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EUROPEAN HOSPITAL @ ECR 2015

SPECIAL ISSUE FOR THE EUROPEAN CONGRESS OF RADIOLOGY

VIENNA • AUSTRIA • 4-8 MARCH 2015

Future ESR President defines the goals

During an exclusive European Hospital interview, in the run up to ECR 2015, Professor Lluís Donoso-Bach MD PhD, incoming President of the European Society of Radiology (ESR), outlines his plans to tackle challenges facing radiology in Europe – and anticipates a brighter future in Spain

Lluís Donoso-Bach MD PhD is Director of Diagnostic Imaging at the Hospital Clinic of Barcelona. He is also the Executive Director of the UDIAT diagnostic centre at the health corporation Parc Taulí. In 1992 he became Chairman of the Radiology Department of the UDIAT Diagnostic Centre at the Corporació Sanitària Parc Taulí and, in 1998, was appointed its Executive Director. Among his numerous honors is the Gold Medal of the Spanish Society of Radiology and he has received honorary memberships of the Argentinean Society of Radiology, Mexican Federation of Radiology, Italian Society of Radiology, French Society of Radiology and the German Society of Radiology. He has also published over 90 articles, seven book chapters and has lectured across the globe.

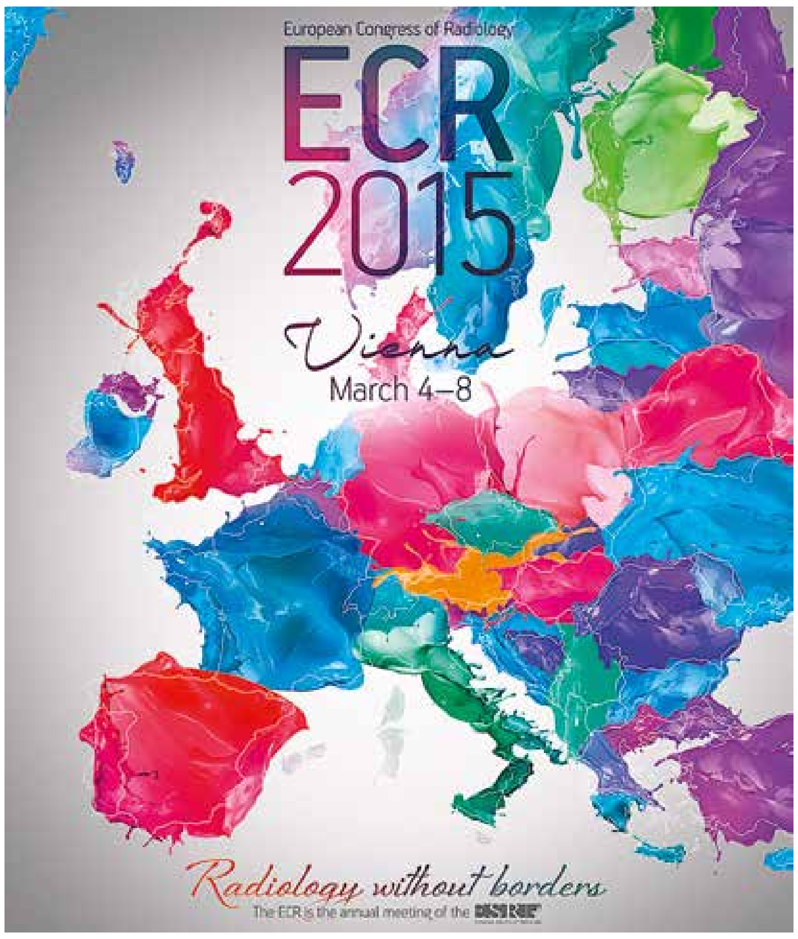
Interview: Mélisande Rouger

'Promoting education remains our core business,' Lluís Donoso-Bach confirms. 'We will open new learning centres in Bogotá and Vienna, and are planning a further one in Moscow. We will also launch the ESR e-learning Platform at ECR 2015 and try to offer an online examination for the European Diploma in Radiology.

'On the research front, we will continue our efforts concerning the quantification of data using biomarkers and biobanks, among others.

'We will soon launch ESR iGuide, a clinical decision support system for European imaging referral guidelines. We recently created a first level of standards on safety, and want to explore the possibility of performing quality control directly on the level of the department management. Meanwhile, we will continue to promote the EuroSafe Imaging campaign to raise awareness on radiation protection.

'We will also strengthen our lobbying actions with European institutions to influence EU legislation. We notably launched a Call for a European Action Plan for Medical Imaging last November, to highlight heterogeneities in Europe and promote harmonisation.'



What is the society's stance on teleradiology?

'Teleradiology should be a medical act that includes not only a report but also consultation with the patient, justification and control of the examination, and follow-up of the outcome. Out-sourcing can also do that, but the problem is that some companies only offer the report and for very low fees, which is what endangers the clinical part of our work.

'We have published many position papers and work tirelessly with the EU Commission and Directorates General in the European Parliament to defend our position, the problem is that we are not always heard.'

What upcoming IT solutions do you foresee in clinical practice?

'There is a very clear trend for cloud computing. Working in a cloud will revolutionise the way we do imaging. It will be split into image acquisition, analysis and processing. We will need structured reports, where we can automatically combine information coming from all these phases.

'The way we write reports will change, and we will move from a subjective approach to using standardised vocabulary based on quantified and processed data. Our reports will be interoperable between different clouds, and systems will emerge to help radiologists write their reports accordingly.

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From crafting Buddhist altars to creating space-age systems

Japanese firm celebrates 140 successful years

The son of a craftsman making Buddhist altars, he was driven to create instruments for physics and chemistry. Attending the Physics and Chemistry Research Institute he gained experience with a variety of technologies and fields of expertise. He was convinced that Japan, as a country with few natural resources, should work towards becoming a leader in science. At the dawn of the industrial revolution and scientific age in 1875 he founded his own business in Kiyamachi, Kyoto. His name was Genzo Shimadzu.

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Calculating a patient's attenuation correction

MRI-based AC may work better than CT-AC

Report: Sascha Keutel

PET/MRI scanners have great potential because they combine the strengths of two different systems. Previous problems resulting from respective, mutually exclusive physical effects of both procedures have been resolved. Now these scanners are being introduced to the hospital and assist in the detection of the position and spread of tumours as well as their metabolic activity, says Dr Harald H Quick, Professor for High-Field and Hybrid MRI Imaging at Duisburg-Essen University.

PET has high sensitivity. The system can locate and measure the very smallest amounts of radiotracers in tumours and metastases and it also makes it possible to quantify their activity. 'This is important because it allows us to classify and differentiate different tumours based on certain thresholds,' Professor Quick explains. 'PET also allows us to monitor a therapy after the initial diagnosis and start of treatment and shows how the activity of cell lesions develops over time and whether or not the treatment is having the desired effect.'

Whole body PET/MR image of a patient with metastases in the pelvic area: (A) PET without attenuation correction; (B) MRI-based attenuation correction; (C) PET after attenuation correction; (D) T-1-weighted MRI and (E) fused whole-body PET/MRI with fusion of (C) and (D)

To fully utilise PET strengths, attenuation correction (AC) is needed. This correction is carried out by software that, in turn, is based on a mathematical solution automatically implemented by the scanner. To make this work, you need to know exactly where in a patient's body photons attenuate in the tissue on their way to the PET detector, and then it becomes possible to calculate the AC and thus determine the correct tracer activity in the tumour.

To date, AC is still required for all PET/CT hybrid systems – however, with the advantage that the raw data of CT imaging can be directly utilised for the AC of the patient tissue. However, with PET/MRI, AC must be performed with new MRI-based procedures. At the centre of this development are the Dixon method sequences, currently experiencing a revival in the context of MRI-based attenuation correction procedures.

The procedure involves the attribution of different levels of attenuation to different types of tissue (air, fat, soft tissue, bone). 'We know topographically – similar to maps – which types of attenuating tissues are in which place.

'This can then be utilised in 3-D to work out the patient's attenuation correction,' he explains.

Although this works well, and is already integrated into clinical routine, room remains for improvement. With the help of comparative examinations, Prof. Quick and team are trying to determine how well MRI-based AC works compared to CT-AC. 'Bones attenuate the PET signal comparatively strongly. The attenuating components of bones are not very visible in the MRI image and therefore cannot be adequately corrected,' he explains.

This could change with the help of ultra-short TE pulse sequences (UTE), i.e. ultra-short echo time sequences. These facilitate the detection of cranial bones in the head and therefore improve the information on brain activity quantification. 'We have thus created the opportunity to add another dimension to the above mentioned maps,' Prof. Quick explains, significantly adding: 'If, in the future, we want to look at the Alzheimer tracer distribution in the brain, it will be important to account for the bones as such (and not soft tissue as is currently the case) so that we can determine activity more precisely.'

Technical pitfalls

Further technical obstacles that PET/MRI scanner manufacturers must overcome are the materials used. As is common in MRI imaging, RF receiver coils are used. These coils are within the field of the PET detector while the PET and MRI data are being acquired, and they attenuate the PET signals accordingly. Therefore, manufacturers should design the RF receiver coils in a way that makes them as PET-transparent as possible. This applies to the materials used, plus distribution and the design.

Manufacturers and researchers hope to integrate the motion correction in its entirety into the examination procedure. The PET/MRI data are currently acquired independently and simultaneously, but more or less side by side.

The objective is to utilise the technical opportunities of MRI imaging, to detect the patient's head, respiratory and heart movements and to correct the PET data helped by this information on movements – meaning to achieve a more precise image of the moving organs, tumours or smaller lesions.

HD-PET is another feature that will enhance the world of PET/MRI. High Density is set to improve the spatial resolution of PET, which tends to reduce towards the edge of the image field for technical reasons. This effect can be corrected with the help of a mathematical model (point spread function, PSF), which can restore the resolution within this border area. 'This,' Prof. Quick explains, 'helps to visualise the laterally situated, smaller lesions in the body better.'

From 2009-2014 Harald Quick was professor of MR imaging at the Institute for Medical Physics, University of Erlangen, where he was also Deputy Director of the Institute. In February 2014 he was appointed Professor for High Field and Hybrid MR Imaging as well as Director of the Erwin L Hahn Institute for MR Imaging, University of Duisburg-Essen. As well as conducting research at Duisburg-Essen Prof. Quick has been a research associate in the Department for Radiology at Zurich's University Hospital and at Johns Hopkins University in Baltimore, USA.

Future ESC Preside

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'A new world is emerging with IT; we've only seen the tip of the iceberg.'

How is the ESR tackling the challenge of training harmonisation?
'The ESR Training Curriculum promotes a five-year training plan. Up to now, 66 countries have endorsed it. ECR 2015 will be organised around the curriculum to stress its importance. However, we can only incite people to follow our recommendations – training remains a national decision.'

The new Spanish training scheme is at odds with these recommendations and raises concerns among radiologists…

'This scheme plans to fuse radiology and nuclear medicine during the first two years of training, leaving only two years of actual specialisation after that.

'In principle, I'm not against the idea of joining nuclear medicine and radiology; some countries do that; but we only have four years of specialisation and wish we had more time for clinical training.'

How short will training be now?
'Many things must be discussed before the scheme is implemented. For instance, not every department in Spain offers both radiology and nuclear medicine training.

Breast CT

3-D images of the entire breast from any orientation

The Koning Breast CT (KBCT) system, which has been granted FDA approval, provides 3-D breast images for diagnoses.

The technology ftp://5.10.164.234 can acquire hundreds of images in only ten seconds, producing true 3-D images to enable a fast procedure with excellent patient comfort, the manufacturer explains.

'Optional accessories for KBCT include a biopsy bracket to enable KBCT-guided biopsies of suspicious lesions, and a collimator, used to limit the X-ray beam to the area of interest. The biopsy bracket provides 3-D targeting at comparable or lower radiation exposure compared to stereotactic guided biopsy.'

A view like no other

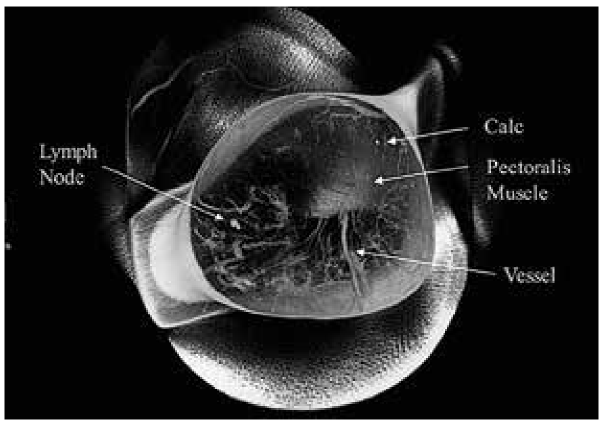
The breast CT images have less distortion than mammography and the system is optimised to differentiate between the breast's soft tissue and cancer tissue, Koning points out. 'These images will be very different from 2-D mammograms. They're truly 3-D images of the entire breast from any orientation. You can scroll through the slices (up and down, left and right) and get a unique view of the breast like never before.

'It gives doctors tremendous freedom in how they look at the interior of the breast and evaluate its structures. It's almost like seeing the anatomy itself.'

No breast compression

As Ruola Ning PhD, Koning's President and Founder, a pioneer and leading expert in Cone Beam CT Technology and sole inventor of cone beam breast CT technology, confirms: 'KBCT represents a revolutionary advancement in breast cancer diagnosis.'

This is the first commercially available 3-D breast CT scanner designed specifically to image the entire breast with a single scan, without compression of the breast tissue – which means this procedure is far more comfortable for patients than regular mammography. Additionally, Koning adds that there is less radiation exposure than during a CT exam of the entire chest, because here only the breast is exposed to X-rays.



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nt defines the goals

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'Besides, I believe we will have a five-year training scheme. Our hope lies with the national commission of the specialty, which is the official consulting agency of the ministry.'

Are you more pessimistic about the research situation?

'I don't like to exaggerate, but consequences of the financial crisis are dramatic. Budgets are low and grants have been reduced throughout Europe. There's an impact everywhere, not just on radiology.

'In Spain the fall was brutal. Salaries in the public system have been cut by 25% over the past three years. Many doctors have left the country.

'We have had less problems with shortage lately. Five years ago, a resident would have received five job offers; now he or she will receive only one. Many very well trained radiologists from Latin America have helped us fill the gap.

'Spain is not doing that badly in other areas, such as PACS. We are above the European average in terms of IT equipment; almost 90% of Spanish hospitals have a running PACS. The electronic patient record is well developed in most Spanish regions.

'Generally, the atmosphere is improving. We've started going up again, everybody can feel that.'

From hospital to multi-discipline group practice

Defining a role and routine differences

Before 2013, when Professor Dietmar Dinter became partner of Radiologie Schwetzingen, a multi-discipline group practice specialised in radiology and nuclear medicine, he was senior resident at the Institute of Clinical Radiology and Nuclear Medicine at University Hospital Mannheim (2003-2012) and head of its Nuclear Medicine Department (2009-2012). Was his work in nuclear medicine altered by the shift from hospital-based to practice-based patient care?

A medical graduate in 1995, **Dietmar Dinter** completed his radiology training in 2001 and nuclear medicine in 2009. After gaining his doctorate (1997) he focused his research on musculoskeletal and oncology imaging, with a special interest in combining morphology and functional imaging in functional MRI and PET-CT. After his habilitation (2009), in 2012 he became adjunct professor at the Institute of Clinical Radiology and Nuclear Medicine, University Hospital Mannheim, where he was also senior resident.
In 2013 the professor became a partner in Radiologie Schwetzingen, a multi-discipline group practice specialising in radiology and nuclear medicine.

Interview: Sascha Keutel

Surprisingly, when asked about key differences between work in a hospital nuclear medicine department and in private practice Professor Dietmar Dinter observed that he had more time for each patient when he was a hospital radiologist.

'In the practice there is a certain economic pressure and everything is tightly organised,' he explained. 'Another big difference is staff composition. While we have only fully certified specialist physicians in our practice, in a hospital teaching plays a major role – particularly in larger teaching hospitals you have many examinations in which one or two junior physicians are supervised. That takes time. 'In a practice you gain experience more quickly due to the larger patient throughput, but you also have to arrive at the – hopefully correct – diagnostic decision more quickly.'

Do the range of exams and therapies differ?

'In Germany, radioiodine therapy is pretty much limited to hospitals, since it cannot be properly performed in private practice because German radiation protection laws require in-patient facilities – the patient has to spend at least 48 hours in a "bunker", an entirely separate area. Most practice-based physicians do not have access to such facilities.

'There are also differences in terms of technology. Very few practices have a PET-CT, for example. That limits the range of exams compared to an emergency/out-patient facility or a hospital. Currently in Germany more than 100 PET-CT systems are installed in hospitals – most of these are operated at a loss due to the low reimbursement rates offered by statutory health insurers. 'In some cases, hospitals cannot recover the costs of PET-CT; indeed they sometimes have to negotiate the number of exams they can perform with the health insurers. That's impossible in private practice. The health insurers' reimbursement parameters for PET-CT exams are clearly defined and adhered to. Lung cancer, for example, is usually imaged with PET-CT and the insurers reimburse. 'However, the Federal Joint Committee, the relevant non-government body, decided that the costs will only reimbursed if the exam is performed in a certified lung cancer centre with the cooperation of surgeons, oncologists and radiotherapists. Thus a number of clinical specialists are needed, such as thoracic surgeons, and tumour boards must be established to discuss the case. In a practice this is close to impossible, unless you negotiate many cooperation agreements with hospitals, which then send the patients to your practice.'

Do you face many other issues that were never contemplated when working in the hospital?

