continued from page 17

develop comfortable coils that are more flexible and conform to a variety of patient sizes," said Stephane Maquaire, MR product marketing director for Europe at the company.

The Premier scanner also features the SuperG gradient coil designed to provide the performance of a research-class 60cm MR system in a 70cm bore. The company reports that the system can perform a routine fast brain examination in under five minutes by using HyperSense, HyperBand and HyperCube, the scanning tools included in the HyperWorks application suite.

Hitachi is featuring the SynergyDrive MR workflow engine. Designed to address bottlenecks in the MR scanning process and speed up throughput, it offers automated patient registration, prepopulation of scanning protocols, streamlined patient positioning and setup, and Auto Image Load – a feature that helps prepare the next scan, according to the vendor.

Evolution 6, the latest version of the firm's MR operating system, supports faster multiphase dynamic imaging with the fat separation time-resolve MRA (TRAQ) technique, an improved patient experience through Hitachi's Softsound pulse sequences, and high-resolution free-breathing abdominal imaging and enhanced metal artefact reduction with the vendor's HiMAR capability.

Meanwhile, **Philips** is emphasising cost-effective scanning with its MR Prodiva, the 1.5 Tesla machine that has a 60cm bore and small footprint to make it easier to site in tight spaces. The system supports the company's Breeze Workflow technology, which consists of a flexible lightweight digital coil system to support fast patient setup. Combined with Philips' dStream digital broadband product, MR Prodiva offers high-quality imaging while also helping to manage costs through low transportation, installation, and energy consumption expenses, according to Philips.

Customers can also make use of Philips' Ambient Experience In-Bore Connect technology, which lets patients personalise their environment with visual themes and also guides them through the examination with instructions. The audio-visual experience is said to calm patients and guide them through MR scans by obscuring the internal surface of the scanner bore from the patient's view and replacing it with soothing video images. The video can be themed according to patient choice (e.g. landscapes, seascapes, underwater marine-scapes) and is accompanied by soothing headphone delivered audio.

Technical Exhibition Opening Hours

Thursday, March 1 to Saturday, March 3	*10:00–17:00*
Sunday, March 4	*10:00–14:00*

BY STEVE HOLLOWAY

MRI 2028: What to expect in the next decade of MRI?

The 50th anniversary of MRI for clinical use will occur in the next decade. Over this time, MRI has remained at the pinnacle of diagnostic imaging, with untold influence over many advances in diagnostic radiology. Yet as we enter an increasingly digital era of medicine, what role will MRI play? Below, we explore some of the future developments and speculate about their influence on MRI and radiology in general.

Trend	Market Impact	Driver	Challenge
MRI-linac for Radiation Therapy	+	Simplified pre-registration More accurate therapy Greater treatment efficiency	Prohibitive cost Limited system availablity Small customer base currently
MRI in Neurology	++	Greater research focus Availability of specific software Declining scanner prices	Limited specialist availablity Early in adoption of radiomics
'Optimised' MRI system availability	+++	Focus on cost and efficiency Increasing role of analytics and BI Multi-protocol technology	Long replacement cycles Relative high cost to other imaging

MRI in neurology

Of the major clinical applications, neurology is perhaps the area that stands to benefit the most from technological advances in MRI. While fMRI has been used in research in the last 25 years, clinical adoption has been far slower. Yet, alongside more recent use of diffusion MRI and wider availability of PET/MR, it is increasingly being used, from pre-surgical assessment to managing complex neurological disorders such as Alzheimer's and epilepsy. New techniques are also emerging, including cerebral sodium MRI for assessment of stroke damage, a technique that required availability of high-field scanners, now possible with declining system prices.

The use of MRI for neurology has benefitted from the growing role of specific software tools to support analysis. Looking forward, radiomics is sure to play a far bigger role. Solutions from a growing group of vendors, such as icometrix, SyntheticMR, CorTech Labs, Brainreader and Pixyl, as well as leading modality vendors, are now making neurological radiomics more accessible and integrated. If this trend continues, establishment of threshold quantitative values for diagnosis of common neurological disorders, such as hippocampal volume for dementia, are expected to become standardised.

Quicker, smarter, cheaper

While often overlooked, the latest generation of 'work-horse' MRI systems on the show floor today will also shape the next decade of use. Due to long life-cycles for MRI systems, new systems today are the industry standard of the next decade for most users. Good news then, given the significant advances made.

