

QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call

Tuesday, January 15, 2019 at 10:30 AM CT

Call Summary

In attendance

Xiaojuan Li, PhD (Co-Chair)

Thomas Link, MD, PhD (Co-Chair)

Michael Boss, PhD

Angie Botto-van Bemden, PhD

Robert Boutin, MD

Majid Chalian, MD

Alejandro Espinoza, PhD

Peter Hardy, PhD

Youngkyoo Jung, PhD, DABR

Leon Lenchik, MD

Ed Mojahed, PhD

Nancy Obuchowski, PhD

Yuxi Pang, PhD

Erika Schneider, PhD

Ramya Srinivasan, MD

Carl Winalski, MD

Cory Wyatt, PhD

RSNA

Joe Koudelik

Susan Stanfa

Moderator: Dr. Link

New Members

- Majid Chalian, MD from UT Southwestern
- Alejandro Espinoza, PhD from Rush University Medical Center

Arthritis Foundation Calibration Study Activities (Dr. Li)

- Though the multi-vendor data analysis is complete, measurements made on different platforms cannot be directly compared; cross-calibration is needed to obtain better comparability
- Since completion of the Arthritis-Foundation-sponsored, multi-site, multi-vendor cartilage $T_{1\rho}$ and T_2 quantification effort, Dr. Li has been working on a manuscript
- A 6-month project extension to follow up with traveling volunteers was granted
 - Cross-site data validation and reproducibility will be performed soon after

MSK Profile (Dr. Link)

- 3.6. Image Data Acquisition: Standardized $T_{1\rho}$ and T_2 sequences
 - Quantitative Imaging sequences will be based on the magnetization-prepared angle-modulated partitioned k-space spoiled gradient echo snapshots (MAPSS) acquisitions that were previously developed and have been validated on multiple vendors in the recent Arthritis Foundation sponsored study
 - Reminder that pulse sequences must match literature from which Claim statement is drawn; references for all Profile performance recommendations need to be cited
 - Discussion on rationale and advantages associated with spin echo vs. gradient (MAPSS) sequence
 - The MAPSS-based $T_{1\rho}$ and T_2 imaging sequence is available as research prototypes on the three major MR vendors including GE, Siemens and Philips
 - Limitations of gradient echo sequences are distortion, flip-angle sensitivity and other factors compared to spin echo sequences (outlined by Drs. Schneider and Winalski)
 - Spin echo sequences will be added into protocol for comparison and to potentially have data to compare values to those generated in the Osteoarthritis Initiative cohort
 - The profile focused on mono-exponential fitting
 - Bi-exponential or multi-exponential decay fitting will require larger number of echoes and higher SNR or images
 - Recommendation to add acceptable SNR measurement

- High resolution sequences for image segmentation and registration
 - Suggested imaging protocols were discussed
 - References for specific vendor sequences are needed in the Profile
 - Dr. Li to consult student who assisted with the study, regarding timeline to publish results; this would allow the addition of new data that would inform the protocol and be added to the Profile
- 3.7 Image Data Analysis and 3.7.1 Discussion
 - High-resolution anatomic images, as well as all T1_p- and T₂-weighted images will be registered to the first echo of the T1_p-weighted images
 - In the next few years, technology will be used with automatic segmentation and AI for new diagnostic understanding of changes regarding tissue structure and disease progression
 - Insights into different automatic segmentation algorithms were provided by Dr. Pedoia in a presentation on automatic cartilage segmentation and voxel-based Relaxometry during the [February 21, 2018 MSK BC call](#)
 - In clinical trials, centralized data processing is needed to avoid variation introduced by different software for relaxation time fitting and cartilage segmentation
 - Information on how a method can be validated will be included in the Profile, as opposed to endorsing a specific vendor product
 - Guidelines for reproducibility of segmentation to be provided; different types of segmentation can be used as long as they fit data reproducibility criteria
 - Dr. Link will draft this information for Section 3.7.1 of the Profile and will send it to Dr. Winalski for review
 - Discussion on this topic will continue during the next MSK BC call, scheduled for February 19
 - Section 3.9 Data Interpretation to be discussed during the next MSK BC call
 - Arthritis Foundation study manuscript will contain valuable information for the Profile
 - Dr. Li hopes to secure funding for development of a calibration phantom, whose utilization could be incorporated into the Profile
 - A long-term study goal is a second manuscript based on the development of the T1_p and T₂ imaging protocol experience

2018 RSNA Annual Meeting & QIBA Kiosk

- MSK BC volunteers were thanked for their time and efforts at the poster Meet-the-Expert sessions
- An overview on the breadth of QIBA projects was provided during the QIBA Working Meeting; QIBA was deemed key to the quantitative imaging efforts underway, e.g., making Profiles available to the imaging community and clinical trials

Next Call: Tuesday, February 19, 2019 at 10 AM CT

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