'Yes, exactly: I learn a lot with all the new and different cases. The two-pronged approach in Germany with a practice-based and a hospital-based segment creates a multitude of referral, exam and treatment paths. Most patients in practices are referred there by other office-based physicians whilst, in a hospital, you mostly see in-patients – unless the hospital has an out-patient department and thus treats in- as well as out-patients.'

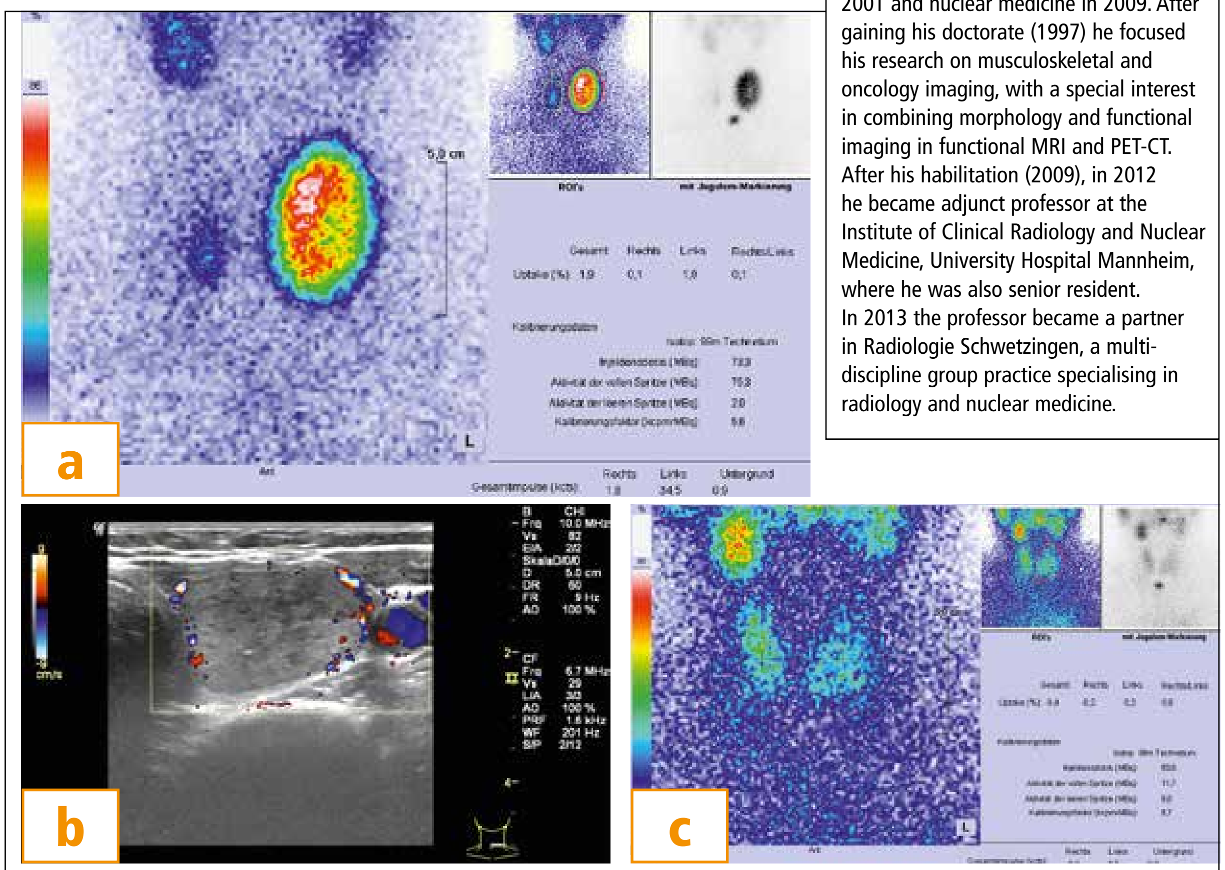
Are there turf wars between hospital radiologist and those in practices?

'There are patients, particularly those who need a bone scintigraphy, who are imaged in hospital although it would be better if they were referred to a practice: practices can often offer appointments much quicker and are closer to the patients' place of residence, so patients can be treated in a familiar environment. But there are colleagues in emergency and out-patient departments who prefer having the exams performed entirely by the in-house team.'

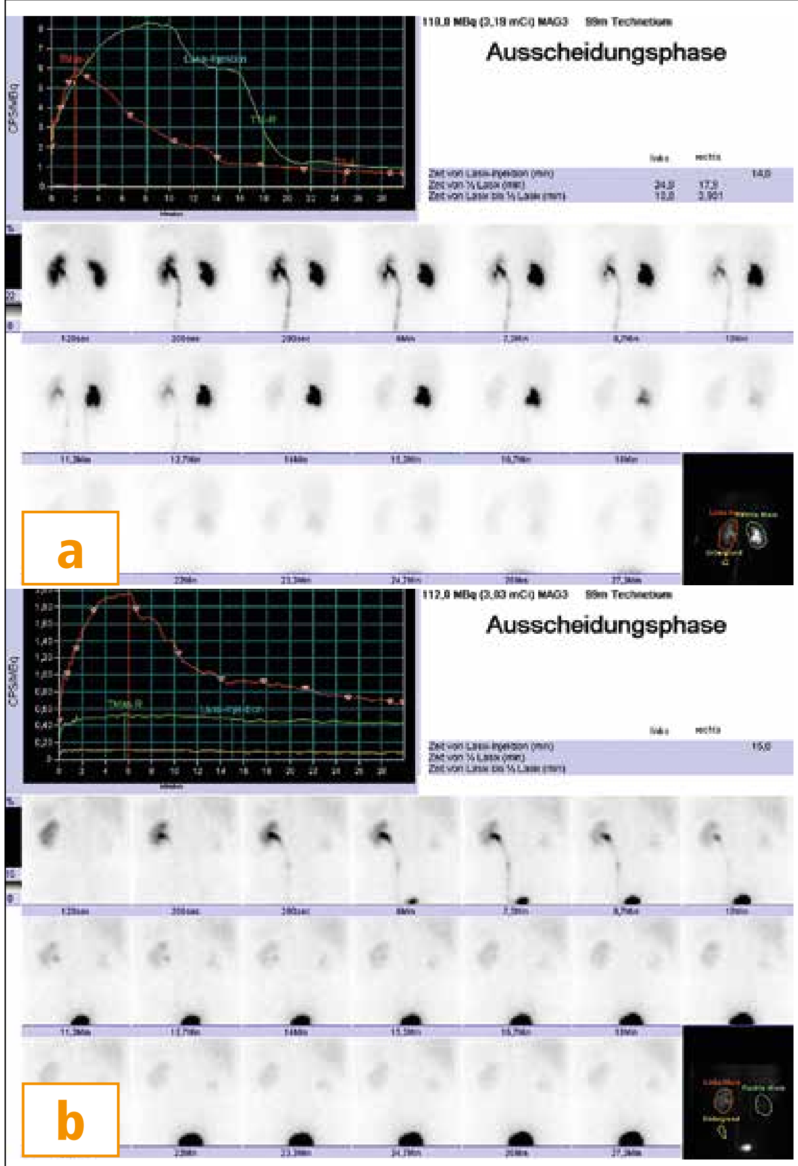
Do you prefer working in hospital or in a practice?

'That's a difficult question because there are advantages and drawbacks to both. I'd like to have more time for our patients because, as a physician, one of the main reasons to work in a practice is patient contact, particularly in diagnostic radiology. As senior resident in a hospital you often only interpret MRI or CT images without ever having seen the patient, but in a practice many exams are scheduled per physician, so you have three to six minutes to talk to a patient. This is just not enough time to communicate a diagnosis that might change the patient's life.

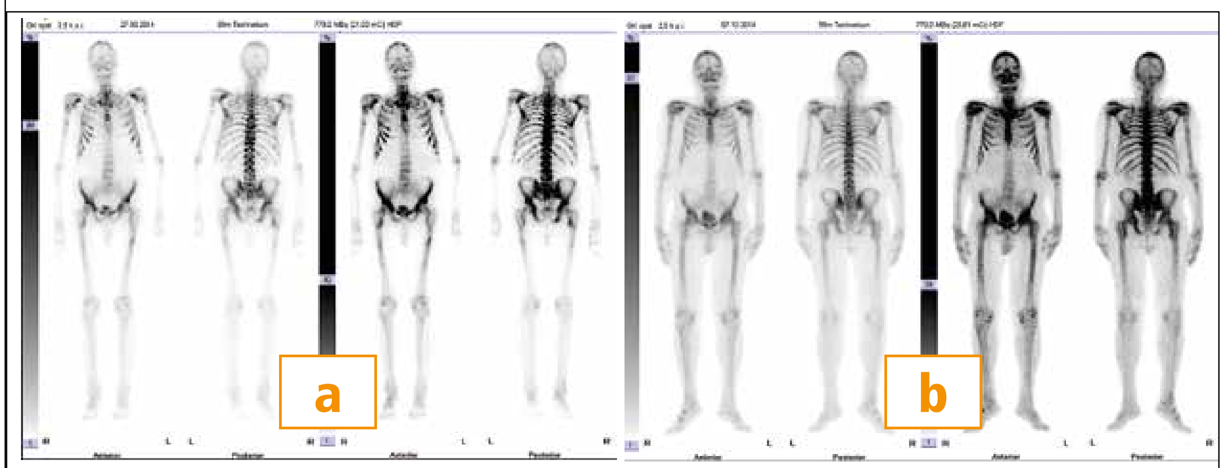
However, you do get used to the advantages of a practice very quickly and take them for granted: no overtime, no weekend duty, better pay.



Autonomous thyroid adenoma pre-therapy (a), (b) and post-therapy (c).
Thyroid scintigraphy shows (a) pathological radionuclide uptake in the left lobe with suppression of the paranodular tissue and pathological uptake; these are typical features of a decompensated autonomous adenoma. Colour-duplex sonography (b) shows a typical nodule with increased vascularisation at the edges, mixed echogenic, largely isoechoic. 12 months after radioiodine therapy with 1500 MBq J131 adenoma function was eliminated; uptake was identical on both sides; TSH-equivalent.



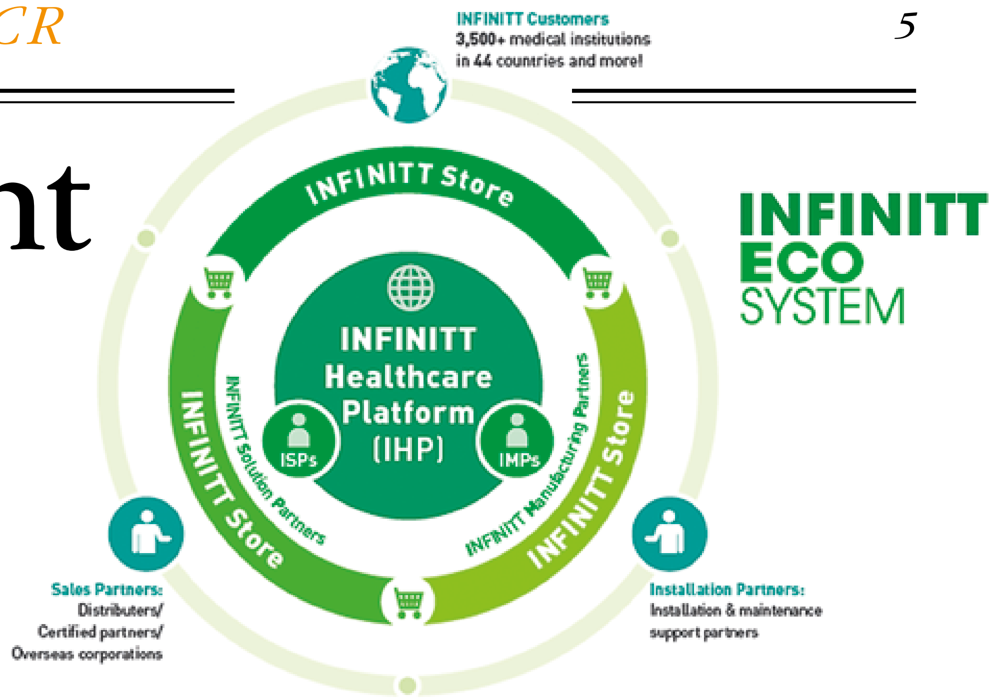
Sequence scintigraphy of the kidney (99mTc MAG3) in a patient with hydronephrosis (a) and a patient with reduced kidney function (b). Sequence scintigraphy of the kidney (a) in a female patient with, which is usually successfully treated with furosemide. (b) Patient with incidentally detected right kidney atrophy shows a horizontal curve after normal perfusion, no response to furosemide therapy – this indicates isosthenuria with reduced specific gravity. In both patients, the left kidney (red curve) is normal in function and excretion.



Diffuse osseous metastasis of a prostate carcinoma pre-therapy (a) and post-therapy (b); regimen consisted of six cycles of Radium 223 (Xofigo). Pre-therapy bone scintigraphy (99mTc HDP) shows disseminated bone metastases, inter alia calvaria, all ribs and along the entire spine, less pronounced in the kidney, indicating a 'Super Scan'. After six therapy cycles over the course of six months with the highly selective osteotropic alpha radiation emitting Radium-223, the follow-up after one month showed reduced diffuse uptake in the bones and a reduced 'spotty' uptake pattern. Ubiquitous pain was also significantly reduced.

Data management

All on one platform: archiving, advice, information, purchasing and selling



The Infinitt Eco system brings together manufacturers, partners and customers via a single platform. The portal to the system is the Infinitt Store, which provides users with a comprehensive insight into the product range on offer, and enables quick inquiries to be made.

Customers and partners can also promote and advertise their own products, increasing the value of the Infinitt Healthcare Platform.

The Infinitt Healthcare Platform (IHP) is the firm's central, vendor-neutral archiving storage system, which allows management and distribution of DICOM and non-DICOM data, the company explains, adding that users can choose which viewer to use to access their images, a flexibility that enables seamless workflow in daily routine. 'The Infinitt Healthcare Platform is more than just a VNA, it is unique.'

Infinitt Solution Partners (ISP) offers integrated software technology and support to Infinitt, while Infinitt Manufacturing Partners (IMP) provides hardware through the platform.

The organisation points out that its solution experts and the manufacturers, distributors as well as overseas corporations play a very important role in reaching customers and markets worldwide.

Radiation therapy

During radiation therapy a patient's situation changes often: bodyweight decreases, causing tumour shrinkage or a changed shape. Consequently, the radiation dose distribution dose set when therapy began is no longer optimal. At worst, radiation can no longer fully hit the tumour, causing part of the radiation to reach and damage healthy tissue. The Fraunhofer Institute for Medical Image Computing MEVIS is developing software to optimise radiation therapy.

The software developed in the SPARTA project (Software Platform for Adaptive Multimodal Radio and Particle Therapy with Autarkic Extendibility) aims to accelerate this process, thus offering cheaper therapy progress.

The Institute has reported that it has contributed a fast, accurate method of transferring the original planning situation to the current patient condition.

To adjust the radiation optimally, doctors must compare the original planning images with the most recent control images. 'Often, the doctor must view old and new images and compare them mentally,' explains MEVIS researcher Stefan Wirtz. 'However, our software can align both of them in a single image and transfer the contours of the radiation area.'

Consequently doctors can quickly recognise whether the original contours still apply to the current situation. If not, the contours can easily be adjusted with the software tools, Fraunhofer explains. 'Until now, replanning radiation therapy could take several hours,' says Stefan Krass, a Wirtz colleague. 'Our software can accelerate the process considerably.'

Xenon aids exposure of previously unseen structures

Xe-MRI advances body exploration

Clinical routine would be inconceivable without Magnetic Resonance Imaging. Without exposure to radiation, doctors can make a patient's organs and tissue structures clearly visible. However, pathological changes in the early stages, degenerated cells or small areas of inflammation, have so far remained almost invisible on these images. In 2014, for the first time, a team of cell biologists, chemists and physicists working with Dr Leif Schröder, Head of the ERC-Project on Biosensor Imaging at the Leibniz-Institute for Molecular Pharmacology (FMP) in Berlin-Buch, succeeded in generating 'two-colour' images for different molecular markers with the help of Xenon-MRI.

Report: Sascha Keutel

Xenon-MRI (Xe MRI) was developed in the mid-1990s to facilitate diagnostic imaging of the lung. Unlike conventional MRI it does not detect water molecules but instead the non-poisonous, noble gas Xenon. The system then directly visualises the ventilated lung areas. For new kinds of imaging, first a contrast medium is administered, which binds specifically to the marker and accumulates in the diseased tissue. Then Xenon is administered, either via inhalation of a mixture of gases containing Xenon, or dissolved in substances such as blood plasma. Advantage: These directly injectable substances can be available in the blood stream immediately.

The FMP scientists aim to bind Xenon gas combined with biosensors, like a contrast medium, to go precisely to disease-specific markers in the tissue. 'We very recently published the results of a first study where we could bind Xenon biosensors to certain glucose structures on the cell surface. These play a certain role in tumours and cannot be visualised with other MRI contrast media. This was proof that the technology has made structures visible for the first time that were previously inaccessible via MRI,' Schröder reports.

The scientists also succeeded in marking different cell types so that they send out radio waves on different frequencies. In the same way as with a light microscope they generate images where some cells glow in red, others green. The researchers used a concept from the world of laser physics where the Xenon signal is amplified about 10,000 times – the gas is 'hyperpolarised'. In the test object itself they then rescind this situation in a controlled manner through a co-action between the biosensor and the MRI exposure sequence.