Scan time has been dramatically reduced, across various protocols, though focus has been directed mostly towards the highest volume scans; spinal, brain and knee. In many cases, the common scan time has been reduced by half or more, with new technology allowing protocols to run simultaneously. Expect such advances to spread into other more common protocols, with abdominal imaging next in line. Reduced scan time has benefits for patients and providers alike; shorter scans reduce patient anxiety and time in the scanner, as does noise reduction and new coil technology, while making MRI more available to patients. For providers, new systems allow an increase in patient throughput without comprising the quality of diagnoses, not to mention the financial and operational benefits. When considering also that analytics and business intelligence (BI) is increasingly being deployed to help manage and optimise patient scheduling and imaging practice management, we should expect that the newest generation of scanners will be the most accessible to patients yet.

Radiation therapy and MRI

Much like the development of 7 Tesla MRI for clinical use, the potential use of MRI for radiation therapy (RT) in place of separate CT and RT linear accelerators (linac) has long been discussed and debated. Yet in the last two years, integrated MRI-linac has become a clinical reality, with a handful of systems now in use and with many more on order.

CT has been used as the primary modality for RT planning and positioning to date, yet it has some limitations. As the CT is performed separately before the RT, there are challenges in ensuring millimetre-perfect patient registration at the start of the therapy cycle. There are limitations too with CT for soft-tissue contrast, making it difficult to accurately target radiation at tumour tissue only, especially in treatment of the brain, liver and other organs.

Integrated MRI-linac systems offer significant advantages over CT or cone-beam CT in these respects, as pre-registration is simplified. The 'real-time' nature of MRI can better accommodate treatment of soft-tissue organs in motion too, accounting for normal breathing. Use of functional MRI (fMRI), which monitors changes in tissue blood flow, allows the therapy beam to be more accurately targeted to the most active parts of the tumour. Dosimetry control can therefore be more specific and targeted, while limiting the chance of healthy tissue being affected.

Development of integrated MRI-linac systems has not been straightforward, especially given in the past that electrons from the radiation beam were affected by the magnetic field of the MRI, causing distortion of the treatment beam. However, these challenges have now been overcome, with the first systems commercially available and in use since early 2017.

Looking forward, MRI-linac systems will become more widely used, especially as a growing number of vendors develop systems. System cost will certainly remain prohibitive (systems can range from €4m to €10m based on current or planned pricing for systems in development), though leading cancer treatment centres are already looking to switch to a fully integrated MRI-linac approach.

Not bad for a modality over 40 years old.

Steve Holloway is Analyst & Principal Analyst at Signify Research, a UK-based independent supplier of market intelligence and consultancy to the global healthcare technology industry.

BY KATARINA KRISCHAK, MICHAEL CREAN, PETER GORDEBEKE

EIBIR-supported imaging research projects feature in ECR session

Due to shrinking national research budgets, European researchers are now increasingly looking to EU funding sources to fill the gap. However, navigating through the rules and regulations of large EU projects while carrying out innovative research with partners from across Europe can be challenging and time consuming. That is why multidisciplinary and multinational research consortia often require professional project management; it ensures the successful accomplishment of their project goals.

The European Institute for Biomedical Imaging Research (EIBIR) is a non-profit organisation, founded by the European Society of Radiology, which aims to enhance biomedical imaging research, in Europe and beyond, by providing invaluable proposal preparation, project management and dissemination & communication services to researchers.

EIBIR's services also include advice on funding opportunities, identifying consortium partners and proposal preparation support from a team of experienced writers with knowledge of the European Commission's requirements. Researchers can also benefit from EIBIR's well-established and extensive network for dissemination. Through the large and diverse landscape of network members, shareholder organisations, industry partners and media contacts the research results from EIBIR-supported projects can be widely and rapidly disseminated.

EIBIR is currently a partner and/or coordinator of seven projects funded under Horizon 2020, the biggest EU research and innovation programme to date. This vital support relieves researchers of the administrative burden inherent in such projects, allowing them to focus on the scientific work and thereby ensuring the best possible outcome for the project.

At ECR 2018, three projects in which EIBIR is involved will be presented during the special EIBIR Research Session today at 16:00–17:30 in Room L8.

The project **Laser and Ultrasound Co-analyzer for Thyroid Nodules (LUCA)** is working on a new solution for thyroid nodule screening and an improved and more accurate diagnosis of thyroid nodules. By combining traditional ultrasound with an optical system based on diffuse correlation spectroscopy (DCS) and an optical system based on time-resolved near-infrared spectroscopy (TRS), the LUCA project partners are developing a portable, low-cost device for simultaneous multiparametric ultrasound imaging with optical measurement of tissue haemodynamics and the composition of thyroid nodules. This new device will help to reduce the number of invasive diagnostic and therapeutic procedures and provide enhanced information for clinical decision-making.

