voluntarily organise a lecture for other students, every two months in the conference hall, to test our knowledge. During my studies, I had many different teachers and I’ve noticed that not everyone enjoys teaching. Some prefer to do research, but I prefer the practical part of medicine. I like to motivate students, I like to discuss with them, whether they come from or whatever their experience might be. So I really enjoy my activities within the ESR Undergraduate Education Subcommittee. We work together to disseminate knowledge across Europe.

Rising Stars Programme

Basic Sessions

Friday, March 8, 08:30–10:00, Studio 2013

Basic Session on Cardiac Radiology

M. Fransone, Rome/IT

Acute aortic syndrome

B. Slabic, Medediac, Port-OPT

Cardiac CT in theWorkup of Coronary Heart Disease

H. Juijten, London/UK

Monday, March 10, 10:30–12:00, Studio 2013

Basic Session on Neuroradiology

A. Jegge, degeneration, and inflammation in the brain: an imaging perspective

M. Gomez, Antwerpen/BEL

Is the Circle of Willis a circle?

R. Jopke, London/UK

CNS infections

H. Pothier, Lyon/FRA

Sunday, March 10, 08:30–10:00, Studio 2013

Basic Session on Interventional Radiology

Management of aortic aneurysm and dissection

B. Caracogna, Rapallo/IT

Overview of the development of interventional radiology

M. Kolossvary, Budapest/HU

Embolisation of liver malignancies

M. Mikes, Vienna/AT

Student Sessions

Friday, March 8, 14:00–16:30, Studio 2013

Student Session 1

Provisional reporting – maintaining high standards in radiology

S. Pfeifer, Mannheim/DE

Provisional reporting – radiology versus emergency radiology

D. Şin, Sofia/BLG

Ulcera cutis: the key for diagnosis of cutaneous plaques

M. Christoff, Vienna/AT

Is the patient; let us establish a rapport

M. Mikes, Vienna/AT

Student Session 2

Sunday, March 10, 14:00–15:30, Studio 2013

Student Session 3

Fraay Phan, Hanoi/VN

Theory plus practice

M. A. M. J. van den Bosch, Utrecht/NL

History and social impact of medical education in the Moderate East

M. M. Thurnher, Vienna/AT

Aging, degeneration, and inflammation in the brain: an imaging perspective

K. Song, Seoul/KR

Acute aortic syndrome

M. A. M. J. van den Bosch, Utrecht/NL

Cardiac CT in the Workup of Coronary Heart Disease

H. Juijten, London/UK

CNS infections

H. Pothier, Lyon/FRA

Basic Sessions

Friday, March 8, 14:00–16:30, Studio 2013

Basic Session on Interventional Radiology

Management of aortic aneurysm and dissection

B. Caracogna, Rapallo/IT

Overview of the development of interventional radiology

M. Kolossvary, Budapest/HU

Embolisation of liver malignancies

M. Mikes, Vienna/AT

Student Sessions

Friday, March 8, 14:00–16:30, Studio 2013

Student Session 1

Provisional reporting – maintaining high standards in radiology

S. Pfeifer, Mannheim/DE

Provisional reporting – radiology versus emergency radiology

D. Şin, Sofia/BLG

Ulcera cutis: the key for diagnosis of cutaneous plaques

M. Christoff, Vienna/AT

Is the patient; let us establish a rapport

M. Mikes, Vienna/AT

Student Session 2

Sunday, March 10, 14:00–15:30, Studio 2013

Student Session 3

Fraay Phan, Hanoi/VN

Theory plus practice

M. A. M. J. van den Bosch, Utrecht/NL

History and social impact of medical education in the Moderate East

M. M. Thurnher, Vienna/AT

Aging, degeneration, and inflammation in the brain: an imaging perspective

K. Song, Seoul/KR
Top radiologists read more than just images
A myriad of opportunities for radiographers at ECR 2013

The quality of the ECR’s sessions for radiographers has been given a welcome seal of approval from the European Federation of Radiographer Societies (EFRS) which recently elected the ECR as their official annual scientific meeting. EFRS president, Prof. Graciano Paulo from the college of health technology of Coimbra, Portugal, has been coming to the ECR for more than a decade and firmly believes this year’s congress boasts one of the best selections yet for radiographers. Here he gives his personal preview of ECR 2013 and each of these sessions.