This results in a further amplification, with an order of magnitude of around three, and allows the detection of relatively small amounts of the specific marker. In the first step, biosensors without Xenon are administered that selectively bind to diseased cells or, respectively, are washed out in other locations. Once the Xenon has dissolved in the nutrient solution for the cells – or later in the patient's bloodstream – the bound sensors become visible and show the sites of pathological changes. Then the Xenon is detected; in the MRI it 'gives itself away' through a certain resonance frequency in the sensors. The images are then superimposed with conventional MRI images to obtain anatomical as well as biochemical information (such as in the PET/MRI hybrid procedure).

Medical physicist **Leif Schröder** has led the Molecular Imaging research group at Leibniz Institute for Molecular Pharmacology (FMP) in Berlin since 2009. Their focus is on the development of Xenon biosensors that highly increase the significance of magnetic resonance imaging (MRI). Schröder gained an initial five-year grant from the European Research Council to explore the potential of these novel contrast agents. Among the physicist's many awards are the Emmy-Noether research fellowship and the Philips Research Prize for medical physics.

Xe MRI has various fields of application

With the help of Xe MRI the researchers aim to significantly expand the range of applications for MRI. They are convinced that,

Faster than light

Cerenkov luminescence merges optical imaging with nuclear medicine in a novel modality

Report: John Brosky

PET scanners are not the only way to image radiotracers. Recent work developed around a phenomenon called Cerenkov luminescence aims to bring a new modality out of pre-clinical development and into clinical practice.

First noted by Marie Curie, it was Soviet physicists who first described the strange blue light that occurred when charged particles travelled through water. Among the Russian group was Pavel Alekseyevich Cerenkov, who shared a Nobel Prize in 1958 for this work.

Long applied in nuclear physics, the Cerenkov effect is now being developed for use in nuclear medicine and biomedical imaging.

At the ECR, on Saturday, Jan Grimm MD PhD presents the lecture 'Cerenkov: Faster Than The Speed Of Light', offering a review of this new method that promises new ways to image radiotracers and describing advances in both technological developments and clinical studies.

'Optical imaging with radiotracers is one of the very few new and novel modalities described in recent years,' said Grimm, who is an Assistant Professor at Memorial Sloan Kettering Cancer Center and Cornell University, New York. He is a Laboratory Head and also Assistant Attending Radiologist in the Radiology and Nuclear Medicine group at Memorial hospital.

'By combining optical light and radioactivity, we are merging the two fields of optical imaging and nuclear medicine, which creates a whole range of new opportunities with possibly huge advantages for patient care. This is totally new, and can be brought relatively quickly into the clinic because the tracers are all available. We just have to figure out the right clinical setting.'

In conventional optical imaging a light is projected onto the area of study to excite an injected fluorochrome. The more external light, the stronger the obtained signal – but also the scatter and reflectance of the external excitation light, degrading the sought after signal. With Cerenkov luminescence imaging the light emanates from the radiotracer within the body. It is an ultra low signal that requires total darkness and very sensitive cameras to be detected.

'We calculate this light is one billion times weaker than ambient light in an operating room, Grimm explained. 'To image Cerenkov light means shielding it from this billion-times stronger light, otherwise it would be like trying to see a candle held up against the sun.

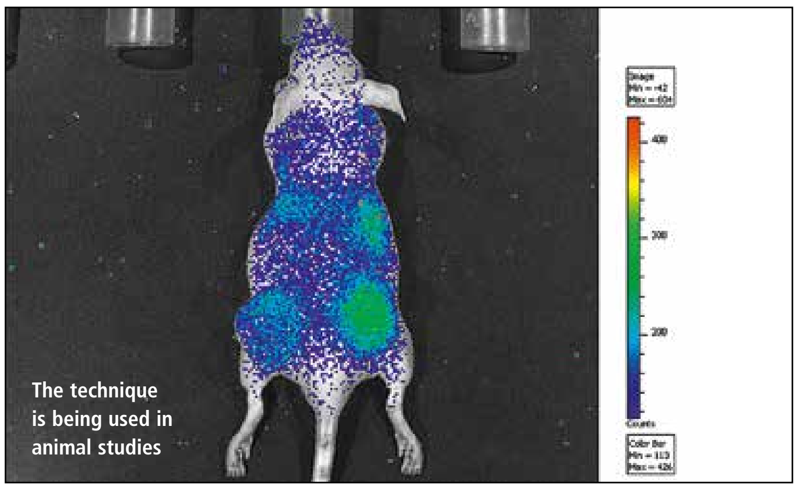
'We have shown that we can do this even in the clinical setting. This provides us with two types of information coming from one source – the radioactive agent. We, and other groups, are now working to create specific agents that make use of the Cerenkov light and some very unique features that allow us to do some very neat tricks'.

One advantage is better quantification of the light, he said.

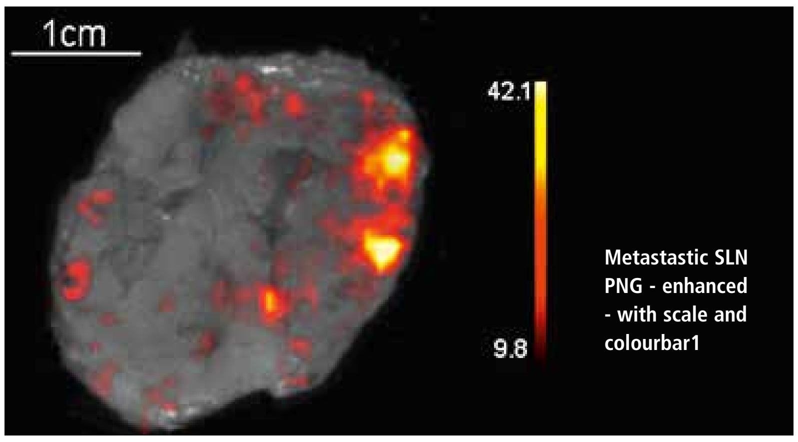
'There are all sorts of light propagation models for radiotracers, but with Cerenkov light we can absolutely measure the radioactivity and then calculate how much light is being generated. We can determine the difference between the light actually generated and the light arriving at the detector, which allows us to calculate an absorption factor for light. Or, as we demonstrated, we can use the light and modulate it to create radiotracer-based sensors, switching Cerenkov on or off with smart tracers to provide additional information one cannot get with just radioactivity alone.'

Another advantage of Cerenkov luminescence imaging is the cost of the camera, which is 25% of the cost of a PET scanner. Additionally, in pre-clinical animal studies, where usually only one mouse can be imaged at a time with PET, Grimm pointed out, 'we can image five mice at the same time and it takes about five minutes.'

The ability to capture Cerenkov luminescence remains the great challenge. Going inside the patient during endoscopic procedures shows promise because the human body serves as a natural shield for the faint blue light.



The technique is being used in animal studies



Metastastic SLN PNG - enhanced - with scale and colourbar1 in the future, the refined procedure will facilitate more precise diagnosis because the stronger signals can visualise structures not previously detectable in the MRI. 'As a non-invasive procedure with excellent soft tissue contrast and no radiation exposure the only entity missing is the molecular specificity to turn MRI into the ideal procedure,' the medical physicist believes.

The method is also very important for the development of active ingredients. He hopes it will help to reduce the number of animal experiments required and to assess the effectiveness of new active ingredients quickly.

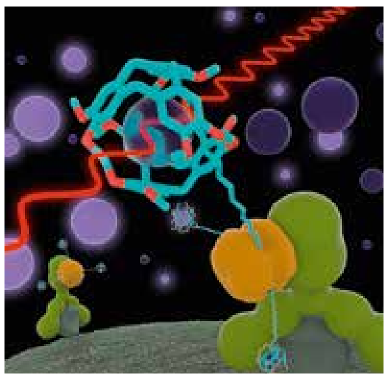
Although the team's current research focuses on oncology diagnostics Xe MRI is not limited to any particular type of disease. 'Everything that has an identifiable molecular marker can, in principle and at sufficient concentrations, be detected with biosensors.

'Currently the detection limit is in the nanomolar range, making these markers around 1,000 times more sensitive than conventional MRI contrast media.

'We have developed sensors for inflammatory processes and for certain receptors on the surface of cancer cells, but we can build on this in a very flexible way,' the physicist points out.

Whether or not Xenon-MRI will become established in clinical routine is currently difficult to assess. The first trials on animal models are planned for this year, but Schröder cautions: 'It's likely to take several years before the procedure can be used in clinical routine. However, patients will also benefit indirectly from the use on animal models, which is expected to begin much sooner, through the improved development of new active ingredients and treatments.'

Physicist Leif Schröder preparing a rubidium sample under protection atmosphere for the laser setup to generate hyperpolarised xenon for novel MRI applications.
Image: Monique Wüstenhagen, Berlin Partner GmbH



The specific detection of cell surface proteins by xenon MRI. The image illustrates the use of hyperpolarised xenon gas (purple) combined with xenon cryptophane cages (pale blue), which are attached to cells via antibodies. During the MRI experiment a unique radio frequency pulse (red) is used to selectively image and 'light up' the surface of macrophage cells.

Image: ©Barth-Jan van Rossum (Leibniz-Institut für Molekulare Pharmakologie, Berlin).

Jan Grimm MD PhD, Assistant Professor at Memorial Sloan Kettering Cancer Center and Cornell University, New York

Yet, this presents a new challenge because the aperture for endoscopic cameras is small for the long and narrow instruments, exactly the opposite of the ideal setting for imaging Cerenkov luminescence emanating from a radiotracer.

In addition to an on-going clinical trial at Memorial Sloan Kettering Cancer Center to explore Cerenkov light in patients, 30 patients are currently being enrolled at the Guy's and St Thomas' NHS Trust in the United Kingdom for a pilot study to evaluate Cerenkov luminescence imaging using an analyser developed by Lightpoint Medical Limited for the ex-vivo measurement of surgical margin status in breast cancer surgical specimens and the metastatic status of excised lymph nodes.

Another 30 patients are being enrolled at University College Hospital London for a prospective, single-centre feasibility study testing the feasibility of 18F-choline Cerenkov luminescence imaging to measure margin status in radical prostatectomy specimens.

Research at Memorial Sloan Kettering, supported by two the United States National Institute of Health and in collaboration with Lightpoint, aims to bring Cerenkov luminescence imaging over the next five years from testing in animals to patients, '…and then,' Dr Grimm predicts, 'all the way up to an open surgery procedure.'

New 3-D system quickens black-blood sequencing

Seeking time-efficiency and high contrast

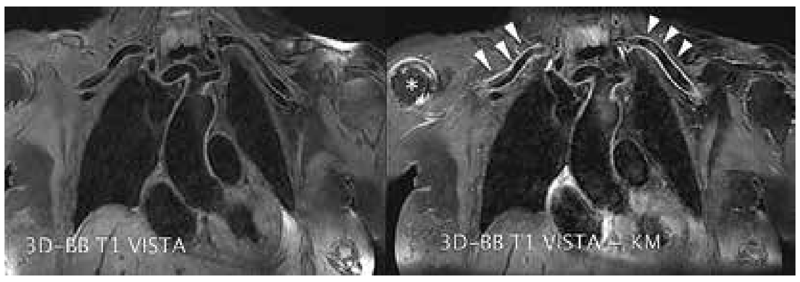
Report: Sascha Keutel

Black Blood Imaging may not sound helpful – but it is. The MRI specialist can work with clearer contrasts and gain greater certainty in tumour diagnosis as well as the detection of inflammatory changes in tissue.

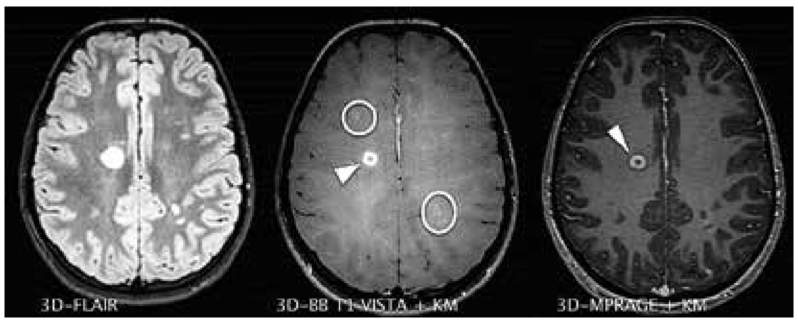
MRI procedures can be divided into those that show blood flow as bright (bright blood) and those that show it as dark (black blood). Although the latter method has numerous advantages compared to conventional imaging it is not yet used in clinical routine, according to Dr Tobias Saam, Head of Magnetic Resonance Imaging at the Inner City branch of the Institute for Clinical Radiology at the Ludwig-Maximilian University Munich.

Black-blood sequences primarily visualise the actual walls of the blood vessels rather than blood flow. These sequences are routinely used for cardiac imaging and to identify artery dissections. However, they have great potential in imaging atherosclerotic plaques and inflammatory changes in the vascular walls.

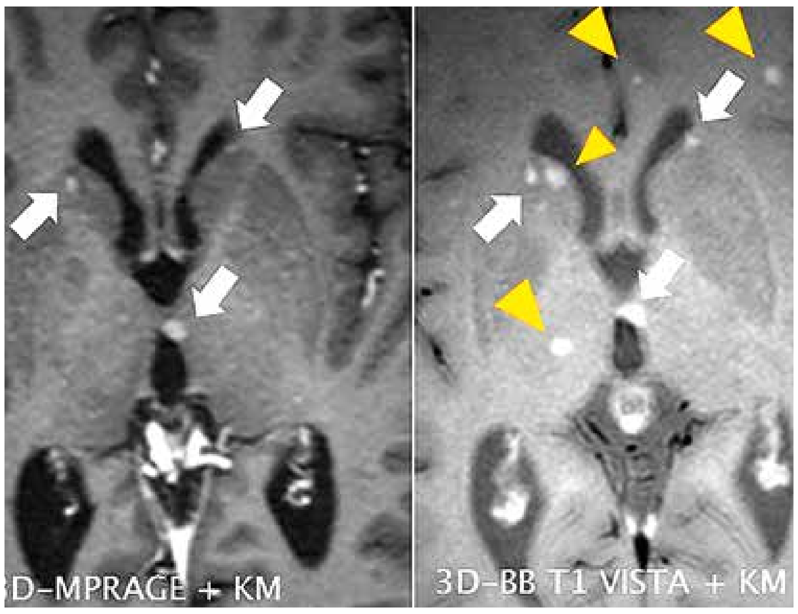
Up to recent years, black-blood sequences could only be shown in 2-D, and running these was very complex. 'It used to take us up to 40-50 seconds to visualise a section of the intracranial vessels of 2mm thickness. It took five to six minutes to acquire a small number of images. A new 3-D procedure, which we developed along with Philips Healthcare, now makes it possible to acquire images of the entire head, and with even better resolution, within the same space of time, so the procedure is now much more time efficient,' Dr Saam explains.



72-year-old patient with polymyalgia rheumatica and known giant-cell arteritis. Activity? A black-blood examination of the thorax clearly shows the vascular walls of the aorta as well as the supra-aortic vessels. After contrast medium administration there is clear evidence of contrast medium absorption along both subclavian arteries (arrowed). Synovitis in the right shoulder joint (right image*) is a secondary finding.



15-year-old patient with disseminated encephalomyelitis. MRI head scan of a 15-year-old patient with known Encephalomyelitis disseminata, or multiple sclerosis. The contrast medium enhanced image of the large lesion is shown both in the standard 3-D-MPRAGE sequence as well as a 3-D-Black-Blood Sequence (arrowed), although several of the white matter lesions detected in the FLAIR sequence show contrast medium absorption in the black-blood sequence that cannot be detected in the conventional sequence (circles). The existence of contrast medium absorption in these lesions shows the degree of disease activity and directly affects the patient's clinical management.



Head MRI of patient with known small-cell bronchial carcinoma. The white arrows point towards three contrast-medium absorbing metastases, which are visible both in the 3-D-MPRAGE sequence as well as the 3-D black-blood sequence. The arrows point towards four additional lesions that can only be visualised in the 3-D black-blood sequence. A study carried out by our working group (Kammer N et al, RSNA 2014) demonstrated that the black-blood sequence detects considerably more metastases than the 3-D-MPRAGE sequence.

The procedure visualises significantly higher number of masses

The new 3-D Black-Blood T1-TSE Sequence does not require pre-pulse for blood suppression and is therefore particularly time-efficient. In a first study on intracranial tumour imaging Saam's team showed that the new procedure visualises a significantly higher number of masses compared to conventional sequences. 'This new 3-D black-blood one Tesla sequence with variable flip angles allows us to detect more metastases than with 3-D gradient echo sequences that are normally used for tumour detection. The difference is significant. The procedure also has fewer flow artefacts than 2D-TSE sequences,' Saam explains. 'This is of clinical relevance because the earlier we can detect metastases or lesions the better we can treat them.'

A further effect of the new sequence: With conventionally used gradient sequences blood and lesions appear bright. The black-blood sequence shows masses/lesions brightly, but not the blood, which is shown as dark. 'This makes it easier to detect lesions, as there is less distraction from bright blood vessels,' he adds.

Tobias Saam studied medicine at Heidelberg University where he also gained a doctorate in 2003. In July 2010 he wrote his habilitation on 'Methodical Development and Clinical Evaluation of High Resolution MRI of Atherosclerotic Plaques in the Carotid Arteries'. Since 2006, Dr Saam has worked at the Institute for Clinical Radiology at the Ludwig Maximilian University (LMU) in Munich and has headed Magnetic Resonance Imaging since 2013. His numerous honours for work on MRI use to detect atherosclerotic plaques include the Coolidge Award.

