

QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call

Tuesday, August 21, 2018 at 10 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

Ali Guerhazi, MD, PhD

Youngkyoo Jung, PhD

Kecheng Liu, PhD, MBA

Sharmila Majumdar, PhD

Nancy Obuchowski, PhD

Yuxi Pang, PhD

Ramya Srinivasan, MD

Cory Wyatt, PhD

RSNA

Joe Koudelik

Susan Stanfa

Moderator: Dr. Link

Arthritis Foundation Calibration Study Activities (Dr. Li)

- Dr. Li provided an update on the Arthritis-Foundation-sponsored, multi-site, multi-vendor cartilage T1rho and T2 quantification effort
- In-vivo data, including subjects for each sites and two traveling volunteers, and phantom data are being collected
- Strategies to minimize variation across multiple sites and vendors are being explored
- Data will be presented on the September 18 or October MSK BC call
- Dr. Li is working with Dr. Mirowski (Verellium) and Dr. Keenan (NIST) to develop the calibration phantom; NIST to provide reference sample (for the phantom) for validation across sites
- NIH/SBIR grant application (to develop a phantom) has been submitted

MSK Profile (Dr. Link)

- Initial draft of “MR-based cartilage compositional biomarkers ($T_{1\rho}$, T_2) for risk prediction, early diagnosis and monitoring of treatment of degenerative joint disease,” distributed by RSNA staff on Aug 20, was reviewed
 - QA procedures, based on Dr. Erika Schneider’s 2013 paper and presentation during the June 12 MSK BC meeting (sections 3.1 – 3.3) were discussed
 - Measurements should include signal-to-noise ratio (SNR), image uniformity, spatial accuracy, eddy current, spatial resolution and gradient calibration
 - Because they introduce variation, hardware changes/upgrades (e.g. coils) as well as change in calibration phantoms need dedicated QA sessions; calibration phantoms and clinical volunteers deemed necessary
 - It was agreed that test sequence (QA) should be run on a monthly basis
 - Calibration phantoms AND clinical volunteers needed for MSK Profile groundwork
 - Dr. Link to refine Profile Section 3.3: Periodic QA
 - Previous work by Dr. Schneider on the OAI project demonstrated that quantitative phantom measurements were stable and only minor changes (in terms of coefficient of variation) were found over 8 years using 4 identical Siemens 3T MRI systems
 - It should be noted that phantom T2 measurements are sensitive to seasonal environmental fluctuations, such as temperature which may not only impact T2 values but may also impact detection electronics or overall power levels into the various system components
 - Dr. Li recommended storing the phantom in scanning room over night to maintain temperature consistency

- New phantom to be developed will contain built-in thermometer
 - As a side project, Dr. Li to look into temperature with T1rho
- QA procedures for MRI scans used during the Osteoarthritis Initiative (OAI) can be used as a template
- Patient selection and handling (sections 3.4 and 3.5)
 - Selection criteria to be based on previously-published studies
 - Indications with T1rho and T2 measurements were developed
 - Assessing cartilage quality in the non-affected compartment before interventions such as osteotomy and unicompartmental prostheses
 - Patients with advanced cartilage disease are not to be included, since measurements will not be limited due to defects in cartilage and abnormal composition of cartilage (repair and scar tissue)
 - Those with suggestions for changes and additions to these Profile sections are welcome to email [Dr. Link](#)
 - Subject handling
 - Important to request information regarding subjects' typical physical activities prior to selection
 - Subjects should be examined after having rested for 30 minutes
 - The entire process should not take longer than 1 – 2 hours
 - Exams should be performed in the morning
 - Patients should not have exercised on the day of the exam
 - Activity control: Patients should not have performed any unusual, atypical physical activities (such as a marathon or an extended hike) 48 hours before the MRI examination
 - Standardized leg/knee holder should be used in order to achieve reproducible images
 - Ankles and legs need to be sandbagged during the MRI scan to avoid motion in patients/volunteers (reproducible positioning inside the coil)
 - Image data acquisition:
 - Important to have standardized acquisitions
 - Brief discussion on methods to avoid motion currently used by some institutions
 - Standardized T1rho and T2 sequences still need to be developed
 - High resolution sequence required for segmentation and registration – SPGR and CUBE (GE), DESS (Siemens), water excitation FFE (Philips)
 - Dr. Link to work on Profile template for review during the September 18 MSK BC call; MSK BC members are encouraged to submit agenda items for this next call

OARSI Discussion Group (OAI) (Dr. Link)

- OARSI imaging discussion group during OARSI 2019 World Congress May 2 – 5, 2019 in Toronto, Ontario, Canada
 - Volunteers work on program is underway
 - Suggestions for potential topics are needed for this 90-minute presentation slot; Dr. Link to develop outline for discussion during the September 18 MSK BC call

Next Call: Tuesday, September 18 at 10 AM CT [regular time slot]

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