Graciano Paulo: The ECR is really a paradise of opportunities. This congress is worth visiting just for the chance to meet radiographers from throughout the profession, to network, and to get a wider perspective on the world of medical imaging. But of course the superb scientific programme is the jewel within them is the core of this meeting. The radiographers’ sessions have been of interest in every year, and for 2013 there are some new additions to the programme that make it one of the best ever. I would like to personally thank the chairs of the radiographers subcommittee, Dean Pekarovic and Valérie Vilgrain, who have ensured a very high quality programme, and I am also very grateful to ECR president Prof. Bilbao for giving us the opportunity to have the myESR’s section for the first time.

EFRS meets Time

The EFRS is very optimistic about this session. It’s the first year that this kind of session is being held, and by destiny we are meeting with one of the countries that the federation is actively supporting in Spain. Spanish Radiographers have developed their professional competencies in recent years, and want to see that recognised by National Health and Education authorities, by transferring their education programmes into higher education institutions. This session gives us a vital opportunity to discuss that, by observing the quality of their professional practice, and to reflect on the improve ment in the quality of care expected. If the Spanish government give their radiographers the chance to be educated and trained at university level, as observed in almost all European countries.

All of the speakers in this session have more than 20 years of experience and belong to a group of 30 Spanish radiographers who decided to cross the border to study in Portugal at the College of Health Technology of Coimbra, a university for people without diplomas. They are clearly strong advocates for the university system and excellent role models for other Spanish radiographers.

Radiographers and ultrasonography in Europe

This is a very important session covering an issue that is a little controversial, because radiographers are not performing ultrasound in all EU countries. The session should give us a chance to see the main advantages of radiographers performing ultrasound themselves. We are very much in favour of the ‘radiology family’, the idea that there should be permanent links between radiologists and radiographers in all techniques and modalities. These techniques should be kept within the remit of the radiology department, instead of delivering the best care possible for patients. The matter of who is allowed to perform ultrasound is completely unregulated in all and several countries other professions use it with no experience or specialist knowledge and probably with less-than-ideal outcomes for patients.

Clinical audit: from EURATOM to the clinical environment

According to the literature, there is a severe lack of implementation of clinical audit, as described in the EURATOM treaty, in radiology departments in the majority of EU countries. In this session we will try to understand what is going on in Europe, looking at experiences in different countries with different models, and we will try to understand what kind of impact the implementation of these audit guidelines could bring to health systems. If you look at what should be controlled, assessed and evaluated in daily practice, it is all with the purpose of improving quality and patient security, and promoting a radiation protection culture. Clinical audit is not being implemented, it is important for radiographers to be aware of the concept in order to check in order to avoid errors.

Hot topics in magnetic resonance imaging

This is a very important topic, one of the most important topics being addressed in this session. The first will aim to help us gain a better understanding of what we mean when we talk about MR safety. The second will highlight how it is possible to do more with our MR systems and what radiographers can do to improve. The final talk is called Challenges and opportunities in paediatric MR and provides a very good example of the way that radiographers can work with other professionals and coregroups. There are a tremendous number of factors challenging radiographers on a daily basis, and how we can do that research and implement the results in daily practice. Continuous education and development is also very important in maintaining and improving the quality of care delivered to the patient. That is why we can provide plenty of examples in this session for people to take home. Hopefully use influence change on a national level.

Hybrid imaging technologies

What are the recent developments in hybrid imaging technologies, what are they used for, and most importantly, how should radiology education look at this technology? In this session we will examine the advances in nuclear medicine and radiology, in most countries they are combined. We have to look at this and see how it is possible to combine these two modalities, these two specialisation fields, and still guarantee the quality of the young graduates that we put into the market and the quality of the care delivered to the patient. It is difficult, but by the end of this session we would like to understand how radiology education should develop in the future regarding emerging technology.

Towards advancing and developing the role of radiographers

This Refresher Course aims to help attendees understand the situations in different countries and how they have affected the development of the profession, as well as their impact on health systems and healthcare delivery. The take-home message will be that a profession can only develop if its body of knowledge is defined and a strategy is put in place to develop that body of knowledge. This has to involve research and particularly evidence-based practice research, so we will try to understand how we can do that research and implement the results in daily practice. Continuous education and development is also very important in maintaining and improving the quality of care delivered to the patient. Hopefully use influence change on a national level.