Advantages for the visualisation of vascular walls

Vasculitis is a comparatively rare disease often with unspecific clinical symptoms; its early detection poses a particular challenge for all clinicians. Vasculitides are primarily based on changes in the vascular walls. Diagnostic difficulty increases because any luminal changes detected are usually unspecific and they can also manifest as a result of other diseases. Therefore, the validity of conventional imaging procedures is often limited.

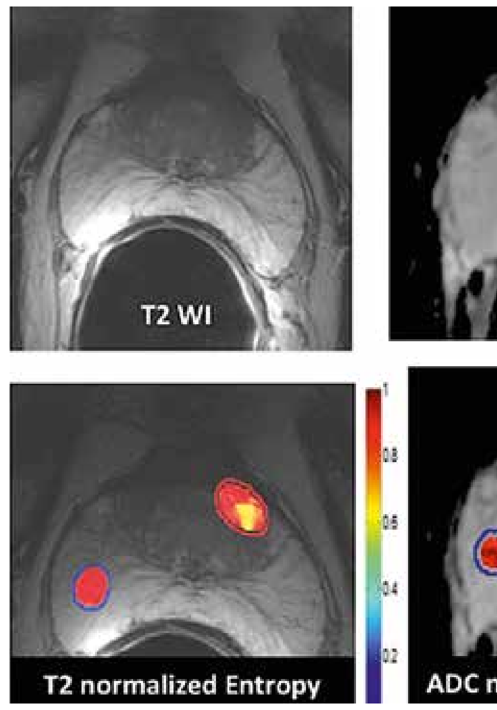
So far, the gold standard for imaging large vessel vasculitis has been PET-CT. However, Saam sees considerable advantages in the new procedure. 'Black-blood technology enables us to directly visualise the vascular wall, to it's possible to detect - at an early stage and with the help of contrast media - thickening of the walls, which can be evidence of atherosclerosis or inflammation of the vascular walls. Therefore we can use the procedure for direct imaging of inflammatory changes of intracranial as well as extracranial arteries.'

Black-blood imaging can reveal central nervous system (CNS) vasculitis

The specialist cites central nervous (CNS) system vasculitis as an example: 'We cannot visualise this with other imaging procedures. In this case, black-blood imaging is the only procedure that makes this possible. This capability has recently caused a lot of interest amongst neurologists,' Saam points out. 'Although this still has to be evaluated in larger studies, the procedure definitely has potential.

'We are already having patients referred to us whose doctors are excited about it.'

Precisio



Professor Hedvig Hricak MD PhD, Chair of the Department of Radiology at the Memorial Sloan-Kettering Cancer Centre, New York, and Professor of Radiology at Cornell University, Ithaca, New York, is a notable expert on cross-sectional anatomic and molecular imaging, particularly of gynaecologic and prostate cancers. *John Brosky* interviewed her about the potential and impact of more precise viewing of inter- and intra-tumoral heterogeneity

Precision medicine in oncology offers tremendous potential and challenges. Are there obstacles?

'Probably one of the greatest challenges to the implementation of precision medicine in oncology is the tremendous inter- and intra-tumoral genetic heterogeneity. The notions of inter- and intra-tumour heterogeneity have been recognised for many years, but recent advances in sequencing technology are allowing the true extent of both forms of heterogeneity to be revealed in detail.

'Furthermore, sequential analysis of tumours has also revealed that intra-tumour heterogeneity temporally evolves during the disease course, which enables development of tumour resistance to therapies. Imaging has a tremendous potential to play in addressing this challenge, as it is the only tool that can examine biological heterogeneity both within an entire tumour and across multiple tumour deposits in the body, in vivo.

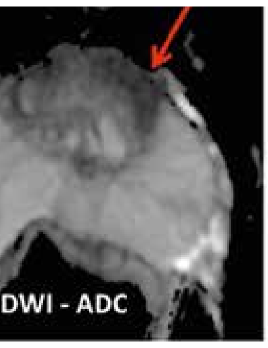
'However, wide-spread use of imaging for this purpose will require tremendous further research, test-validation further combine with overcoming regulatory hurdles to tracer development and approval, educating current and future radiologists to have a deeper understanding of molecular biology, and implementing bioinformatics on a much larger scale.'

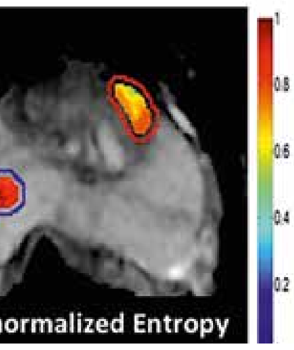
You have said MRI has extensive untapped potential to contribute to molecularly-based precision medicine. Where is this being realised?

'I'd like to point out that my comments are limited to the abdominal and pelvic MR – as those are the areas of my expertise. Functional MRI techniques, such as dynamic contrast-enhanced (DCE) and diffusion-weighted (DW) MRI, are already providing prognostic, predictive, and early-response biomarkers that can be used to help determine the need for treatment, pre-

Advancing sequencing technology

on medicine in oncology





Texture analysis: Compared to T2WI & DWI there is further improvement in PCa detection, visualisation of tumor heterogeneity and tumour characterisation

dict treatment response and assess the effectiveness of treatment early on. However, many of these biomarkers still need to be validated in multicentre prospective studies.

'In the future, the new discipline of 'radiomics' promises to dramatically expand the number of imaging biomarkers we can derive from MRI. With radiomics analyses, a large number of features quantifying tumour signal intensity, texture and shape, as well as functional parameters and clusters of multiparametric data, can be extracted from MR images and correlated with treatment outcome data.

Furthermore, in an approach called 'radiogenomics', such features can be correlated with omic data, including specific gene clusters.

'By providing spatially and temporally specific information about tumour biology, radiomics and radiogenomics will enable radiologists to recommend where to biopsy, make predictions about tumour aggressiveness in areas where biopsy is not feasible, and improve treatment selection and planning as well as assessment of treatment response. As discussed (see below), hyperpolarised MRSI is another MRI technique with great potential to contribute to precision medicine.'

Hyperpolarised MR spectroscopic imaging may revolutionise the way MRI is used in cancer care. What does this revolution look like?

'Hyperpolarised MR spectroscopic imaging (HP-MRSI) is a new technology that increases the MR signal 10,000–100,000-fold, and therefore enables MR imaging of nuclei other than 1H with great speed and sensitivity. Imaging after injection of a hyperpolarised agent, such as 13C-pyruvate, allows visualisation of the distribution of the agent itself as well as its downstream enzymatic products.

'By allowing precise identification of aberrant molecular processes, HP-MRSI should enable better treatment selection and earlier assessment of treatment response.'

How do you see these advanced MRI techniques being translated into clinical routine for greater precision in medicine?

'Importantly, HP-MRSI allows short imaging times (seconds to minutes) that can be added to existing protocols without significantly affecting workflow, and injected HP-MRSI agents are naturally occurring substances with no inherent toxicity, making them safe for use in patients. Because of these practical characteristics, HP-MRSI could easily be incorporated into routine MRI examinations that include other sequences, such as T-2-weighted imaging, DCE-MRI or DW-MRI.

'When these capabilities are also combined with an overlay of augmented information from radiomics and radiogenomics, MRI may become an extremely powerful tool for increasing precision in all areas of cancer care, from diagnosis to treatment selection and planning, treatment monitoring and follow up.

'Of note, machine learning, construction of radiomics algorithms and automated pattern recognition should make it possible to develop augmented programmes and therefore disseminate and introduce the added value of radiomics/radiogenomics in clinical practice, thus improving accuracy in oncologic imaging among radiologists who do not sub-specialise in the field.

'Getting to that point will need a great deal of teamwork and much greater integration of advanced biomedical informatics in clinical settings.'

Professor Hedvig Hricak MD PhD, Department of Radiology, Memorial Sloan-Kettering Cancer Center. New York and Cornell University, Ithaca, New York

Harmonising European imaging

Could the dream ever come true?

Boris Brkljačić, professor of radiology at the Medical School University of Zagreb, Croatia

Report: Mélisande Rouger

Every European knows how differences can boost cultural diversity and open unexpected perspectives – but, when it comes to having a homogeneous standard of care, they can become an absolute nightmare.

Disparities impede this vision from becoming reality also in radiology, which is confronted with heterogeneities in many areas. As initiating changes takes time on the EU level, radiologists are aiming to speed things up. At this year's ECR experts are gathering at a dedicated professional challenges session.

One of the most striking differences on the old continent is the brutal gap between salaries in medical imaging. Data collected by the European Society of Radiology (ESR) show that Swiss radiologists in training receive an annual income of €67,500 while their Romanian counterparts earn less than €3,000. (Diagram 1)

Examinations also differ from country to country because radiation doses used are not always the same. For instance, the mean effective dose for chest thorax examination is 0.20 mSv in Germany, whilst it is lower than 0.05 mSv in the UK, according to EU data. (Diagram 3)

Education is another key area of division. Most countries adopted the five-year training curriculum for radiology promoted by the ESR, but others offer much less. (Diagram 2)

This gap hampers radiologists' mobility in what should be an open space, according to the session moderator Lluís Donoso-Bach, Director of the Diagnostic Imaging Department of the Hospital Clinic of the University of Barcelona, Spain: 'If we want to promote the EU as a substantial concept, we radiologists must be able to work everywhere. This is why education needs to be as similar and recognised as possible in every country.'

The ESR recently launched a 'Call for a European Action Plan for Medical Imaging', hoping to overcome the rigid division of responsibilities between the various EU directorates that seems to impede reforms.

The situation of imaging equipment is dramatically heterogeneous as well, and the density of CT and MR machines differs a lot in the EU, according to data acquired by the Organisation for Economic Co-operation and Development (OECD) in 2012. (Diagrams 4 & 5)

Least equipped of all was Hungary, with 2.8 MR and 7.7 CT scanners per million inhabitants. Romania, Bulgaria and the Czech Republic were also below European averages, as well as, perhaps more surprisingly, the UK and France. Conversely, Greece, Italy, Austria and Scandinavian countries did generally well. More importantly than the sheer number of machines is their national distribution, Boris Brkljačić, professor of radiology at the Medical School, University of Zagreb, Croatia, points. 'What matters is whether the machines are utilised or not and where. It is more important to have excellent CT machines in hospitals that treat polytrauma patients than, say, a rehabilitation hospital.'

Session speaker Brkljačić also underlines that equipment age as a key factor in imaging quality. Experts agree that the golden rule is to have 60% of equipment aged between one and five years old, and 30% between six and ten. It is also acceptable to have 10% of equipment older than ten but, at this stage, one should think of a replacement strategy.

This issue is gaining momentum in Europe because equipment is rapidly ageing. According to the European Coordination Committee of the Radiological Electromedical and Healthcare IT Industry (COCIR), 60% of CT machines were up to five years old in 2008. [Age profile of CT and MR equipment in Europe (2009) http://cocir.org/fileadmin/Publications_2009/new_members_ws_-_del._3_-_cocir_age_profile_17_june_2009.pdf].

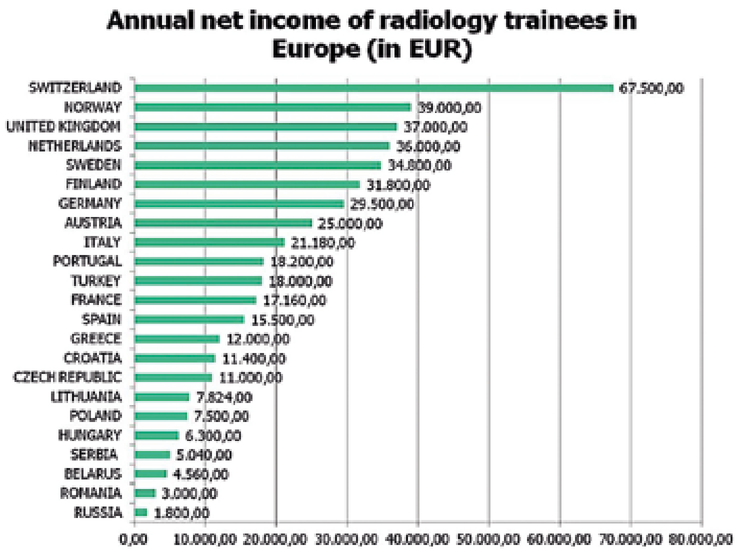
In 2013, their number dropped to 49.5%. 'That's a considerable drop within just five years, and it means that equipment is not being renewed, probably as an impact of the financial crisis,' Brkljačić notes. 'In Croatian public hospitals, for instance, new CT scanners only represent 11% of all CT equipment, which is an absolute disaster. That's why the ESR is pushing this issue now more than ever.' (http://link.springer.com/article/10.1007%2Fs13244-014-0345-1)

The number of CT scanners aged six to ten also increased between 2008 (30.7%) and 2013 (38%). Similarly, the number of machines older than ten grew from 9.1 % in 2008 to 12.5% in 2013. Trends are the same for MRI data.

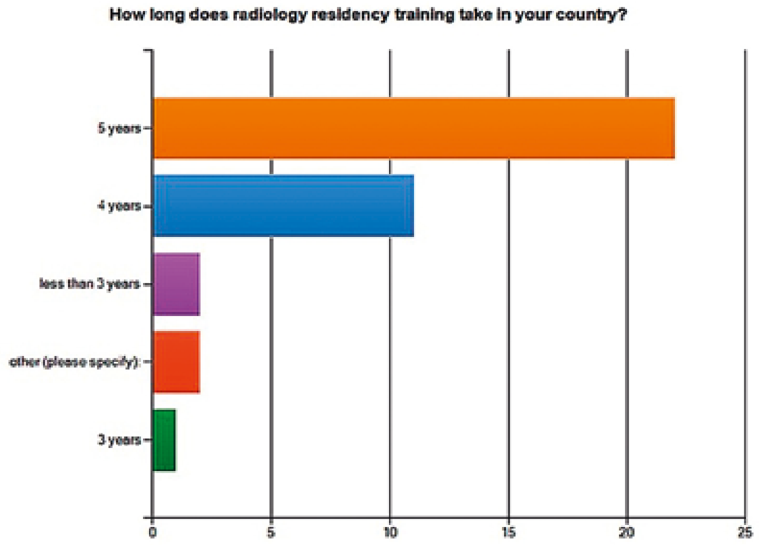
Regularly serviced, well-maintained and not over-used machines may still work well after ten years. One should avoid performing more than 15,000 CT scans annually and less than 8,000 with an MR scanner.

Regardless of economic contractions, health managers should not hesitate in investing in new equipment, because it improves imaging quality tremendously, Brkljačić insists. 'These examinations are highly profitable to patients and healthcare systems. In many countries, there are waiting lists and huge pressure on radiologists to image as many patients as possible.

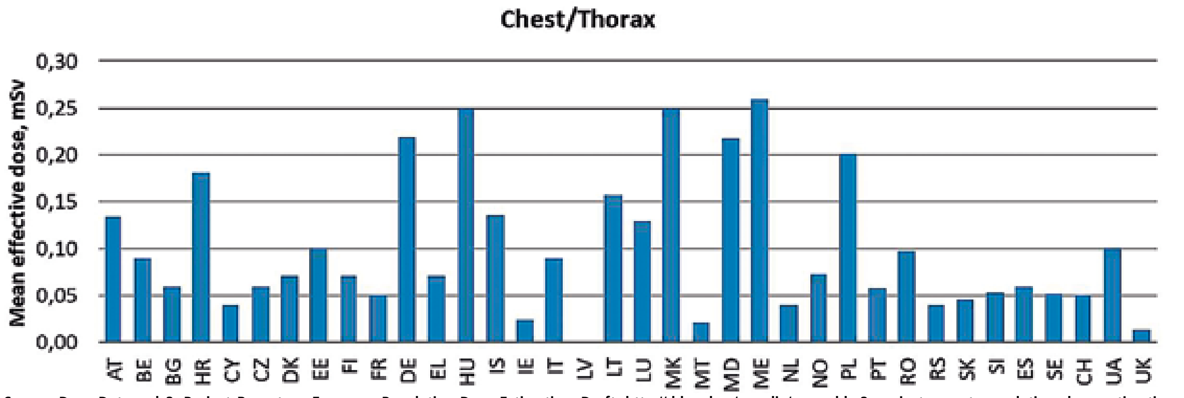
'Governments should ensure that hospitals have proper equipment, especially those that treat acute patients and perform complex procedures. Politicians tend to have their own policy and buy things that are not priorities. For instance, in Croatia you'll find the best CT equipment in a rehabilitation hospital that doesn't treat acute patients, while a few kilometres away, the structure for trauma patients has only 16-slice scanners.' His conclusion: 'I think it's very important for radiologists to have proper arguments to fight on these issues.'



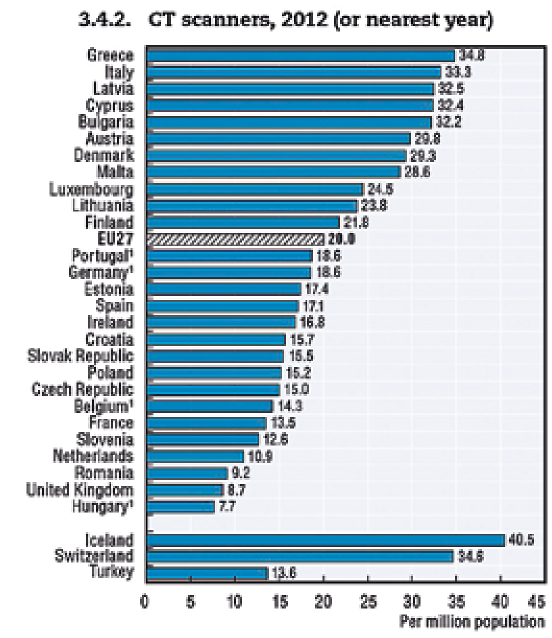
Source: RTF/ESR Survey 2012.



