A-404 14:55

DCE-MRI in oncology - when is quantitative imaging essential?

A.R. Padhani; *London/UK (anwar.padhani@stricklandscanner.org.uk)*

Using perfusion imaging in clinical practice should not be delayed/hindered by the complexities of the technique. Introducing quantitative perfusion MRI into the clinic has to go through validation and clinical deployment phases. The validation phase is quantitative but clinical deployment can be qualitative or semi-quantitative. Complex quantitative analysis has roles in validation, drug development and is needed for multiparametric assessments. Future work should now focus on incorporating perfusion imaging as part of multiparametric assessments towards improving understanding of tumour heterogeneity, including response in the era of targeted/precision medicine.

Learning Objectives:

1. To show that the implementation of perfusion DCE-MRI into clinical practice has been delayed/hindered by the complexities of the technical analysis.
2. To demonstrate that complex quantitative analysis has roles in validation, drug development and is needed for multiparametric assessments.
3. To illustrate that the key role of quantitative DCE-MRI is in the validation phase of biomarker development but that clinical deployment can be reductive provided that sensitivity is maintained.
4. To discuss future work, which should focus on incorporating perfusion imaging as part of multiparametric assessments so as to improve understanding of tumour heterogeneity, including response in the era of targeted/precision medicine.

15:20
Panel discussion

14:00 - 15:30 **Room L 1**

EIBIR Session

EIBIR 3

MITIGATE consortium: state of the art imaging and therapy in GIST

Moderators:
S.O. Schönberg; Mannheim/DE
I. Virgolini; Innsbruck/AT

A-405 14:00

Selective internal radiotherapy in GIST patients

S.J. Diehl; *Mannheim/DE (Steffen.Diehl@umm.de)*

Gastrointestinal stromal tumours (GISTs) spread frequently to the peritoneum and the liver. If resection of metastases or tyrosine kinase inhibitors (TKIs) fails, interventional ablation techniques are considered. Main topic of the presentation is the application of Selective Internal Radiotherapy (SIRT) for liver metastases in GIST patients. Our outcome data will be presented. SIRT offers a safe and effective treatment for patients with GIST liver metastases who do not show a response to TKIs. The results might challenge the notion that GISTs are resistant to radiation therapy. Another focus of the lecture is on the combination of SIRT with other local ablative therapies, like Microwave-Ablation or Irreversible Electroporation (IRE). By showing different case studies the use of minimal-invasive therapies in GIST patients will be demonstrated.

A-406 14:30

Multimodal imaging in GIST

D.L. Longo; *Turin/IT (dario.longo@unito.it)*

Gastrointestinal stromal tumours (GIST) develop from interstitial cells of Cajal in the gastrointestinal tract and typically express activating mutation in the c-KIT oncogene leading to tumour cell growth proliferation and survival. Although tumour response to chemotherapy have long been determined using conventional anatomic imaging techniques, such as computed tomography (CT) and magnetic resonance imaging (MRI), volume changes in GIST response to imatinib treatment occur late and are often only detected several months after the treatment start. This interval can be a significant amount of time, in which a patient may be receiving an ineffective treatment intervention. This problem is even more an issue when evaluating newer drugs. Development of preclinical tumour model, on the other hand, allows to address novel targeted cancer therapeutics. In this situation, novel or alternative imaging methods may be advantageous in assessing drug efficacy. Besides metabolic imaging using fluorodeoxyglucose-based positron emission tomography (FDG-PET), MRI offers several approaches and techniques which measure changes in vascularity, cellularity and pH.

New Gd-based contrast agents dedicated for preclinical imaging allow to improve DCE-MRI procedures for a better assessment of tumour vascular permeability. In addition, contrast agents exploiting the chemical exchange saturation transfer (CEST) mechanism allow to report on the extracellular tumour pH, thus linking the metabolic activity measured by FDG-PET with tumour acidosis.

A-407 15:00

Principle of X-Nuclei MR imaging: what the radiologist should know

L.R. Schad; *Mannheim/DE (lothar.schad@medma.uni-heidelberg.de)*

Sodium (23Na) ions play an important role in cellular homoeostasis and cell viability. In healthy tissue, the extracellular sodium concentration ([Na+]ex = 145 mM) is about ten times higher than the intracellular concentration ([Na+]in = 10-15 mM). Using sodium MRI, volume- and relaxation-weighted signal of these compartments can be measured. Thus, sodium MRI is a promising diagnostic tool, since pathological processes can alter this ion gradient. A density-adapted 3D radial projection reconstruction pulse sequence (DA-3DPR) is presented that provides a more efficient k-space sampling than conventional 3D projection reconstruction sequences (3DPR). The gradients of the DA-3DPR sequence are designed such that the averaged sampling density in each spherical shell of k-space is constant. Benefits for low SNR applications are demonstrated with the example of sodium imaging. In simulations of the point-spread function (PSF), the SNR is increased by the factor 1.66 for the DA-3DPR sequence. Using analytical and experimental phantoms, it is shown that the DA-3DPR sequence allows higher resolutions and is more robust in the presence of field inhomogeneities. High-quality in vivo images of the human brain are acquired at 3 and 7 Tesla with up to a factor of 1.80 higher SNR and better anatomical detail resolution for DA-3DPR. First clinical/experimental results for measuring tissue viability are presented in volunteer/patient brain examinations at 3 Tesla and accompanying animal studies (rat/mouse) in experimental studies at 9.4 Tesla together with promising new developments for human whole body sodium imaging.

14:00 - 15:30 **Room MB 2**

EuroSafe Imaging Session

EuroSafe 2

EuroSafe imaging call for action

A-408 14:00

Chairman's introduction

G. Frija; *Paris/FR (guy.frija@egp.aphp.fr)*

The ESR launched EuroSafe imaging, an ambitious radiation protection initiative, at ECR 2014 as a driver for improved quality and safety in medical imaging in Europe. Within this framework, a call for action was issued in September 2014 comprising 12 action items with concrete projects and specific goals to deliver this mission. The call for action was designed to support the implementation of the Bonn call for action, launched by the IAEA and the WHO in 2012, setting priorities for stakeholders regarding radiation protection in medicine. EuroSafe imaging's action plan covers topics such as clinical audit, up-to-date imaging equipment, clinical decision support, education and training, and communication activities. Work has already begun on several items, including the development of European imaging referral guidelines for the ESR's planned clinical decision support product, data collection through the 'Is your imaging EuroSafe?' survey, or the publication of the ESR economics working group's paper on the renewal of imaging equipment in Europe. The cooperation between the research platform MELODI and several medical associations including the ESR was launched at a meeting in October 2014. This variety of actions and the range of different stakeholders involved in EuroSafe imaging reflect the ESR's inclusive and holistic approach to medical radiation protection.

Session Objectives:

1. To learn more about the ESR's strategy to establish a new quality and safety culture across Europe through the EuroSafe Imaging campaign.
2. To learn about CT practices in Europe based on the results of an ESR data collection survey.
3. To learn more about EuroSafe Imaging's training and education activities in the area of radiation protection.
4. To understand that medical radiation protection is a multi-disciplinary team effort.