QIBA Dynamic Contrast-Enhanced (DCE) MRI Biomarker Committee (BC) Call

Monday, January 4, 2021 at 11 am (CT)

Call Summary

In attendance			**RSNA staff**
Hendrik Laue, PhD (Co-Chair)	Annelise Malkus, PhD	Russell Rockne, PhD	Joe Koudelik
Michael Clark, MS, PMP	Krishna Nayak, PhD	Rianne van der Heijden, MD, PhD	Susan Stanfa
Todd Jensen, PhD	Nancy Obuchowski, PhD	Divya Yadav, MD	
Cristina Lavini, PhD			

New Member Introductions

- Rianne van der Heijden, MD, PhD, is a radiologist in training and postdoctoral scholar of quantitative musculoskeletal MRI at the Advanced Musculoskeletal Imaging Research Erasmus MC (ADMIRE) group of the Erasmus MC University Medical Center (Netherlands)
    - Research focus is on advanced quantitative MRI of the knee, such as compositional cartilage MRI, perfusion (DCE) MRI and PET-MRI
    - Serves as ISMRM Benelux Communications/Clinical representative on the organizing committee for the 2021 ISMRM annual meeting

- Michael Clark, MS, PMP is the Chief Operating Officer (COO) at Image Analysis Group, Ltd. (IAG) (UK)
    - IAG strategically uses MRI, CT, and PET imaging to accelerate drug development and lower investment risks

Discussion of Dr. van der Heijden's public comments on DCE-MRI Profile

ROIs need to be delineated on anatomical images, not on the parameter map

- It was proposed that to avoid registration issues, which are quite frequent in other body parts than the brain, it would be best to draw ROIs on the raw DCE images
    - This way, registration of the individual DCE time points is the only registration needed; of course, this is only possible if the acquired DCE images have a high enough resolution
    - Additional discussion needed re: whether each kind of ROI should have an inter-observer variability measured
        - This should be sufficient if a certain ROI, e.g., knee cartilage, is known to be reliable
        - In the case of a known high variability, consensus between two observers would be a better solution
        - In the case of automatic ROI drawing, a proportion of the ROIs should be visually checked to ascertain quality

- DCE-MRI BC discussion focused on using the first (non-contrast) image
    - DCE applications beyond cancer was welcome as a future Profile since new contrast agents are safer than Gadolinium
    - Inflammation as a new target
    - Knee embolization
    - Anatomical landmarks/structure sufficient for ROI delineation
    - Fit-quality to be included in the ROI delineation, which is difficult in bone; it may not work in tissues other than brain and could be influenced by model results

Opulation vs. patient specific venous input function (VIF)

- Though the temporal resolution is often insufficient, patient specific VIF was suggested as the best option; otherwise, the population average VIF is superior to literature VIF
    - VIF choice also depends on the question to be answered and the available expertise to recognize good vs. poor VIF
    - In the case of individual patient follow-up, the patient specific VIF is needed to adequately detect individual changes
    - With comparison of a controlled group of patients, the population average is more reliable and will be recommended in the Profile specifically for prostate use

- DCE-MRI BC members discussed that the population average was most reliable in rheumatoid arthritis; **Dynamic contrast-enhanced MRI of the patellar bone: How to quantify perfusion**, was referenced and the Profile text will be adjusted
- In addition to cancer, DCE can also be used to study inflammation and there have been several publications on knee rheumatoid arthritis and osteoarthritis, e.g., **Reproducibility of DCE-MRI time-intensity curve-shape analysis in patients with knee arthritis: A comparison with qualitative and pharmacokinetic analyses**

Scan Duration

- Though it was understood that K^{trans} is the parameter upon which the Profile focuses, it was suggested that the reliable measurements of volume of the extravascular extracellular space (V_e) and rate constant (K_{ep}) are needed, and scan time should include the wash out period
- The DCE-MRI BC discussed that:
    - A 6-minute acquisition time was deemed acceptable for the Profile (for brain and prostate)
    - In some instances, longer acquisition times are needed for musculoskeletal sites
    - Wait until extravasation started in tissue
    - May depend on K^{trans} range
    - Or it should possibly be stated that it should be highly perfused tissue

- It was noted that Dr. Sourbron had stated via public comment submission, that K^{trans} is not a model-specific parameter; it is a physiological parameter that measures the rate of uptake of an indicator into the extravascular space
- B1-mapping to be incorporated into a future version of the DCE-MRI Profile

Next call: Monday, February 1, 2021 at 11 am (CT)

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