Source: ESR survey 2012.

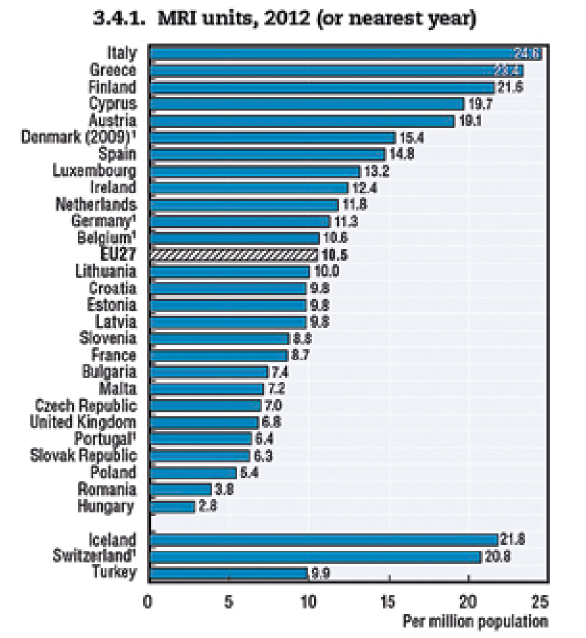


Source: Dose Datamed 2. Project Report on European Population Dose Estimation: Draft. http://ddmed.eu/_media/news:ddm2_project_report_population_dose_estimation_final_draft_for_web_page_28_jan_2013.pdf



Note: The EU average does not include countries which only report equipment in hospital.
1. Equipment outside hospital is not included.
Source: OECD Health Statistics 2014, http://dx.doi.org/10.1787/health-data-en; Eurostat Statistics Database.

Source: OECD (2014), Health at a Glance: Europe 2014, OECD Publishing.



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Source: OECD Health Statistics 2014, http://dx.doi.org/10.1787/health-data-en; Eurostat Statistics Database.

Ensuring your imaging panel meets the DICOM standard

Displays benefit from auto-calibration

The standard Digital Imaging and Communications in Medicine (DICOM) enables the integration of scanners, servers, workstations, printers and network hardware from multiple manufacturers into a picture archiving and communication system (PACS). It can also sort out when, where and how to calibrate a display.

DICOM recommends regular calibration, in the centre of the display with a 10% target and 20% grey surround, using a calibrated photometer.

For auto-calibration the aim was not to compromise

When Dome (a brand of the medical visualisation technologies firm NDS Surgical Imaging) introduced the first medical imaging panel displays the company knew that auto-calibration was a key feature that would dramatically improve display quality and reliability. In 2001, Dome introduced the first auto-calibrating, liquid-crystal display system.

DICOM calibration required a photometer to measure and characterise the display's behaviour. 'This is the first and most critical step in the calibration process,' Dome explains. 'To perform auto-calibration, we knew we would have to compromise when, where or how this characterisation was done. We believed that where and how must not be compromised, because that directly affected the display characterisation. Instead, we compromised on when."

Utmost accuracy in display characterisation

'Dome uses true DICOM test targets and takes measurements over the full dynamic range with a high-precision, instrumentation photometer,' the manufacturer reports. 'This provides the most accurate characterisation of the display possible. The characterisation data is then permanently stored in the panel and is always available to be read back and used to perform an instant calibration at any time.'

Other vendors, the firm point out, 'choose to compromise where and how the display is characterised, using a tiny front sensor instead of a calibrated photometer and measuring at the very edge of the display, rather than the centre. Due to bezel crimping and backlight non-uniformity, the edge of the panel is a poor substitute for centre measurements. Using a low-precision sensor to take measurements also yields much poorer results.

'Not surprisingly, front sensor calibration is less accurate and more volatile, but it's hard to know this if the same front sensor is also used for QA and for the conformance testing as well."

Promising long-term reliability

'For our system to work,' Dome explains, 'the display behaviour must be stable over time, and it is. Over a decade of research and experience has demonstrated this. A10-year-old Dome display is still as perfectly calibrated as it was the day it left the factory. The huge advantage of this approach is that the display will always be DICOM calibrated.

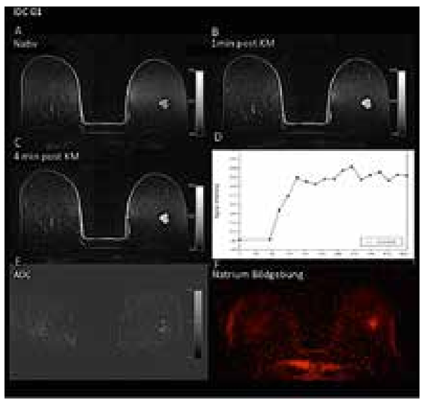
Dome adds that it encourages users to measure for themselves. 'If you compare the conformance of a Dome display to any other display on the market, we are content that you'll see our superior calibration. In fact, if you do a full 256-step conformance test, you'll not only see our extraordinary calibration, but you can witness the volatility of front sensor based approaches.'

Details: www.ndssi.com

Breast canc

Can, should and must MRI replace mammography?

In breast cancer care each patient receives personalised, highly effective diagnosis and treatment procedures. In breast diagnostics this mainly revolves around new MRI scanning procedures that allow the quantification of biological and physiological processes on a cellular and molecular level. 'The talk here is of molecular MRI (mMRI), which even today makes it possible to differentiate between benign and malignant breast cancers without needing biopsies, with an impact on treatment procedures – such as minimising over-diagnosis – and of the early prediction of the therapy response of individual



mMRI with DCE-MRI, DWI and Sodium Imaging: Female patient with low-grade, invasive ductal carcinoma in the central left breast area: (A-D). The DCE-MRI shows that the irregularly configured lesion has an increased tumour tissue permeability. (E) The lesion has limited movement of the hydrogen molecules with clearly lowered ADC levels (0.9 x 10-3 mm2/sec). (F) Sodium imaging confirms an increased concentration of sodium. mMRI shows that the lesion is without doubt a malignant one (BI-RADS 5).

cancers,' says Professor Thomas H Helbich, Vice Chairman of the University Department of Radiology and Nuclear Medicine at Vienna's Medical University.

During this year's MR symposium in Garmisch, his lecture centred on mMRI. Various processes, such as tumour angiogenesis, cell proliferation, molecular movement and numerous metabolic changes, play a key role in the development of breast cancer. mMRI facilitates the quantification of these key processes on a cellular and subcellular level. 'The combined use of different MRI procedures, such as contrast enhanced MRI, diffusion weighted imaging (DWI) and MR-Spectroscopy (MRS) provides first insights into the world of mMRI. This method allows us to measure multiple imaging biomarkers simultaneously and non-invasively,' Prof. Helbich explained. It has been shown that the acquisition of these parameters enhances specificity considerably without overlooking breast cancer. Therefore he advocates increased use of mMRI in routine breast diagnostics.

MRI also plays a vital role in monitoring cancer therapy. Depending on the chosen procedure it enables doctors to differentiate between cancers that do or do not respond to treatment shortly after it begins. This means, the professor explains, that MRI meets all the requirements for implementation in personalised medicine: Treatments that do not have the right effect can be replaced by more efficient procedures.

Fast, uncomplicated and low in radiation

Osteoporosis risk assessments wi

Women over the age of 50 are not only at higher risk of developing breast cancer but also osteoporosis. Would it not be practical to use the same method to detect both diseases early on? Definitely, decided Sectra, the Swedish company specialising in PACS and mammography systems. Based on international scientific studies and data, the company developed an algorithm that determines the risk of developing osteoporosis based on digital radiology images of the hand.

The equipment used for image acquisition utilises the low-dose mammography modality.

Michael Risch has used OneScreen for years in Munich

First the breast and then why not the hand?

For women who would like to have their bone density assessed, the Schwabing Radiology practice, in Munich, has been offering the special OneSceen solution by Sectra for several years, under the direction of Dr Michael Risch.

Following a mammogram, the same digital radiology equipment is used to take an additional X-ray of the hand. This is sent to a trained expert at Sectra in Sweden where it enters the PACS along with the mammography image. The expert checks whether all parameters important to the evaluation of the examination have been met – the metacarpal bones of the index finger, middle finger and ring finger being the important ones – and puts the images through a specially developed programme. 'In our practice we offer three procedures to measure bone density: Quantitative Computed Tomography (QCT), Dual-energy X-ray Absorptiometry (DXA) and digital radiology examinations with low-dose mammography. The latter are particularly suitable for early screening where there is no evidence of suspected disease as the procedure is carried out with only a very small radiation dose of just a few microsieverts,' explains Dr Michael Risch, who has gained very good experience with the procedure with the initial selection of patients.

Apart from low radiation dose, the ease and speed of the examination particularly make the procedure highly attractive for routine medical practice. 'Acquiring images is a matter of seconds and the evaluation is fully automated. This is extremely convenient and allows us to offer this service, which is not covered by the statutory medical insurers o patients at a reasonable price – quite a bit less than one hundred euros,' he points out. 'If, based on the Sectra evaluation, osteopenia, i.e. early stage osteoporosis, is diagnosed, further examinations are carried out for quantification and then treatment is recommended.

Global data comparison

Sectra OneScreen already allows significant conclusions about bone density, according to Maria Bolin, General Manager and head of Sectra's Osteoporosis Division: 'Our system measures more than 1,000 points on the metacarpal bones of the three middle fingers. The system evaluates the volume as well as the curvature of the bones and the data is then used to determine the

Dr Thomas H Helbich MSc MNA is a professor and Vice Chairman of the University Department of Radiology and Nuclear Medicine at the Medical University of Vienna. As an expert in breast cancer diagnosis he was previously in charge of the Breast Imaging Department at the University of Toronto.
He is also a past-president of the European Society of Breast Imaging (EUSOBI) and the Austrian Society of Senology (ÖGS) (2009-2011)

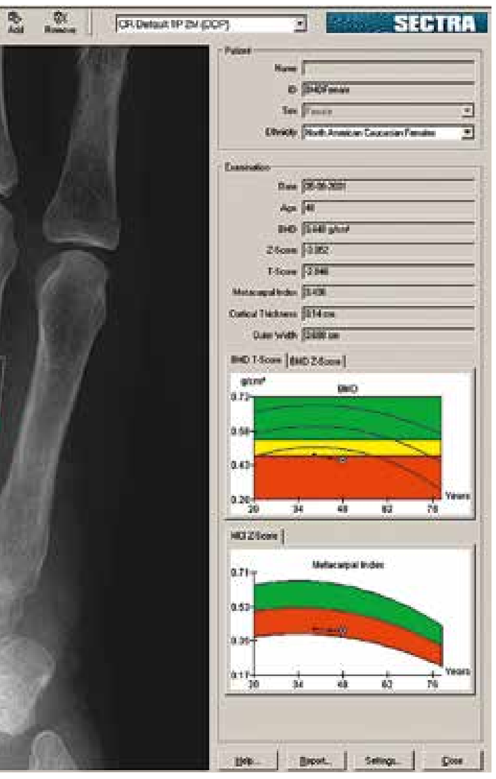
The enhancement of mMRI through PET constitutes a further quantum leap for the implementation of personalised medicine. Fluorodeoxyglucose (18F-FDG) PET measures the glucose metabolism, which increases in tumour tissue compared to normal cells. Additionally, PET allows precise imaging using specific radiotracers. These can capture different, relevant processes of tumour development, progression and therapy response, such as tumour hypoxia, apoptosis, cell proliferation or receptor density. 'In a recent study, our Working Group showed that PET-MRI facilitates improved, non-invasive differentiation of benign and malignant breast cancers. The procedure can achieve a reduction in the rate of unnecessary biopsies by 50%,' the professor confirmed.

Despite all its advantages, breast-MRI, which resulted from pioneering work by two German radiologists i.e. Professors Sylvia Heywang Köbrunner and Werner Kaiser – who unfortunately passed away far too early – currently doesn't fare too well in its 'homeland', a development that Prof. Helbich views critically. Undoubtedly, breast MRI has not become a routine examination but should be carried out when and where indicated. However, the wide range of indications for breast MRI should not be limited by an evidence-based view of medicine with a limited focus.

'Breast MRI is of benefit for pre-operative staging, such as for invasive lobular cancers and for non-invasive ductal cancers. It is also successfully being utilised for neo-adjuvant chemotherapy and is undisputedly the best method to differentiate between scar tissue and recurrence. Furthermore, it is also the best procedure for high risk screening,' he added: 'In particular, the data for high risk screening with MRI show that a large proportion of clinically significant breast cancers are detected far too late with mammography and ultrasound compared to MRI scanning.

Therefore it's no surprise that some countries are already considering considerably shortening the MRI protocols for breast imaging and establishing MRI for screening in place of mammography.'

th DRX



estimated BMD (bone mineral density). The BMD is then correlated with that of the population of the same age group and additionally with the estimated peak bone mass point, i.e. the point in time at which all humans have their highest bone density, around the age of 30. In this way we create several comparisons and reference points for individual assessment.'

A huge reference database, compiled from different worldwide studies, is used as the basis for all those measurement. Naturally, the results of every examination fed into the OneScreen system in turn enhance this reference database.

The OneScreen system is FDA approved, has the CE mark and is available to all users of low dose mammography.

Currently, the only hindrance for the procedure's comprehensive utilisation is the lack of reimbursement by the statutory health insurers in European countries. However, due to the comparatively small financial contribution required from patients the method doesn't lose its overall attractiveness. Source: Sectra

Structured reporting

Liberating radiologists to be expert consultants

Where some decry the commoditisation of radiology, Gabriel Krestin MD, sees an opportunity to redefine the profession, for radiologists to rise up from basement reading rooms to consult as equals with other medical specialists in multi-disciplinary conferences focused on patient care.

'If we are going to think about the future, we should not be looking in a rear view mirror. We need to be open to the changing environment,' he said in this interview with European Hospital editor John Brosky.

A past-president of the European Society of Radiology, Krestin will address the European Congress of Radiology on 5th March in a session dedicated to the future of radiology with his presentation entitled 'Quo Vadis the Radiology Profession: A Pragmatic Approach.'

Professor Krestin spoke from his offices in Rotterdam, the Netherlands, where he chairs the Department of Radiology at the Erasmus Medical Centre.

EH: What is your assessment of the state of radiology today?

'In this moment, when medicine is becoming more personalised for the patient, we are challenged to deliver greater precision. This definitely changes the face of radiology and the involvement of radiologists in the continuum of healthcare. What I want to talk about particularly is that this precision can only be obtained through standardisation, quantification, automation and integration. It means that we need a more structured reporting, which is quite obvious, but also a more extensive use of imaging biomarkers that means quantification of imaging characteristics.

'Because we know that radiologists typically don't like to measure, this will require a certain level of automated quantification in imaging. Coming around the corner are many algorithms in image processing and they are increasingly available where structures, functions and biomarkers that we consider important can be automatically quantified. If radiologists dislike measuring these things, automated processing will help them make reports more objective, more precise, and contribute to the concept of precision medicine.'

Is the resistance to structured reporting due to the way it pushes against a tradition in radiology of interpreting images from an examination?

'That is one of the reasons. A second reason is that it narrows the freedom to be more subjective, or to emphasise aspects you find of interest and tend to report more often. Structuring reports obliges a radiologist to go to a template each time and clearly and objectively report about every part of the exam. It obliges us to use more objective characteristics. It does not always need to be a number, but it does need to be a classification that is objective. This is what is meant by structure.

'It does not leave room for subjective descriptions where you are free to say something is 'enlarged'. What can a clinician do with "enlarged"? Is it larger than five or seven centimetres? The clinician needs to know exactly what is meant by "enlarged". Quantification and structuring go hand in hand.'

Gabriel Krestin MD, works at the Department of Radiology, Erasmus Medical Centre Rotterdam, The Netherlands

Do you see the role of radiologists diminished?

'Definitely not! We still have leverage, perhaps even more, because we will be taken more seriously. While there are measurements, and even if they become standardised, these measurements stay within radiology.

'Two other issues that come in here; first, that the more an examination contains objective, measurable markers, the more it approaches other diagnostic specialties, such as pathology or laboratory medicine. A lab report, for example, delivers a long list of numbers of biomarkers measured in the blood or urine. My prediction, which is perhaps exaggerated and says exactly what radiologists would fear, is that our reports will look similar to lab reports, long columns of numbers, saying things like "At position N° 27 the number is 78".

'I don't really believe our reports will ever look like that. Yet it is the direction we should be moving toward. My colleagues who are thinking in this way would love to have measures that are validated, consistent in delivering the same number no matter what technology is used. Like the creatinine value in blood, our measurements of, let' s say the plaque volume in the coronary artery, should always be consistent and delivered as the same number.

'We are very far away from this because industry is not really collaborating in this effort. We are far from standardisation in acquisition techniques. We are far from standardised processing techniques. We are far from being standardised in measurement techniques. We still have a long way to go. Yet this is where radiology, as a diagnostic specialty, needs to go, to be like laboratory medicine, moving toward reports that are open to integration – and this is the next topic – the integration between laboratory, pathology and radiology.

'Many people see this as the future of our profession. Integrating our diagnostic information with diagnostic information from other specialties to deliver a comprehensive report based on all these elements.'

In light of overwhelming utilisation of radiology today in every area of medicine, wouldn't radiologists welcome the assistance of automation and standardisation to manage the sheer volume of the workload?

'They should do so. In some healthcare systems, as is the case in the Netherlands and surely in many other countries, the product from the radiological service is the report, and less so the images. Radiologists are still spending a lot of time producing these reports. Where the real added value of radiologists should be is in the multi-disciplinary conference where they can contribute to the management of the patient.

