2D TRABECULAR FREE ENDS AND SEMIQUANTITATIVE SCLEROTIC SCORES ARE SENSITIVE TO KNEE OSTEOARTHRITIS SEVERITY

A. Wong1, K.A. Beattie1, J. O’Neill2, P.D. Emond1, J. Dunyda3, A. Doan3, J.D. Adachi1, A. Papaioannou1. 1McMaster University, Hamilton, ON, Canada. 2St. Joseph’s Health Care, Hamilton, ON, Canada. 3Harvard Medical School, Boston, MA, USA

Purpose: (1) To determine the relationship between 2D radiographic bone texture (BTX) parameters and semiquantitative sclerosis scores assessed by a radiologist. (2) To assess how subchondral sclerosis scores differ with respect to OA severity.

Methods: Fixed-flexion radiographs of OA knees were obtained from severe OA participants recommended for total knee arthroplasty. Kellgren-Lawrence (KL) scores (0 to 4) as well as scores for medial and lateral subchondral tibial and femoral sclerosis (0 or 1) were determined by a radiologist (JO) using the Altman radiographic atlas (2007). Apparent BTX parameters were computed from digitized radiographs in the sub-compartmental tibia using an anatomic landmark-guided algorithm previously described. BTX parameters included: bone volume fraction (BVTV), bone surface area to total volume (BSTV), trabecular spacing (Tr.Sp), trabecular thickness (Tr.Th) and connectivity index (CX). Medial minimum joint space width (mJSW) was evaluated using a semi-automated software algorithm.

Subchondral sclerosis scores were summed into a binary measure of diffuse sclerosis (both tibial and femoral sides, score = 2) and localized sclerosis (absent or single-sided sclerosis, score ≤ 1). Correlations between area-adjusted BTX parameters and binary sclerosis scores were assessed using binary logistic regression. Both BTX parameters and binary sclerosis were correlated with mJSW and KL scores using a binary logistic and linear regression analysis, respectively. Age, gender and body mass index (BMI) were used as covariates. Pearson correlation coefficients and odds ratios (OR) are appropriately reported.

Results: In 34 OA knees (17F, 13M; Age: 66±9 yrs; BMI: 31 ± 6 kg/m²), diffuse semiquantitative sclerosis was weakly correlated with an increased number of trabecular free ends (FE) (p = 0.021; OR: 1.04 (1.01, 1.07)) after BMI adjustment but not with other topological or run-length BTX parameters. More diffuse sclerosis was associated with smaller mJSW and higher KL scores as shown in Table I. Regression analyses also revealed a negative correlation between FE number and mJSW after BMI adjustment, and a positive correlation between FE and KL score.

Conclusions: In the subchondral tibia and femur of severe OA knees, a higher number of trabecular FE only weakly increased the odds of developing diffuse sclerosis. However, diffuse sclerosis appeared more sensitive to measures of disease severity (mJSW and KL score). Likewise, mJSW and KL scores remain strong correlates of FE. While the Altman radiographic atlas is able to identify patients with the presence or absence of sclerosis, 2D analyses of FE are able to quantify sclerotic severity in a disease-sensitive manner.