A novel method for the assessment of joint space width and subchondral bone micro architecture

visual computing techniques for automated detection of Osteoporosis (OP) and Osteoarthritis (OA)

background
- changes in the joint space (narrowing) are currently visually measured
- shortcomings in measuring progression of disease and efficacy of therapy
- no standardized follow up methods
- lack of comparable disease scoring

objectives
- developing a novel method for the early prediction, assessment and feasibility of osteoarthritis (OA) and osteoporosis (OP)
- including automated joint space measurement and Kellgren & Lawrence scoring
- using high-resolution radiographs
- assessing subchondral bone by bone micro architecture (BMA)

methods
- 274 standardized knee radiographs of which 109 female patients were selected
- assessment by 3 independent physicians
- ear-based analysis of BMA, JSW/A
- evaluation of the discriminatory power of BMA, with or without additional clinical parameters

results
- current methods often subjective and user-dependent
- texture analysis and automated JSW/A provide an alternative
- significant difference in BSV values between cases/controls
- deviation in mean values between cases and controls of 7.04% (for BSV of 6.39)
- combination of BSV and JSA > discrimination improvement

conclusion
- presented method provides an objective and reproducible analysis for disease prediction, assessment and monitoring
- BMA and automated JSW/A provide a significant discrimination between case and controls
- application of BMA as a possible early disease predictor
- future work should focus on the potential role of BMA to serve as a fracture risk assessment tool

workflow
- Image segmentation and analysis combining an assessment of joint space width/area (JSW/A) and texture analysis of the adjacent subchondral bone micro architecture (BMA)
- Bone contour detection
- Automatic JSW assessment
- ROI placement and BMA calculation
- JSW and BMA results
- Print single report

* Department of Technologies, Vienna, Austria
** PRIMA Research Cluster, Center, Vienna, Austria
† Faculty of Medicine, Universidade de Lisboa, Portugal
‡ Department of Internal Medicine, Division of Endocrinology and Metabolism, Albertina University of Care, Austria

Contact information: Richard Ljungar, rijunger@toronto.ca

BrainCon Technologies