'Here, I tell my radiologists that if we have a shortage of staff with so much work to do, when we are forced to choose, it is better to postpone the reporting and get to the conference! This is where a radiologist should always be present as an adviser to consult with the primary care physicians and other specialists in deciding about the management of the patient.

'This is my argument to address the fear some radiologists have about becoming obsolete because radiology is becoming commoditised. Already some aspects of radiology services are moving towards commoditisation. For example, scheduling of the examination can be out-sourced to a call centre or even utilisation management company. In most cases, radiographers and techs already perform the acquisition task. Even the reporting can be sent to less expensive sources where radiologists dictate reports of a sufficient quality.

'But what can not be out-sourced, and what will never be commoditised, is the added value of consulting by the radiologist in a decision-making process and participating in the management of the patient. It's where a radiologist brings knowledge of the technology, both for its benefit and limitations. To be the specialist who knows what a structured report and the numbers in that report mean, as well as their significance for the patient.

'This is what we need to deliver, not just a report. To give other physicians an appreciation of the study and an understanding that goes beyond their own specialties. This is where radiologists should be going. It brings us out of the basement and reporting rooms into the conference room and even closer to the patient.'

Thursday, 5 March
08:30–10:00. Room E2.

Session: Quo vadis radiology professions? A pragmatic approach.Looking into the future of radiology

Professor Gabriel Krestin MD (Rotterdam), former President of the European Society of Radiology, will speak on the challenge of precision through standardisation., quantification, automation and integration.

Launching many imaging and IT concepts

On show at ECR 2015

First unveiled at RSNA 2014 last November, Carestream's Touch Ultrasound System is on show for the first time in Europe at this year's ECR

'This innovative ultrasound platform delivers a unique all-touch control panel, integrated GPU processing power and smart transducer technology coupled with a single-board system design,' the manufacturer reports. 'This creates a highly reliable product with advanced imaging capabilities, a compact footprint and a modern user interface. The sleek, all-touch control panel blends the best of both worlds by combining the speed and flexibility of a soft user interface with the tactile feedback of traditional keys. Etched marking for primary controls assists the user with easily locating key functions without looking away from the image display monitor.'

The company is also demonstrating notable new features for its healthcare IT platforms, which manage, store and share patient data and medical imaging exams. 'Carestream's new Clinical Collaboration Platform can boost collaboration among clinicians; break down walls between ancillary departments, sites and networks; and provide physicians with a single view of critical patient records and information,' the company explains. 'The Clinical Collaboration Platform enables healthcare providers to capture, archive, manage and distribute clinical data such as images, videos, photos and reports related to the patient from different ancillary departments, such as endoscopy and dermatology.

'This creates a patient-centric clinical record that complements the electronic health record. Capturing structured data will also deliver greater clinical insight with interactive reports where a single click of a hyperlink takes physicians to the actual data.'

The firm suggests that this Web-enabled platform can be used for telemedicine, to provide specialist input in remote areas. 'The platform also offers a secure digital patient portal that allows patients to download, view, store and share their own medical imaging studies with physicians and specialists,' the report adds.

Carestream is also highlighting new features in its radiology portfolio to help diagnose and treat a wide range of conditions, including:

A compact new Vita Flex CR system that provides excellent image quality and can process images while set on a floor, table or other flat surface. 'This affordable platform can meet the diverse needs of imaging centres, private practices and smaller hospitals, as well as orthopaedic, veterinary and chiropractic providers,' Carestream points out.

New tools for digital breast tomosynthesis designed to enhance the early breast cancer detection and treatment.

The latest version of the company's radiology information system that enables the importation of a patient's clinical history for referring physicians can have a more comprehensive file on which to base diagnostic and treatment decisions.

Carestream's newest cardiology image management platform enables text messages or e-mail notifications to be sent to a physician when a patient has a critical condition, and a dashboard that provides data to assist with diagnosis of a current examination.

Finally, there's a new premium laser imager that produces images from CT, MR, digital mammography and other imaging modalities on radiographic film.

Details: www.carestream.com/ecr.

Two hospitals independently select Japanese equipment

Seeking the best systems

When the Medical Radiological Institute (MRI) at the private Bethanien Hospital in Zurich and the local hospital in Ærø, Denmark, needed new fluoroscopy and radiography equipment, they investigated quality, functionality, service quality and cost. Among systems examined was Shimadzu's Sonialvision G4, which has been completely revised, with innovations in all areas, including dose reduction and enhanced image quality, simplified processes and improved patient comfort. 'The premium application software offers the most recent improvements for diagnostic imaging. It supports useful applications, such as multi-slice imaging, slot radiography as well as DSA & real-time and motion-tolerant RSM-DSA, which are all options to extend its functionality,' Shimadzu explains.

Multi-purpose needs in Switzerland

Dr Thomas Vollrath, board certified radiologist said that the MRI Bethanien needed to increase capacity with optimum use of existing space. Fujifilm Switzerland presented the institute with a multi-purpose examination room containing Shimadzu's high-performance R/F-system Sonialvision G4, combined with a ceiling-mounted 3-D X-ray tube support, a bucky stand and an additional mobile FPD. Up to this, the institute had different systems in two rooms. The Sonialvision G4 now combines the former applications for fluoroscopy and radiography in one small examination room of only 27 m².

'This offers us the great advantage of patients no longer having to be moved, which is very comfortable for them,' notes Franziska Bissig, supervising radiographer. 'The mobile FPD is compatible with our second X-ray room and offers usaddtional flexibility for further emergency and bedside examinations.'

From left: Bethanian project managers Paul R Hilfiker MD, supervising radiographer Franziska Bissig and Thomas Vollrath MD

The robust X-ray table allows bariatric studies with a patient load up to 318 kg in horizontal position

Equipped with the largest available FPD at 43 x 43 cm, the X-ray table of the Sonialvision G4 offers large, long-view examinations of the patient from head to toe, so that the MRI Bethanien can also perform digital slot radiography. Very soon, slot radiography provides high-resolution, homogeneous and dose-reduced long-view imaging (e.g. full leg and full spine imaging). 'We have been able to improve in all respects,' Dr Vollrath concludes. 'The Shimadzu system is simply newer, more modern and more manageable.'

Bissig confirms that the image quality and intuitive operation shortening work processes soon convinced staff of its value.

The combination of X-ray tube and detector covering the examination area more than 200 cm longitudinally without the tabletop having to be positioned is also welcome. 'In our small examination room we can thus avoid any possible collisions, for example with infusion stands,' Bissig adds. 'It's also very helpful that the patient mattress can be fixed to the top lateral mounting while standing and that the handles can be fixed quickly and easily.'

Roughly 30 km long and up to 8 km wide, Ærø is one of Denmark's Baltic Sea islands. The local hospital recently installed the first Sonialvision G4 equipment in that country; therefore the hospital will be used as a reference when new customers want to see how it operates.

An X-ray image presented in two minutes

For Ole Gilberg, head of the X-ray department, the new equipment has much to offer: 'Earlier, it took 10 minutes to produce an image. With the new equipment we can present an X-ray image in two minutes, which means a lot when we have trauma patients from a car accident, for instance.'

In addition, the robust X-ray table can be lowered to 47 cm, thus giving easier access for children, older patients or patients with limited mobility. It also allows bariatric studies with a patient load up to 318 kg in horizontal position.

Another plus: 'The fully flat table top and built-in cable system of the X-ray table is a good improvement in terms of hygiene and workload,' Gilberg adds.

Details: www.shimadzu-medical.eu

Japanese firm celebrat

Continued f

Celebrating its 140th anniversary in 2015, Shimadzu sits among leading international manufacturers of analytical instrumentation and diagnostic X-ray imaging systems. The firm's technologies are essential tools for quality control of consumer goods and articles of daily use, in healthcare as well as all areas of environmental and consumer protection. Spectroscopy, chromatography, environmental analysis, balances, biotechnology, material testing and medical technology make up a homogeneous yet versatile offering. Along with many 'industry first' technologies and products that Shimadzu has created and invented since 1875, there has also been the exceptional awarding of the 2002 Nobel Prize for Chemistry to Shimadzu engineer Koichi Tanaka for his outstanding contributions in the field of mass spectrometry.

As a global player, Shimadzu operates production facilities and distribution centres in 76 countries, with more than 10,000 employees worldwide. For over 45 years the European headquarters has been

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1896 - One year after Dr Roentgen discovered X-rays, Shimadzu succeeded in producing an X-ray image
1909 - Shimadzu developed the first medical X-ray device made in Japan. Ever since, Shimadzu has pioneered medical X-ray devices
1934 - With the development of Japan's first spectrograph, Shimadzu advanced into the field of analytical instruments
1936 – The company began to manufacture aircraft equipment
1951 - Shimadzu began to increase the number of exports to global markets
1956 - Development of Japan's first gas chromatograph
1960 - Shimadzu developed a vacuum quantometer, which served as a major stimulus to the steel industry
1961 - Shimadzu created a remote-

High-tech R/F solutions

Confident launch for a new French system

Launching in March, Optima is the latest offering from the French R/F specialist Apelem (part of the high-tech medical solutions DMS Group).

Based on the firm's Platinum technology, Optima is reported to provide nearly all the benefits of the Platinum in a cost efficient, robust mechanical package, the firm points out, adding that Optima '...is the ideal choice for centres looking for the advantages of digital in an easily accessible price range'.

Sweamless transition

With the same platform used by both Platinum and Optima, the transition from one solution to the other is reported to be seamless. 'In terms of service, maintenance and applications the two systems are nearly identical,' Apelem confirms.

Platinum provides a 'most comprehensive technical package available on the market,' the manufacturer adds. 'These include excellent image quality; optimised settings for maximum dose reduction; SID 180 cm for chest and stitching exams; variable height 48-130 cm for comfortable patient charging; and brushless motors for smooth precise movements.

Additionally. it takes a patient's weight up to 265 kg with no limitations to any movements, has a; long table top for maximum patient coverage 240 cm as well as optional 4-way movement of the table top, and there's full access around the table for easy patient transfers. A video camera integrated in the collimator enables radiation free positioning, with fully motorised movements and unlimited pre-programmes for table positioning;

There's also relaxing ambient light and a music player, collimator, touch screen, foot pedal, remote control and maintenance. Internationally over eighty Platinum systems have been installed.

Details: www.apelem.com

es 140 successful years

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located in Duisburg, Germany.

Since 2012 Shimadzu's brand value proposition was expressed through the new claim 'Excellence in Science' representing the company's scientific and technological approach to always provide business and research solutions with the most modern analytical and diagnostic systems ensuring better product, consumer and patient safety. Numerous world firsts that have become industrial standards today as well as increasingly sensitive measuring methods substantiate this claim, Shimadzu points out.

Laboratory World

The company's new Laboratory World in Duisburg, Germany is an example of how to fulfil this brand promise. Spread over 1,500 m², most-modern testing and training facilities were created for Shimadzu's entire product range – from chromatographs, spectrophotometers, TOC analysers, mass spectrometers and material testing machines.

Details: www.shimadzu.com/about/topics/140th.html

LESTONES

controlled X-ray fluoroscopy system

1968 - The firm's European HQ was established in Germany

1999 - Development of the world's fastest DNA sequencer

2002 - Shimadzu engineer Koichi Tanaka received the Nobel Prize for Chemistry and Japan's Order of Cultural Merit

2003 - World's first diagnostic imaging system with a direct-conversion flat-panel detector was launched

2005 - The first fully digital mobile X-ray system in the world, equipped with a portable flat panel detector arrived

2007 – A digital tomosynthesis function for general radiographic examinations was released

2014 - A next generation high-performance crossover digital angiography system was launched

Mobile IT in radiology

How secure are your data?

Report: Mélisande Rouger

The appetite for mobile information technology (IT) seems insatiable. Boosted by the sales of the iPhone 6 Plus, Apple generated a record $18 billion profit in 2015's first quarter alone. Social media use is exploding, and dedicated professional platforms, such as Figure 1, a sort of Instagram for doctors, increasingly emerge. These changes are affecting our daily lives, and this is also true for radiologists.

While tablets and smart phones create unprecedented opportunities for radiologists to connect with their colleagues and patients, mobile IT also raises a number of questions, especially regarding its safety. A panel of experts are tackling these issues in a dedicated refresher course during the European Congress of Radiology.

More and more radiologists succumb to the charms of mobile devices. Apps like Osirix enable cases to be reviewed at home, prepare slides, give a conference, and, increasingly, to communicate with other physicians. Mobile tools may also improve communication with the patient, and a number of institutions are already enabling patients to access their images online, or to discuss their record with physicians during teleconferences.

However, in the absence of a clear regulation on the topic, a hefty question has been on everyone's lips for some time: with mobile IT, how safe is our data?

Hospitals are increasingly a target for hackers. A large number of cases were reported in which cardiac devices, or parameters of a CT examination, had been manipulated at a distance (ref: http://www.wired.com/2014/04/hospital-equipment-vulnerable/).

Data security is simply insufficient in healthcare facilities, according to Erik Ranschaert, radiologist at the Jeroen Bosch Ziekenhuis teaching Hospital in 's-Hertogenbosch, the Netherlands, a speaker during the course.

'Hospitals will have to change their security protection. Hackers are targeting systems that store personal information in electronic medical records,' he said. 'In the United States alone, there has been a 600% increase in attacks on hospitals in 2014, according to a report published by security firm Websense (ref: http://www.cnbc.com/id/102030232).'

With mobile devices, patient data are being transported outside the hospital, so the risk of leaking data is multiplied exponentially. There is currently no firewall to protect data on a tablet – just a login and a password. One can certainly remotely cancel access to an iPad, but there is no 100% certified protection for data. What happens if they are stolen?

'Imagine you are treating Barack Obama and you have, on your tablet, the images of his colonoscopy that you performed a day earlier. Now, suppose the results show he has cancer, and suppose you lose your tablet during a flight. What happens next? You risk having these images exposed to the whole world before even discussing them with your patient,' said Emmanuele Neri, associate professor of radiology at the University of Pisa, Italy, and Chair of the ECR course.

To make matters worse, most hospital managers are still unaware of those risks. They also do not realise that data can be lost or damaged during their transmission from one device to another, according to Neri.

Stakes are high because valuable personal information can be used for commercial purposes; knowing which medication a patient uses offers a unique opportunity to advertise products – just like Facebook already does using your own data. The medico legal loophole concerning the issue only exacerbates the risks.

'I suspect there will be a great business around data selling. It may even be the biggest business of our century. I expect there will soon be a policy to protect data security. However, I don't think there will be one regarding privacy so soon. How we will manage these issues in the future is a big issue, because our data are already everywhere,' Neri pointed out.

The European Union is addressing the issue but its resolutions may come too late. The Horizon 2020 research programme plans to offer solutions to security and privacy… by 2020.

In the meantime, hospitals can defend their systems by making sure tablets and smartphones are used in a protected environment. Raising the level of protection of an IT system against hackers is of course mandatory, but it is not the only way, Ranschaert explained. 'One could also develop solutions to deliver access only after identification, or force data to remain within safe containers and make sure it cannot be downloaded or accessible by private apps – e.g. for image or photo sharing.

'Furthermore, one should be able to remotely wipe the data, and the hospital's policy should be adapted to usage of social media within the facilities. For instance, Breda hospital in the Netherlands forbids everyone to take pictures in the hospital with mobile devices,' he said.

Training personnel and radiologists on how to use mobile devices and social media safely is key to improving safety. Part of healthcare will soon become mHealth, so physicians and providers should get ready for the switch.

'We shouldn't try to avoid it; the ostrich strategy will not pay off. We have to think how can we use mobile IT for the mutual benefit of our patients and ourselves. There are advantages in using these tools to facilitate our services and improve education but,' Ranschaert concluded, 'we have to be aware of the risks, too.'

Emmanuele Neri, associate professor of radiology, University of Pisa, Italy

Getting a grip on today's management in radiology

MIR@ECR

The fourth Management in Radiology (MIR) Symposium to be held during the ECR will focus on key issues in the profession, including quality and safety.

The Chairman of the MIR Subcommittee Professor Peter Mildenberger introduces the first MIR@ECR session, covering professional issues and top innovative developments.

Professor Erika Denton (UK) is then presenting the 'Update on radiology: a strategy for the future'.

Professor Emanuele Neri (IT) is to report on Imaging Biobanks, based on his lengthy experience in this field and as Chairman of the ESR Working Group on this subject.

An 'Update on decision support for radiology' comes from Professor Keith Dreyer from Boston, USA, a radiologist with leading expertise in actual implementation and usage of decision support. Professor Sergey Morozov (RU) follows with his update on social media in radiology, a topic already discussed with great interest at the 2014 MIR Annual Meeting in Italy. Closing the first session, Professor Boris Brkljačić focuses on economics.

2nd session: Improving quality and safety

Dr Adrian Brady (IE) is presenting 'First experiences from a nationwide peer review in radiology'.

The chairman of the MIR sessions, Peter Mildenberger, is professor of radiology and leads the IT-group in the radiology department at Mainz University Clinic, Germany

Dr Peter Cavanagh will describe 'How to organise meaningful audits in radiology'.

Finally, Professor David Koff will speak on 'Errors in radiology: how to learn from a systematic approach'.

A Panel Discussion 'Learning from critical situations or errors' will round off the session, and renowned international speakers will present their personal experiences and share expertise when meeting participants.

Both sessions have time reserved for discussion, including participation from the floor, and a break in between will provide the opportunity to discuss topics individually or in groups with the speakers or others.