Case-based learning in radiology

This is an important topic for radiographers because technology is improving so fast that we always need to know how to keep up. Whenever we use CT we are using a modality that in the last ten years has increased the number of procedures more than five fold. So the purpose of this session is for us to understand what kind of innovations are being made in dose optimisation; the possibilities of new equipment, new protocols, and the new ways of doing things that can help radiographers in daily practice to decrease dose not only in patients, but also in staff. It is always possible to do better with less, but there is not always a bridge between technological and daily practice. So we need to develop a team concept in order to translate new advances into the hospital, to achieve better optimised procedures to decrease dose in the patient.

Radiology Trainees Forum focuses on education and research

By Deniz Bulja, RTF Chairman

In 2012, the Radiology Trainees Forum (RTF), an organisation representing the interests of junior radiologists, focused its activities on education during its first year-long term to achieve a uniform level of radiological knowledge and skills for trainees across Europe. It was another successful year, with the RTF Board meeting in January and May, and September, in addition to the RTF Board Meeting and ECR, which took place in Porto during ECR 2012 in Porto.

Dr. Alexandra Hutchings from Portsmouth, UK, became a member of the newly established Undergraduate Education Subcommittee, who are actively interested in the RTF. Many radiology trainees involved in undergraduate education are also interested in improving it. For radiology trainees, especially members of the RTF, radiology is one of the most important things in life. By delivering quality education to undergraduates, trainees can express their enthusiasm for radiology and attract more students to radiology.

In her function as research officer of the RTF, Dr. Myraam Edjlalil-Goujon from Paris, France, has been our RTF committee manager, for which we would like to express our gratitude. In addition, the RTF made an effort to invite experienced lecturers. This year’s RTF Highlighted Lectures have already proved to be a big success in the past and will continue during ECR 2013.

During ECR 2013, the Rising Stars Lounge will again serve as a central meeting point for national RTF delegates and trainees. Meet & Greet Sessions will be held, where interested trainees will receive RTF Promo Kits, up-to-date information on RTF activities and useful information about ECR Sessions Suitable for Trainees. All these initiatives have already proved to be a big success in the past and will continue during ECR 2013.

The RTF Board has once again organised RTF Highlighted Lectures for ECR 2013, which the RTF regards as the best venue for radiology trainees to meet, discuss issues of importance for them and learn the latest trends of radiology, as well as the latest trends. Members of the RTF, as representatives of radiology trainees in their countries, identify a number of topics of interest, and the RTF Committee invites experienced lecturers. This year’s RTF Highlighted Lectures will be held on Thursday, March 7th, 10:30 – 12:00, addressing the following topics:

Emergency radiology manage ment in patients with polytrauma (U. Linsemann; Munich/DE) Imaging of non-traumatic intracranial haemorrhage (Z. Merhemic; Sarajevo/BH)

Case-based learning in radiology (P. Pokieser, Vienna/AT)

Dr. Viola H. Koen from Harleem, the Netherlands, and I will serve as moderators. As in previous years, the RTF Board has provided three radiology textbooks from well-known publishers for the book rafers that will take place during the RTF Highlighted Lectures. Also, the RTF Board has planned a special surprise for the Highlighted Lectures during ECR 2013.

The RTF Board has once again organised RTF Highlighted Lectures for ECR 2013, which the RTF regards as the best venue for radiol-
Albertina

The Albertina houses one of the world's largest and most precious graphic collections. Presently it contains almost 70,000 drawings and more than one million graphic prints from all of the significant art eras from the late Gothic period to the contemporary. The range of outstanding works spans from Leonardo, Michelangelo, Raphael, to Albrecht Dürer, Rembrandt and Rubens, and further to Lorrain, Delacroix, Manet and Cézanne. The Albertina is distinguished for its collections from the 20th century, including the works of Schiele, Klimt and Kokoschka, as well as Warhol, Rauschenberg and Baselitz. The photographic collection contains examples of scientific photography, studio photography, early colour photography and pictorial works. The architecture collection consists of almost 25,000 drafts, sketches and models. The core pieces are the architectural models by Otto Wagner, Le Corbusier, Mies van der Rohe and Alvar Aalto.