The LUCA project is expected to have a major impact on the effectiveness, cost and speed of medical diagnosis in the field of thyroid cancer and beyond. The device has the potential to represent a very innovative tool for the diagnosis, screening and therapy monitoring of other types of cancer in areas of the body accessible to both ultrasound and near-infrared diffuse optical technologies and is expected to have a major impact on society.

EIBIR serves as leader of the Dissemination Work Package in the LUCA project, overseeing the dissemination and communication of its results to the scientific community and outreach to the general public. EIBIR also closely supports the project coordinator with the project management, ensuring that all tasks, milestones and deliverables are achieved on schedule. The project as already passed its first 18-month reporting period, with positive feedback from the European Commission.

The project **Digital Hybrid PET/MRI for Enhanced Diagnosis of Breast Cancer (HYPMED)** is designing, building and testing a ground-breaking PET radiofrequency (RF) insert that will vastly improve breast cancer imaging. This new device will also facilitate guided biopsy through a combination of high-resolution/ultra-high sensitivity PET and structural and functional MR. With the molecular and functional PET-RF imaging developed by the this project, physicians will have more information when selecting appropriate and individualised treatment, leading to improved survival and quality of life for women with breast cancer.

With this new insert, any regular clinical MR machine can be turned into a hybrid system when required. The insert is being created by integrating an innovative and fully digital MRI-transparent PET detector into a multichannel PET-transparent MRI surface coil.

The impact of this technology on breast cancer diagnosis, prediction, monitoring and assessment of treatment response will be evaluated by a clinical study, due to begin in the latter half of the project, which will test established and novel PET tracers in patients. Imaging data will be correlated with established and novel molecular biomarkers, and the results will be compared to those obtained from whole-body PET/MRI and PET/CT.

The project is made of ten partners, which include leading universities, research organisations and industry from across Europe. EIBIR serves as project coordinator while also leading project management and dissemination work packages. Having already passed its first 18-month reporting period, the project received a positive review from the European Commission and is on track to reach all objectives and milestones. As leader of project management and project coordinator, EIBIR was instrumental in ensuring an efficient reporting process, assisting and guiding all partners through the European Commission's complex reporting procedures.

The **Smart Optical and Ultrasound Diagnostics of Breast Cancer (SOLUS)** Project aims to develop a new imaging system that can detect and classify breast lesions in a non-invasive manner and significantly improve the ability to differentiate between benign and malignant tumours. Invasive procedures, such as biopsies, are currently carried out in an unnecessarily high number of cases. SOLUS can help avoid such unnecessary biopsies by improving the characterisation of lesions in the breast.

The project's main objective is to develop an innovative, multi-modal tomographic system, combining diffuse optical tomography and ultrasound/shear wave elastography to support the in vivo diagnosis of breast cancer. This will achieve a substantially improved in-depth diagnosis of breast lesions with higher specificity and more effective treatment of breast cancer.

SOLUS is a four-year project which brings together engineers, physicists and radiologists of nine partners from five European countries. Over the past year, the project has focused on the development of components and subunits for the SOLUS system prototype. The photon detector and laser drivers were designed, and are currently being integrated into a smart optode, and subsequently combined with a regular ultrasound probe. Additionally, measurement procedures and phantoms for testing have been developed. The initial steps for the clinical validation were also taken, as the clinical study protocol was defined.

In the coming year, integration of components and manufacturing will continue, and the project's initial validation efforts will begin.

The LUCA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.. 688303.
The HYPMED project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 667211.
The SOLUS project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 731877.

EIBIR Session

Thursday, March 1, 16:00–17:30, Room L 8
EIBIR Research Session:
European imaging researchers united in diversity

- Chairperson's introduction
  G.P. Krestin; Rotterdam/NL
- **Laser and Ultrasound Co-analyser for Thyroid Nodules (LUCA) Project: latest results**
  U. Weigel; Barcelona/ES
- **Testing hybrid MR/PET (HYPMED) device for enhanced breast diagnosis in a multicentre clinical trial**
  T.H. Helbich; Vienna/AT
- **Smart Optical and Ultrasound Diagnostics of Breast Cancer (SOLUS) Project: aims and objectives**
  P. Taroni; Milan/IT
- **EIBIR's role in imaging research projects**
  P. Zolda; Vienna/AT