Details: www.mir-online.org

Friday, 6 March
13:00–15:00. Room D2.
Session 1: Best of professional issues in radiology
Moderators: S. Morozov (Moscow); E. Schouman-Claeys (Paris)

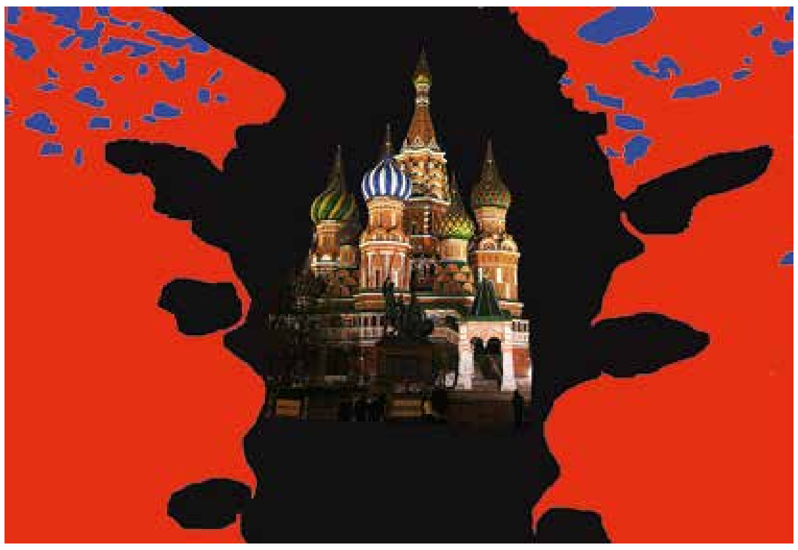
15:30–17:30. Room D2.
Session 2: Improving quality and safety in radiology
Moderators: J. A. Brink (Boston); R. FitzGerald (Shropshire, UK)

Rebuilding Russian radiology

Facing challenges common to any manager, Russian radiologists must also confront a funding crisis, system dysfunctions, self-referring patients, and head-hunters chasing staff, John Brosky reports

'We are not reinventing the bicycle here in Russia,' said Sergey Morozov MD PhD MPH. Radiologists anywhere would be familiar with the experience of restructuring imaging services for the nation's healthcare system, he added. Thanks to a recent modernisation programme, today there are new radiology systems installed in even smaller community hospitals across the country.

'The heads of these radiology operations face the same kinds of issues confronting our colleagues across Europe or the United States. The equipment we have is the same, the standards for operating the equipment are the same, the protocols are very similar,' stated Prof. Morozov, who is Deputy CEO at the European Medical Centre in Moscow, and a member of the Management in Radiology (MIR) Subcommittee of the European Society of Radiology (ESR). 'As is the case elsewhere, once you receive the equipment, you need to adopt standards, train your team in working to those standards, and then begin to work in a way that is similar with colleagues elsewhere.'



The radiologist as manager

The lessons learned to this point are also very similar. 'We have found that a good radiologist can become a manager, but it does not mean this good radiologist is going to suddenly become a good manager,' he laughed. 'With the expanded number of radiology systems, and a rapidly increasing demand on the utilisation of that equipment, we now understand that doctors given charge of these departments really need specific skills to run them effectively. They need to define processes and key performance indicators,' he added.

Prof. Morozov's work with the ESR on the MIR committee is part of a larger effort to introduce a programme for retraining Russian doctors as professional managers of healthcare services.

The next level of challenge, he said, is to build information technology (IT) systems on top of these processes to better manage hospital departments and networks of hospitals. 'I can tell you that IT people in Russia are the same as IT people everywhere else,' he said. 'They often believe that they know all the answers about how to organise workflow, for example. Yet you cannot start by making IT decisions, or you will not be free in decision for managing the processes. IT comes as a systemic solution.'

Currently there is a widening gap between the level of digitisation and IT capabilities between public and private hospitals, which are moving faster to introduce PACS and hospital information systems (HIS). 'They can make purchasing and installation more straightforward, they are more transparent in their operation, and they can assure financing because they are structured as businesses,' said Prof. Morozov.

'With public hospitals this all can become more complicated,' he acknowledged. 'It can sometimes be difficult for public hospitals to understand why they need things like PACS or IT or HIS, and to understand why they need to find the funding for these projects.' The good news, he said, is that there is increasingly a top-down support for IT and PACS as the heads of hospital administration see an advantage in having a visibility for what is happening inside the hospital and the ability to better manage what is going on.

Radiology as a business

As with other European countries, the Russian healthcare system is under financial pressure with severe constraints for radiology, some of which would seem familiar, but much of which is peculiar to Russia. Prof. Morozov: 'An important development is that, today, when we want to develop a new project or programme for radiology we need to prepare detailed business plans and financial analysis predicting cash flows. It is a recognition of radiology as a business, by the state hospitals as well as the private hospitals.'

Sergey Morozov has headed the Radiodiagnosis Service of the European Medical Centre in Moscow since 2013. An honours graduate (2002) from the Sechenov Moscow Medical Academy, he specialised in General Medicine and gained his Medical Sciences PhD for his thesis on functional MRI in 2004 and another Medical Sciences doctorate for his thesis on radiodiagnostics in orthopaedics in 2010. Dr Morozov completed multiple residencies on X-ray diagnostics in the USA (Memorial Sloan-Kettering Cancer Center), Norway (Oslo University) and Italy (La Sapienza).

Making a tough situation even more difficult, he said, is that financing has collapsed for the national programme of healthcare modernisation that equipped hospitals and clinics. 'Unfortunately much of the equipment was often provided without service contracts, only guarantees for one year after installation. In addition, not all equipment was installed according to the proper specifications. This has left many hospitals without equipment service. Clearly the lesson has been learned that we cannot just buy a piece of equipment without thinking about service from the beginning; and on-going financing; and proper staffing and training.

'In these areas we also have some challenges that are specific to Russia,' he said. 'A huge difference here is that many patients refer themselves for radiology exams. They do not come from a specialist or even a general practitioner. They go to Google Doctor and come to us saying they would like an MRI. I had one patient who, when I asked her what her health issue was, she answered she suffered T2 hyperintense lesions in the brain. Because there is not an absolute requirement that a physician must order a scan or radiological exam we have a major policy issue and we need to define patient flows to radiology'.

'Another issue is that the percentage of patients who pay out of their own pockets for health services is rapidly expanding. Patients don't always go to the appropriate public hospital service, but instead search for better diagnosis and treatment among private clinics. 'Money has become the major driver of healthcare.

Radiologists as stars

'Today, in Russia, radiology services are perceived as a source of revenue for hospitals. Radiologists have become the stars of the healthcare system. Consequently, qualified radiologists are requesting high salaries; head-hunters are after them, making it difficult to find good radiologists and trained technicians – critically, experienced radiologists who can act as managers to run a department efficiently.

'In addition to my hospital work, I teach at the chair of radiology at Sechenov Moscow Medical University. Five years ago we would have 10 to 15 residents each year; now we have between 50 and 60. Young doctors who wish to enter radiology must find a programme themselves, yet the program for training has not kept pace, so that hospitals and state universities cannot provide enough courses.

'This is creating a business of post-doctoral medical education in Russia where we see private companies providing specialised training courses with experienced doctors. These private companies hire radiologists to train young radiologists. Combined with a fee-for-service model of payment, this drives costs higher and higher until we see that Russia's healthcare spend per patient is constantly increasing. With understaffed state hospitals providing patients with poor service and a lower quality of treatment and diagnosis, those who can afford it prefer to go to a private hospital.

'The good thing is that, over the past three years, Moscow Healthcare has acquired about 150 CT and 70 MR scanners. They are now acquiring a regional PACS system from Agfa Healthcare to connect all these scanners to create a centralised Centre of Excellence that can offer second readings for other medical centres. Here we are seeing a concerted state effort in a policy to provide better standards for radiology in imaging and interpretation.

'The Centre for Excellence in Moscow is proving a driver for increasing quality. It creates an opportunity to enhance the education and training system. Radiologists learn a second opinion is not a punishment but a systematic review to identify discrepancies. In this way people learn how to avoid any mistakes, whether in equipment use or interpretation.'

A portable colour Doppler for POC

M9 brings maximum mobility

For medical ultrasound it's quick, easy and portable – and so popular with Professor Christoph Dietrich, chief of Medical Department 2 at Caritas Hospital, Bad Mergentheim, one of the first physicians worldwide to test the M9 in clinical routine. 'The compact Mindray colour Doppler system is about the same size as a notebook computer. The imaging suite comes to the patient,' the specialist reports.

Located on the Tauber River in the quaint town of Bad Mergentheim, Medical Clinic Two focuses on haematology/oncology, palliative medicine, gastroenterology and herpetology, geriatrics, endocrinology and metabolic diseases and has an excellent reputation for specialised and innovative endoscopic and ultrasound techniques.

Dr Dietrich uses the M9 ultrasound system for any standard diagnostic exam, from head to toe, and simply opens up M9's high-resolution 15 inch LED monitor for swift bedside exams. 'Despite its compact design, the M9 offers outstanding image quality that's definitely comparable to that of a stationary system,' he happily reports. 'It offers all image data needed in a general hospital or medical office environment.'

Above all the patented 3-T transducer technology provides excellent visualisation in b-mode and colour mode, Mindray adds. 'It offers higher sensitivity and larger bandwidth as well as enhanced transmission efficiency and excellent signal-to-noise ratio. The single crystal probe technology allows imaging of deep structures.

'Not only is the transducer state-of-the-art; the small and lightweight five kg system itself is chock-full of premium Mindray imaging technology, such as Echo Boost, High Dynamic Range Flow (HDR Flow) for visualisation of minute vessels and complex flow patterns, as well as the Natural Touch elastography package for reproducible and user-independent measurement of tissue elasticity. The professor highly values that ability to perform bedside exams. Where every second counts, particularly in emergency and trauma care, quick intuitive diagnostic tools are in high demand. The mobility of current ultrasound devices has swiftly shifted them from an emergency modality to a primary diagnostic modality.

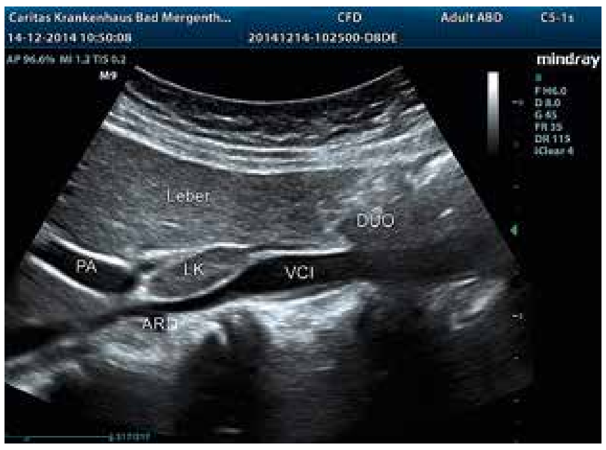
Caritas Hospital is a certified regional trauma centre in the Northern Bavaria trauma care network. Prof. Dietrich cooperates closely with the emergency department. 'Thanks to the M9's portability and immediate usability we can immediately start radiography on an injured patient – even while other clinical tests are being performed. We unfold the M9, it's up and running within seconds.'

To accelerate diagnostic work-up in trauma care, the ultrasound exam follows an internationally recognised standard, Focused Assessment with Sonography for Trauma, FAST for short. This rapid bedside screening test is designed to detect or exclude free fluid, mostly bleeding, in certain anatomical regions. 'The procedure lists clear questions that can be answered with an unambiguous yes or no,' Professor Dietrich explains. 'By systematically imaging the entire abdomen the physician can tell, in less than a minute, whether free fluid is present or not.'

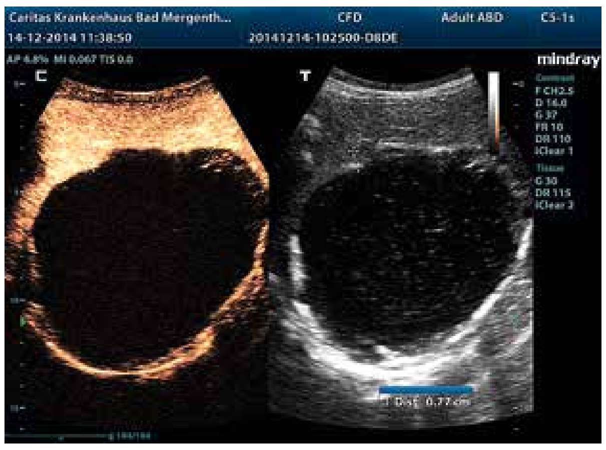
Even for abdominal contrast-enhanced ultrasound (CEUS) the professor relies on the M9's image quality. 'With the M9 you can quickly detect or exclude a spleen, kidney or liver rupture. Two to three minutes after contrast administration you can see blood flow.'

For CEUS the M9 offers another advanced Mindray technology: Ultra Wideband Nonlinear Contrast Imaging. This transmission uses second harmonic as well as non-linear signals, which results in excellent contrast-to-tissue specificity.

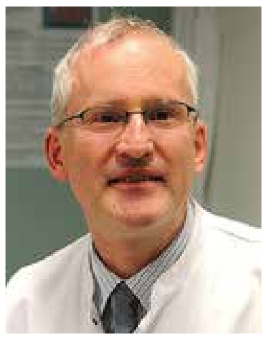
Prof. Dietrich is convinced that ultrasound, while still essential in a clinical setting, will continue to gain importance in disciplines such as intensive and trauma care due to mobility and POC availability.



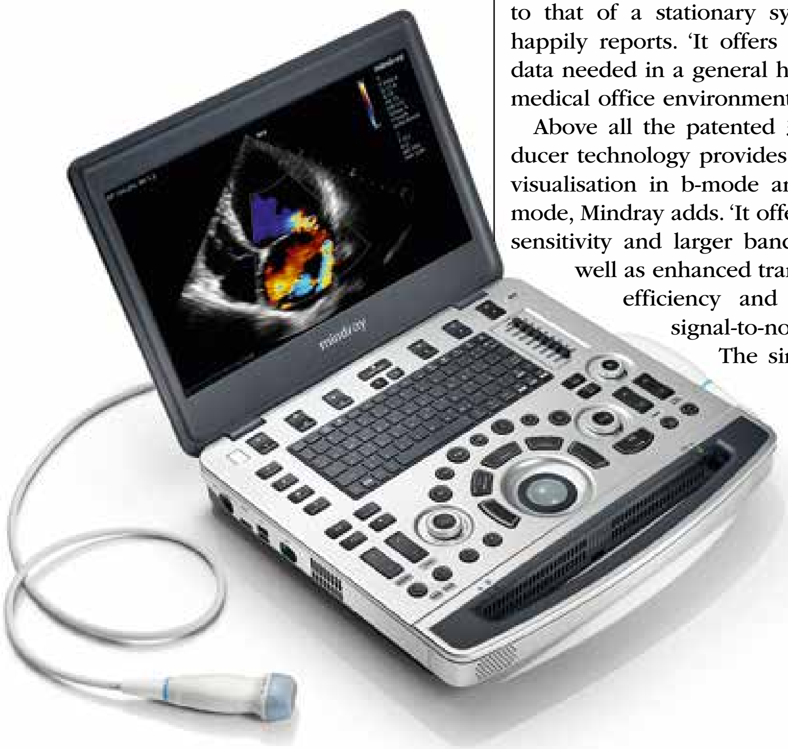
A perihepatic lymph node (LK) situated between hepatic portal vein (PA) and inferior vena cava (VCI) illustrates the M9's high resolution. Liver, duodenum (DUO) and right renal artery (ARD) are also marked.



Contrast-enhanced ultrasound (CEUS) visualises bleeding and abscesses and allows characterisation of the surrounding liver tissue. Note the enhanced margin between the markers.



Current President of the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) **Christoph F Dietrich** has been senior consultant at Caritas Hospital in Bad Mergentheim, Germany, since 2002. A German National Academic Foundation scholarship enabled studies at Hanover's Medical University. Additionally, in 1988 he passed the US-American FMGEMS exam. From 1997 he specialised in internal medicine and in 1999 received his habilitation. Professor Dietrich is also a certified specialist in several other disciplines, including gastroenterology and haematology/oncology.



M9 ASSETS

- Single crystal 3T transducer
- UWN+ Contrast Imaging (ultra-wideband non-linear)
- HDR Flow (High Dynamic Range Flow)
- Natural Touch elastography
- LVO (left ventricular opacification) with stress echo
- Compatible with TEE transducers
- mQuadro ultrasound platform

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Ultrasound system sharpens paediatric hepatic imaging

High quality B-mode with advanced functions makes UltraFast the "go-to" device for paediatricians

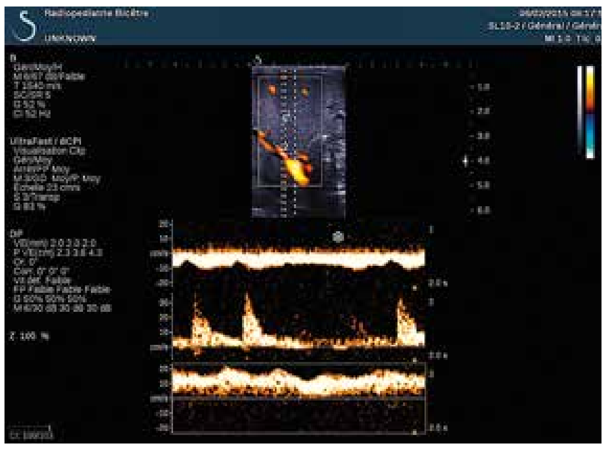
Ask about UltraFast ultrasound and you might expect a technical answer explaining why the ultrasound is faster. However, for Stéphanie Franchi-Abella MD, fast means just fast, an ultra-quick acquisition she can take of a squirming, agitated new-born in the blink of an eye. 'These babies are small and breathing rapidly, the organs are moving fast in the image and it's sometimes difficult to record Pulsed Wave Spectral Doppler in their vessels that are small.

