QIBA Musculoskeletal (MSK) Biomarker Committee (BC) Call

Tuesday, March 26, 2019 at 10 AM CT

Call Summary

In attendance			**RSNA**
Thomas Link, MD, PhD (Co-Chair)	Leon Lenchik, MD	Rob Peters, PhD	Joe Koudelik
Michael Boss, PhD	Nancy Obuchowski, PhD	Hollis Potter, MD	Susan Stanfa
Angie Botto-van Bemden, PhD	Valentina Pedoia, PhD	Suraj Serai, PhD	
Robert Boutin, MD	Qi (Chris) Peng, PhD	Ramya Srinivasan, MD	
Majid Chalian, MD			

Moderator: Dr. Link

Recent Publications

- The following paper was discussed: Pedoia V, Lee J, Norman B, Link TM, and Majumdar S. **Diagnosing Osteoarthritis from T_2 Maps using Deep Learning: An Analysis of the Entire Osteoarthritis Initiative Baseline Cohort**. 2019 Mar 21. pii: S1063-4584(19)30901-X. **doi: 10.1016/j.joca.2019.02.800**. [Epub ahead of print] – **PubMed citation**
- OBJECTIVE: Aimed to study to what extent conventional and deep-learning-based T2 relaxometry patterns are able to distinguish between knees with and without radiographic OA (please access **the article** for information on methods, etc.)
- Segmentation process is considered one of the major challenges when applying T1ρ and T2 clinically
- Only baseline data were analyzed for the manuscript, but future plans are to analyze the entire dataset
- CONCLUSION: In this study, an MRI-based data-driven platform using T_2 measurements was presented to characterize radiographic OA. Results showed that feature learning from T_2 maps has potential in uncovering information that can potentially better diagnose OA than simple averages or linear patterns decomposition.
- Q&A occurred
- "The more we learn, the more we realize how important standardization is."- Dr. Link
- Phantom needed to cross-calibrate/normalize different machines in efforts to improve data interpretation

MSK Profile (Dr. Link)

- Sections 3.6: Image Data Acquisition & on 3.7: Image Data Analysis were reviewed during the Feb. 19 MSK BC call
- The focus on the Mar. 26 call was on: Section 3.8: Data Interpretation
    - Dr. Gabby Joseph discussed normative MRI cartilage T2 values in the knee and shared data from the Osteoarthritis Initiative (OAI) during her presentation at the Feb 19 MSK BC meeting
    - Recommendation to introduce Z-scores to make abnormal T1ρ and T2 values better comparable between different sites/scanner types and to prove a more standardized approach to therapy
    - Discussion on how to define "healthy individuals" in the OAI; Dr. Link defined it in the Profile as the following:
        - To date, a large scale normative cartilage T2 database is available from the OI data
        - Gender, age and BMI are based on 481 subjects aged >45 years with radiographic Kellgren-Lawrence Scores 0/1 in the study knee
        - Not much change in cartilage composition occurred over time within the cohort; suggestion made to increase range to 20-80 years (children not recommended, as comparison would not be feasible due to their difference from adults in regard to cartilage structure)

- The MSK BC is the first QIBA group to propose using a reference database to evaluate its results; concern that it would be burdensome in terms of cost for all sites/groups to own independent databases
- As an alternative, QIBA groups have conducted multi-site phantom studies with every site calibrating to the phantom
    - GE has developed a phantom that is largely used for T1ρ and T2 relaxometry; Dr. Li has been working with High Precision Devices (HPD) in Colorado to build a more advanced MSK phantom
    - A phantom calibration process would avoid local sites investing in their own reference database and help with cross-scanner/site calibration
    - Dr. Link to update language in the MSK Profile accordingly
    - The recommendation to use Z-scores instead of absolute values deemed unique to the MSK BC, but Z-scores will be better in regard to reducing variability and dependence from different scanners
    - Currently, compartmental averages are used for simplicity, but only measure one physical feature; more advanced methods may allow to measure texture and heterogeneity measurements of focal degeneration, this would require specific phantoms

- Discussion regarding the development of risk scores; clinical parameters to be considered
    - Clinical parameters include age, sex, weight, BMI, height, etc.
    - It was suggested that mean T_2 values may be able to estimate risk for developing moderate to severe osteoarthritis
    - QIBA leadership decided that this would not be part of official QIBA Claims, but it may be done as part of image interpretation
    - Discussion about risk score concept and how to best define outcomes
        - Risk score deemed challenging to use as a method for patient care
        - Is joint replacement a viable outcome
        - Knee pain and radiographic osteoarthritis may not be ideal in the prediction of levels of self-reported disability
        - a “disability index” was suggested to be used as a clinically relevant outcome
    - Better measures to define outcomes are needed
        - Discussion regarding whether screening would be clinically-feasible (e.g., affordable)
        - Suggestion to have age criteria for entry to avoid abusing the technology by applying to cohorts where prevalence of disease is infinitesimally small; unsure what the cutpoint should be, but a parameter should be set
        - Case-filing vs. population-screening
        - Risk criteria to be defined
        - Moderate levels of activity and losing weight deemed risk reducing measures
    - Dr. Link to continue working on the Data Interpretation Section of Profile

Next Call: Tuesday, April 23, 2019 at 10 AM CT [4th Tuesdays of each month]

RSNA Staff attempt to identify and capture all committee members participating on WebEx calls. However, **if multiple callers join simultaneously or call in without logging on to the WebEx, identification is not possible.** Call participants are welcome to contact RSNA staff at QIBA@RSNA.org if their attendance is not reflected on the call summaries.