QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call

Tuesday, May 28, 2019 at 10 AM CT

Call Summary

In attendance			**RSNA**
Xiaojuan Li, PhD (Co-Chair)	Gabby Joseph, PhD	Kecheng Liu, PhD, MBA	Joe Koudelik
Thomas Link, MD, PhD (Co-Chair)	Youngkyoo Jung, PhD, DABR	Yuxi Pang, PhD	Susan Stanfa
Michael Boss, PhD	Feliks Kogan, PhD	Qi (Chris) Peng, PhD	
Robert Boutin, MD	Leon Lenchik, MD	Cory Wyatt, PhD	
Majid Chalian, MD			

Moderator: Dr. Link

*Some content/details below come from slides sets presented by Drs. Link and Li

Follow-up on OARSI imaging discussion group meeting in Toronto during OARSI 2019 World Congress May 2 – 5

- Dr. Link summarized presentations given during the discussion group meeting held on Saturday, May 4
    - Approximate attendance was 80-90 representatives of a variety of roles in the radiology field including industry, orthopedic surgeons, clinicians and researchers
- Mission and goals of the **OARSI imaging discussion group**:
    - Create an inclusive group including clinicians, radiologists, imaging researchers and industry representatives
    - Expertise in all imaging technologies and evaluation techniques
    - Representation of imaging related research and new developments at OARSI
    - Provide a forum to review State-of-the-Art imaging technologies and their clinical application
    - Present novel research
    - Allow discussion to identify gaps in research, clinical translation and education
    - Compose review articles, white papers and position statements
    - Provide an expert forum that may be used during the approval process of imaging biomarkers by regulatory agencies
    - Liaison to other committees such as RSNA Quantitative Imaging Biomarkers Alliance
    - Liaison to other meetings such as the International Workshop on Osteoarthritis Imaging
    - Liaison to funding agencies such as NIH and Arthritis Foundation

- "Introduction of a potential white paper on guidelines for imaging in the clinic" by Dr. Flavia Cicuttini (Monash University, Australia)
    - Clinical imaging in OA deemed a balancing act: low value care vs.:
        - Consumers need for diagnoses and the state of their joints
        - Healthcare providers need confidence in their diagnosis

- "Cartilage compositional MRI – does it have a role in defining early OA from a clinical perspective?" By Jamie MacKay (University of Cambridge)
    - Yes, for the following reasons:
        - Performance characteristics well-established
        - Repeatability comparable to other quantitative imaging biomarkers used in clinical practice
        - Well-characterized technically
        - Proven ability to detect early disease and predict development of cartilage defects
        - Incorporating qualitative assessment is relatively straightforward

- No, for the following reasons:
    - Fully quantitative approaches remain challenging in the clinic
    - Difficult sell to wider OA community
    - Ability to influence management remains uncertain

- Take-home message for non-imaging clinicians/guideline developers: "If we want to detect some of the earliest (reversible) stages of OA, cartilage compositional MRI is worthy of inclusion in an early OA definition"
- Take-home message for the imaging community: "We need studies demonstrating the real clinical utility of these methods and better, widely available methods for quantitation which fit into clinical workflow"
- Early OA needs to be better defined

- The discussion group meeting was a good format for providing greater visibility for imaging
- MRI was deemed a clinically essential part of the diagnosis and management of OA with atypical features
- Dr. Link predicted that more drugs having a positive impact on treating OA may be introduced over the coming years; at this time, no drugs exist to manage or prevent OA disease
- Availability of drugs will potentially make compositional MRI a more important diagnostic test used for deciding to treat and monitoring disease

Dr. Li presented the results of the Arthritis Foundation funded Cross-Calibration Study during ISMRM

- "Multi-vendor, Multi-site $T_{1\rho}$ and T_2 Quantification of Knee Cartilage" involving Cleveland Clinic, Albert Einstein College of Medicine, UCSF and University of Kentucky
- Siemens, GE and Philips machines were used
- Introduction:
    - Osteoarthritis (OA) is a degenerative joint disease characterized by deterioration of articular cartilage
    - $T_{1\rho}$ and T_2 are promising biomarkers for detecting early stage of OA
    - Several multi-site single-vendor studies on reproducibility were conducted
    - Few prior studies evaluated the reliability with different sites and vendors
    - Goal: evaluate reproducibility of $T_{1\rho}$ and T_2 in multi-site multi-vendor setup

- Conclusion:
    - 3D MAPPS were successfully implemented on 3 vendor MRI platforms
    - Excellent intra-site reproducibility was achieved
    - Differences in measurements among vendors and sites were observed
    - Contributing factors such as temperatures for phantoms, scan preparation for in-vivo, B_0 and B_1 in homogeneity will be investigated in the future

- MSK BC members discussed ways to reduce inter-site variability:
    - Temperature monitoring device will be implemented in the phantom during the extension of this study
    - All phantoms will be shipped and scanned on a single scanner at Cleveland Clinic to look at variability within the phantom itself
    - Other subject-handling factors (length of scan time, activity of patient, etc.) were discussed
    - In the absence of ground truth, separate longitudinal Claims to be rewritten to incorporate the results from this study (intra- and inter-site reproducibility to be differentiated)
    - Reference values will be added to Section 3.8: Data Interpretation section of the Profile

- Sample was too small to determine differences between systems and linear or non-linear variance relationships; a more systematic evaluation will be done upon receipt of additional funding
- The manuscript draft is actively underway and will be submitted for publication
- Additional study and data are needed to define clinically significant cartilage change over time

MSK Profile (Dr. Link)

- Due to time limitations, discussion was tabled until the next meeting
- Once Section 4: Assessment Procedures has been finalized, the profile draft will be circulated for review and discussion during the June 25 call
- Tighter protocols and Claim work needed

Next Call: Tuesday, June 25, 2019 at 10 AM CT [4th Tuesdays of each month]

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