'UltraFast facilitates Doppler acquisitions. It only takes two seconds to record all Doppler data in an image and you can obtain all conventional Pulsed Wave Spectral Doppler measurements retrospectively and assess the blood flow in these vessels recorded in the image. This is interesting in young patients because one acquisition may be sufficient to assess arterial and vein patency.

'In liver disorders it is very interesting in showing transient inversion of peripheral portal blood flow that we would not be able to see with a Doppler. For us, this can be a sign of portal hypertension,' explained Dr Franchi-Abella, who is a paediatric radiologist at Bicêtre Hospital in Paris, the leading tertiary centre for paediatric liver disease and liver transplantation in France.

At this year's ECR she is presenting a lecture on *'The Benefits of Using UltraFast Ultrasound Imaging in Paediatric Patients'* during the SuperSonic Imagine Satellite Symposium (4 March).

Liver Fibrosis of a few months old child measured simultaneously in kPa (4.7kPa & 5.1kPa) and m/s (1.2m/s & 1.3 m/s). No fibrosis corresponding to a F0 Metavir score



UltraFast Doppler displays multiple spectrums in a single image in this neonatal liver with cholestasis. Full display achieved in a single acquisition

In 2012, her clinic was first equipped with an Aixplorer ultrasound platform from SuperSonic and the following year the group presented at JFR (the French meeting of Radiology and ESPR European Congress of Paediatric Radiology) preliminary findings from a study of 98 children, half of whom were healthy while the others had liver fibrosis. The study compared the metrics reported by the ShearWave Elastography function on the Aixplorer with histological staging of biopsies from the same tissue. 'In 90% of cases the ShearWave Elastography (SWE) matched the liver fibrosis staging obtained from biopsy,' Dr Franchi-Abella said.

An article reporting these preliminary findings is now in press with the journal Radiology. Meanwhile these results caught the interest of the French ministry for health, which is co-sponsoring an expanded study that will enroll over 200 children to establish and validate SWE as a non-invasive tool for the diagnosis of liver fibrosis. 'I would not want to promote any findings ahead of the definitive results; but, what is clear, and what we can say, is that the preliminary findings are very encouraging. There may be a possibility that we can better decide when to perform biopsy in certain indications,' she said.

While the primary endpoint of establishing a correlation between histology reports and SWE remains the same, the method for analysing the histological samples calls for a computer-assisted assessment. 'In other words, instead of having only a visual assessment, where the pathologist looks at a slide, we will scan the slide for an additional and more objective assessment with software analysis,' Dr Franchi-Abella explained. 'We expect to be able to complete this study next year.'

In her ECR symposium presentation, the expert said she will discuss specific applications of Aixplorer, both for its advanced UltraFast functions and elastography, as well as for its B-mode, 'although I plan to show examples of how we apply the Ultrafast ultrasound in clinical practice, notably for liver disorders,' she said. 'We have had high-end ultrasound systems with complicated keyboards and so many buttons everywhere that there is nothing natural about learning how to use them. The Aixplorer has proven to be so much simpler to use that most radiologists in our service have taken it up easily and rapidly. It quickly became the preferred system for everyone in our clinic. It is the "go-to" ultrasound system because of the high-quality imaging.'

The multi-task Aixplorer can cover routine clinical assessments of morphology, whether for a neo-natal brain, or the hips, and notably for the digestive anatomy, she added. 'We have improved our diagnostic performance in some disorders since using the Aixplorer. For example in biliary atresia – a progressive biliary fibrosis leading to biliary obstruction in newborns – the presence of a microcyst (<0.5 mm) next to the portal bifurcation is quasi pathognomonic of this disorder. The quality of the SL10-2 probe improved the detection of such microcysts a lot, and that is helpful in assessing this pathology. For this diagnosis we don't want to lose any time. Babies who have surgery before 40 days have a better outcome with a greater chance to resolve the pathology and avoid liver transplantation, so it is essential to make a diagnosis as early and as quickly as possible.

'The fact that we have advanced functions for measuring liver stiffness, or to better see microvasculature, helps us to understand certain pathologies better. For children receiving liver transplants, the first month can be complicated with many things that could happen (rejection, infection, vascular disorders and so on).

'Sometimes the ability to link a morphological image with elastometrics helps to understand what is happening better and make a much more precise diagnosis. I'll be sharing examples from such cases of children with a liver transplant in my ECR presentation.'

Paediatric liver imaging expert Stéphanie Franchi-Abella MD, Department of Pediatric Radiology, Bicêtre Hospital, Paris, France

Subscription rate
6 issues: 42 Euro, Single copy: 7 Euro.
Send order and cheque to:
European Hospital Subscription Dept

Printed by: WVD, Mörfelden-Walldorf, Germany
Publication frequency: bi-monthly
European Hospital ISSN 0942-9085

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At work with a new generation 1.2-T MRI scanner

Value in an open platform

As Hitachi deploys its new generation of Oasis 1.2-T MRI scanners throughout Europe, our Madrid correspondent asked Dr Manuela Jorquera Moya about her experiences with the new scanner over the past few months

Report: Mélisande Rouger

Musculoskeletal- and neuro-radiologist Dr Moya works at San Carlos Hospital, a public facility, and at the Advanced Surgery Centre of Virgén de la Paloma Hospital, a private institution where an Oasis 1.2-T MRI Scanner was recently installed. Open from 8am to 10pm her department scans 20 to 24 patients a day, mainly for ambulatory care.

Dr Moya: 'A high percentage of the patients suffer from claustrophobia, and a significant number of patients prefer to be examined in an open-platform, probably because they feel more comfortable here than in a confined scanner.

'The Oasis platform offers high field imaging, so we mainly perform MSK and nervous system examinations. Most of our patients come from traumatology and neurology. We also perform abdomen and mammography examinations, mainly in patients with claustrophobia. We rarely image obese patients; this population is still low in our country.'

Why did the Centre choose Hitachi's equipment?

'Ours is the first Oasis system installed at a private facility in Madrid. Only one public hospital had previously been equipped in the capital. This means we can now also offer this service to patients coming from the private sector, who represent a large number of patients in Spain.'

What is specifically good about working with Oasis?

'Oasis is useful for any study that requires high field imaging. The wide open-platform enables us to perform high field studies in patients with claustrophobia who otherwise would never be able to benefit from, for instance, specific abdomen, liver or whole-body MR examinations, unless they are sedated.

'The open-platform is very convenient. I have been working with the system since last September, and I find it very good not only for patients with claustrophobia but also for children. Young patients who undergo an examination in a confined bore tend to move because they are nervous. If one of their parents can sit and chat with them during the examination, it helps them relax. Putting them at ease definitely reduces the risk of repeated scans, decreases scan time and provides higher quality diagnostic images.'

Oasis 1.2-T features susceptibility weighted imaging (SWI), spectroscopy and perfusion, which all play an important role in neurological exams.

For MSK examinations, the open platform architecture helps to acquire an image radially. Many patients will voluntarily or involuntarily move during an examination. The flow and motion compensation technique of radial acquisition significantly improves image quality and expedites interpretation without having to sedate patients.

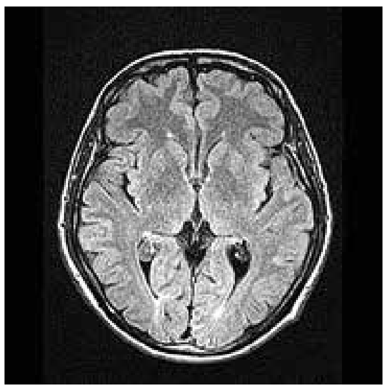
What could be changed in the future?

'I am not sure how Oasis is going to develop further, but I think technology will soon enable the magnet power to increase to 1.5 or 2-T, which would definitely improve the offer for open high-field equipment. However, for the moment, I believe developments will rather focus on short bore MR equipment.'

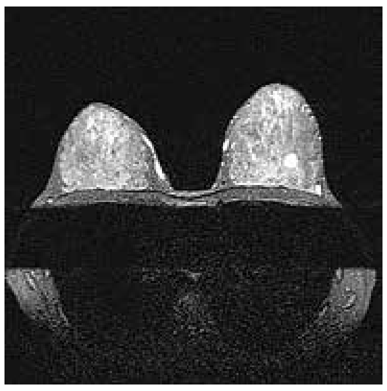
Hips coronal arthrography

Knee magnetic resonance arthrography

Wrist magnetic resonance arthrography



Skull FLAIR axial



Breasts STIR axial

Orbits STIR axial

Clinical images by courtesy of Dr Jorquera Moya

Dr Manuela Jorquera Moya works at San Carlos Hospital, one of Madrid's largest healthcare facilities, and at the Advanced Surgery Centre of the Virgén de la Paloma Hospital

Cardiac CT scanner drops radiation d

Further big plus: Even patients with AF and high heart rates can be scanned

Consultant radiologist **Russell Bull** joined the Royal Bournemouth Hospital in 2000, where a year later the UK's first Toshiba Aquilion multi-slice CT was installed. The hospital has been the main UK reference site for Toshiba ever since. In 2009, the hospital again became the first in the UK to install the Aquilion One single rotation, single heartbeat cardiac CT scanner. Then, in 2012, a 128 slice Aquilion CxL was installed which also incorporates AIDR 3D technology.

Dr Bull initially worked as a general cross sectional radiologist and started a cardiac CT service at Bournemouth in 2004, using a Toshiba Aquilion 16. For the past four years he has worked almost exclusively as a cardiothoracic radiologist, splitting his time between cardiac CT and MRI.

A British Society of Cardiac Imaging (BSCI) survey has confirmed that Toshiba's Aquilion One scanner not only delivers exceptionally low radiation doses for cardiac CT, but also widens the scope of diagnostics in Cardiac CT because even patients with conditions eliminating them from a CT exam before this machine arrived can now be scanned.

An incredible 40% lower radiation dose

'This data is possibly the most powerful I can show about the Aquilion One with the PureVision detector,' said Russell Bull MD, Consultant Radiologist at the Royal Bournemouth Hospital, Dorset, United Kingdom, where the study data was collected. Over a one-month period at the hospital, an unselected patient population was surveyed. The group included all patients, as well as those with atrial fibrillation and high body mass index.

The radiation dose of around 1mSv for an unselected population is amongst the lowest ever recorded for cardiac CT. 'I would have been happy with 20% reduction in radiation dose compared to the previous survey,' Dr Bull said, when presenting the BSCI findings. 'In fact, there was a 40% reduction in dose. This is extraordinary as the Aquilion One was already a low dose scanner in the previous survey.'

Better imaging with high contrast

Adaptive Iterative Dose Reduction in 3D (AIDR 3D) is integrated in the Aquilion Vision. This not only minimises image noise, thereby enabling radiologists to lower the radiation dose, but also assures high diagnostic quality images.

Combined with the wide detector array of 16 cm., this CT scanner enables volumetric scanning, where entire organs can be captured with perfect temporal uniformity and completely free from z-axis misregistration at a rotation speed of 0.275 seconds. As a result Dr Bull said: 'The image quality is actually much better, which has to do with the combination of the PureVision detector and the AIDR 3-D processing. We are seeing better images for 40% less radiation dose. With Aquilion One we can scan patients we wouldn't even consider scanning on a conventional scanner.'

4-D imaging and more

With this Toshiba CT scanner time can be added as the fourth dimension paving the way for high-quality dynamic volume applications, or 4-D dynamic volume imaging,' the manufacturer reports. 'Each individual set of data, acquired in a dynamic volume, shows an exact moment in time, or the exact phase of contrast enhancement.

Dr Bull also added that, the ability to change the table speed on the fly with Variable Helical Pitch (vHP) is unique to Toshiba. This, for example, makes it easier for the technician to do a TAVI scan,

Standardised CMR education

Cardiologists gain MRI training

Seeing a substantially increasing importance of the cardiac MRI procedure, cardiologists have developed a specialist cardiac MRI training programme for their colleagues, Bettina Döbereiner reports

Over the last two years technical developments in cardiac MRI have undoubtedly had a major impact on cardiovascular medicine. To acknowledge this development, at least to some extent, the German Cardiac Society (DGK) has developed a specialist Cardio-MRI training programme. This January, Professor Hugo Katus, Head of the DGK's Working Group for Training and Advanced Training, introduced the new curriculum at the annual DGK press conference in Berlin.

These days, cardiovascular medicine would be inconceivable without cardiac MRI and, according to Prof. Katus, who is also Medical Director of the Clinic for Cardiology, Angiology and Pulmonology at the University Hospital Heidelberg, its importance will continue to grow.

Therefore, Katus and his DGK colleagues aim to ensure that this imaging procedure has a firm place in out- and in-patient cardiovascular medicine

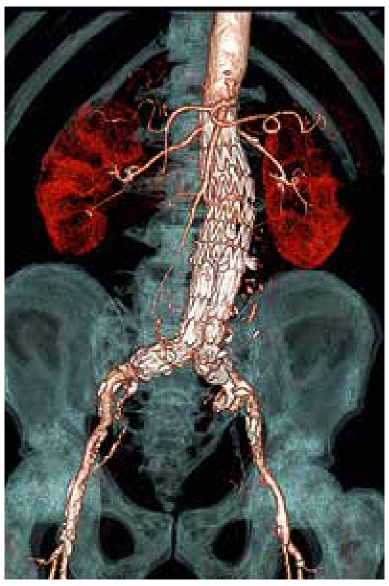
Unified standards

As a first step, the society's cardiologists have developed an additional qualification in Cardio-MRI, which members of their profession can attain. The initiators hope that the curriculum (V. Hombach et al, Curriculum Cardiac Magnetic Resonance Tomography (CMR), in: Cardiology 2014, 8:451-451) developed by the DGK Working Group will set the first, unified standards for well-conceived MRI training (education CMR curriculum) across Germany.

Advanced training in this field is closely aligned with existing international curricula, such as those developed by the European Society of Cardiology (ESC) and

Continued on page 24

lose 40%



because it saves time and contrast dose while reducing the patient's radiation dose.

In addition, the radiologist noted, 'We have no problems with patients who are unable to lie flat or have ridiculously high heart rates, or even atrial fibrillation. They can be scanned perfectly, showing coronary arteries at low dose. This really works. We can scan anyone.'

New device provides 3-D panorama, 2-D sequential imaging and more…

Safer head and neck imaging

'The engineering evolution of the NewTom range has delivered an ultra-modern, ultra-technological, ultra-competitive device – the most complete CBCT,' the device manufacturer reports.

'NewTom VGi evo performs 3-D imaging, panoramic imaging, teleradiography and 2-D sequential imaging. The device introduces a new image chain, which includes features that increase standard CBCT performances, such as an enlarged flat panel sensor, with an improved signal/noise ratio and a rotating anode generator with a 0.3 mm focal spot.'

With 51 scan modes, NewTom VGi evo adapts to specific needs of different clinical applications. The FOV range goes from 5x5 cm to 24x19cm, recommended for Head & Neck applications. NewTom also introduces SHARP 2-D technology, enabling the VGi evo to generate a complete set of 2-D images (AP, PA and LL cephalometric images), the manufacturer explains, adding: 'It also features the CineX function, a dynamic sequence of 2-D images for analysing swallowing, salivary ducts, TMJ with contrast and flexion and extension of spine.'

Dose reduction

To protect users, the device uses pulsed emission that activates the X-ray source only when needed and a total exposure for a standard exam takes only 1.8 seconds. Further dose reduction is achieved by using VGi evo's new Eco Scan mode, available for all FOV, combined with SafeBeam technology.

Details: www.newtom.it

Cardiologists gain MRI training

Continued from page 23

the Society for Cardiovascular Magnetic Resonance (SCMR).

Just like its international models, the DGK curriculum is divided into three CMR-levels. Level 1 and 2 will provide the basis for a cardiologist to assess the indications, perform and interpret CMR examinations correctly in a large database of patients with a broad range of cardiovascular diseases. The third level will enable the cardiologist to lead a CMR laboratory and to perform scientific CMR examinations at a defined high level.

However, this curriculum is only a first, modest step; Prof. Katus believes there is still much to do to integrate CMR into cardiovascular medicine as envisaged by the cardiologists. At the conference, Katus pleaded for CMR to become a mandatory part of training for all those specialising in cardiology, and for CMR-qualifications to be recognised in all German Federal States – currently not yet the case. He pointed out that safe performance of cardiac MRI investigations in patients with critical heart disease, and proper interpretation of the functional MRI images, requires in-depth training and substantial expertise in clinical cardiology.

Reimbursement

Katus also argued for the statutory health insurers to comprehensively cover all out-patient CMR examinations without any limitations, and for in-patient CMR examinations to be reimbursed as a 'separate charge' (currently, cardiac MRI is only accounted for by being included in lump sum payments).

The professor also made a further demand in the name of the DGK, thereby venturing into somewhat controversial territory. He called for the equal treatment of cardiologists and radiologists from an accounting perspective, because the statutory medical insurers currently only reimburse costs if CMR is carried out and evaluated by a radiologist qualified in cardiac MRI. However, as recently as 2014 and in response to a lawsuit from a cardiologist, the Federal Social Court of Germany upheld the current regulation that governs that only sufficiently qualified radiologists are entitled to receive reimbursements for CMR costs.

In its decision, the court referred to, among other regulations, the 'Two-Man Rule', which remains intact as long as the division of duties between radiologists and cardiologists continues. The principle is also used to ensure that diagnosis is made independent of potential financial interests.