Special Exhibition: Max Ernst. A retrospective
January 23 – May 5, 2013

The Albertina will devote an exhibition – his first retrospective in Austria – to Max Ernst, the great pictorial inventor. Presenting a selection of 180 paintings, collages, and sculptures, as well as relevant examples of illustrated books and documents, the exhibition will assemble works and archival material documenting Beckmann, Kandinsky, and Warhol, introducing his life and œuvre discoveries, and techniques, thereby the exhibition will assemble works illustrated books and documents, © VBK, Vienna 2013 / K20 Kunstsammlung Nordrhein-Westfalen, Düsseldorf

Max Ernst, Au premier mot limpide, 1923
© VB, Vienna 2013 / K20 Kunstsammlung Nordrhein-Westfalen, Düsseldorf

“Before he descends, a diver never knows what he will bring back up.” (Max Ernst)

Max Ernst. La ville entière, 1935/36
© VB, Vienna 2013 / Kunsthalle Zürich

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ECR Today 2013
Arts & Culture
Thursday 7 March 2013
**What’s on today in Vienna?**

### Theatre & Dance

Please note that all performances are in German!

**Akademietheater**
1010 Vienna, Litudestraße 1  
Phone: +43 1 51444 4145  
www.burgtheater.at  
19:30 - Geschichten aus dem Wiener Wald by Ödön von Horváth

**Burgtheater**
1010 Vienna, Dr. Karl-Lueger-Ring 2  
Phone: +31 51444 4145  
www.burgtheater.at  
19:30 - Romeo und Julia by William Shakespeare

**Rabenhof**
1030 Vienna, Rabengasse 3  
Phone: +43 1 712 82 82  
www.rabenhof.at  
20:00 - Iba de giunt oamen Leit: Tragicomic electronic opera based on poems by the famous Viennese author Christine Nöstlinger

**Schauspielhaus**
1090 Vienna, Porzellangasse 19  
Phone: +43 1 317 01 01  
www.schauspielhaus.at  
20:00 - Der Gelbeige – Ein Familienmarmelde nach Molière by Peter Licht

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

**Theater in der Josefstadt**
1080 Vienna, Josefstadter Straße 26  
Phone: +43 1 7290 300  
www.josefstadt.org  
19:30 - Medea by Henrik Ibsen

**Volkstheater**
1070 Vienna, Neustiftgasse 1  
Phone: +43 1 52111 400  
www.volkstheater.at  
19:30 - Die Goldberg-Variationen by George Tabori

### Concerts & Sounds

**Musikverein (Classical Music)**
1010 Vienna, Bösendorferstrasse 12  
www.musikverein.at  
19:30 - Jewgenij Kissin, piano  
J. Haydn, L. van Beethoven, F. Schubert, F. Liszt

**Porgy & Bess (Jazz)**
1010 Vienna, Rieslingsgasse 11  
www.porgy.at  
20:30 - Céline Bonacina Trio (Fr)

**Arena (Alternative Music)**
1030 Vienna, Baumgasse 80  
www.arena.co.at  
19:45 - Steve Harris (UK)

**Gasometer (Alternative Music)**
BA-CA Halle Gasometer  
1110 Vienna, Guglgasse 8  
www.planet.tt  
20:00 - Mumford and Sons

### Opera & Musical Theatre

**Volksoper**
1090 Vienna, Währingerstraße 78  
www.volksoper.at  
19:00 - Carmen by Georges Bizet

**Wiener Staatsoper – Vienna State Opera**
1110 Vienna, Opernring 2  
www.wiener-staatsoper.at  
19:00 - Don Giovanni by Wolfgang Amadeus Mozart, conducted by Louis Langrée  
With Ildar Abdrazakov, Marina Rebeka, Toby Spence, Wenwenzi Geou, Eren Schrott

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

**Ronacher**
1010 Vienna, Selersätte 9  
www.musicalvienna.at  
19:30 - Natürlich Blond by Lawrence O’Keefe, Nell Benjamin & Heather Hach