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

Monday, March 30, 2020 at 11 am (CT)

Call Summary

In attendance			**RSNA staff**
Caroline Chung, MD (Co-Chair)	Hyunki (Harrison) Kim, PhD, MBA	Ho-Ling (Anthony) Liu, PhD	Joe Koudelik
Hendrik Laue, PhD (Co-Chair)	Cristina Lavini, PhD	Nancy Obuchowski, PhD	Susan Stanfa

Moderators: Drs. Chung and Laue

Profile Progress

3.6. Protocol and Reconstruction Design: discussion re: signal saturation and non-linearity subsection

- Depending on the sequence used, the signal to concentration relation can become non-linear at high concentrations
- At 1.5T, the MRI parameter ranges should preserve a sufficiently linear relation and prevent saturation
- It is recommended to test the sequences using the R1 phantoms and software by NIST
- It is important to take dosage and relaxivity of the contrast agent into account when adjusting sequences
- The publication currently informing the Prostate Claim at 3.0T is: Peled et al, 2018. **Selection of Fitting Model and Arterial Input Function for Repeatability in Dynamic Contrast-Enhanced Prostate MRI**. *Academic Radiology*
- At 3.0T, due to a T2* effect and a SAR limit, the signal linearity is difficult to preserve
- Dr. Kim suggested that population-based Arterial Input Function (pAIF) would be more practical, and the following aspects were discussed
    - The concern is not as much about T2* effect, but variation according to ROI determination; it will be more severe when field-of-view (FOV) is small
    - Since Parker's pAIF was measured from abdominal aorta, may not be able to use it for tissues other than abdominal organs; ideally, the pAIF will need to be measured for major organs
    - pAIF will need to be measured in lower magnetic field strength; since Peled, et al. used 3T, their pAIF is very likely to be influenced by the T2* effect
    - pAIF may not be useful for patients with severe heart complications or extreme body configuration, e.g. obese patients
    - Suggestion to calculate the inter-subject variation of pAIF to estimate the amount of variation of the target lesion perfusion that is caused by biological change, not by measurement variation; better if male and female can be differentiated
    - Option to modify pAIF using nearby muscle, however, the inter-subject variation of muscle-based correction and inter-operator variation must be calculated, as the ROI will be different according to the operators; muscle perfusion can be changed by a simple massage or weightlifting
- Recommendation to avoid providing details for 3T since this would require a separate imaging protocol, additional phantom testing and revisions to the current Profile
- It was emphasized that the purpose of the DCE-MRI Profile is to provide high-level guidance and clear instruction on how to acquire and analyze images in a standard, quantitative way; all nuances regarding linearity testing cannot be addressed in the body of the Profile
- Appendices need to be cleaned up and Dr. Lavini will address linearity details

DCE-MRI BC Members to be asked for feedback re: the following

3.11: Image QA

- Dr. Boss had previously recommended adding radiological images of common artefacts seen when doing DCE imaging as done in the DWI Profile; including examples from brain, prostate and breast, if possible
    - Sample images welcome from BC members

3.13: Image Analysis

- Add body site specific recommendations for image analysis, addressing brain, prostate and breast
- These recommendations could include identification of the appropriate VIF, warnings or guidance in terms of ROI, etc.
- Dr. Liu to work on brain section

3.14 Image Interpretation

Dr. Chung to remove text since much of this detail was included in other sections

Next call: Monday, April 13, 2020 at 11 a.m. CT
