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THE ASSOCIATION OF WORSENING OF CARTILAGE DAMAGE AND MENISCAL PATHOLOGY WITH INCREASE IN RADIOGRAPHIC TIBIOFEMORAL JOINT SPACE NARROWING IN PERSONS WITH KNEE OA. THE MOST STUDY

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Purpose: The aim of this study was to determine the association of worsening of 1) cartilage damage, 2) meniscal damage, and 3) meniscal extrusion in the tibiofemoral compartments, assessed by MRI, with any increase, and with slow and fast increases, in radiographic joint space narrowing (JSN) over 30 months in persons with knee osteoarthritis (OA).

Methods: The Multicenter Osteoarthritis (MOST) Study is a longitudinal cohort study of subjects with or at risk for knee OA. Posteroanterior radiographs were performed at baseline (BL) and 30 months follow-up (FU) and read for BL Kellgren-Lawrence (KL) grade, for JSN according to the OARSI atlas, and for JSN increase including within-grade changes. MRIs were performed at BL and FU on a 1.0 T extremity system. A random sample of 600 subjects with BL radiographic OA (KL grade ≥ 2) in one or both knees had BL and 30 months FU MRIs read using the WOMBS system. Tibiofemoral compartments were scored for cartilage morphology (0–6 scale) at the central femoral subregion, and anterior, central, and posterior tibial subregions. Meniscal morphology (0–4) was assessed at the anterior, body, and posterior horns of both menisci. Meniscal extrusion (0–2) was assessed at the body of both menisci. Compartments with maximum grades in all subregions of any BL MRI feature were excluded. Knees with a KL grade ≥ 3 were excluded to avoid ceiling effects in regard to JSN increase. In compartment-specific analyses we assessed the association of worsening of cartilage damage (including within grade), meniscal damage, and meniscal extrusion (predictors) with any JSN increase and with slow (increase up to 1 grade) and fast (increase >1 grade) JSN using logistic regression with generalized estimated equations to account for correlations between a knee's compartments. We analyzed one knee per person in models simultaneously including all three MRI predictors adjusted for age, gender, and body mass index (BMI). All results were similar for medial and lateral compartments analyzed separately.

Table 1. The associations of worsening of MRI features with progression of radiographic joint space narrowing (JSN) from baseline to 30-month follow-up. The percentages presented refer to a total of 528 tibiofemoral compartments included in the analysis.

MRI predictor	Progression of JSN (Outcome)		Adjusted OR* (95% confidence intervals)
	Absence	Presence	
Worsening of cartilage loss			
Absence	372 (70.4%)	22 (4.2%)	1.0 (reference)
Presence	91 (17.3%)	43 (8.1%)	4.9 (2.6, 9.3) p<.0001
Worsening of meniscal damage			
Absence	449 (85%)	46 (8.7%)	1.0 (reference)
Presence	14 (2.7%)	19 (3.6%)	4.8 (1.8, 13.0) p=0.002
Worsening of meniscal extrusion			
Absence	457 (86.5%)	51 (9.7%)	1.0 (reference)
Presence	6 (1.1%)	14 (2.7%)	5.1 (1.5, 17.0) p=.0008

* Adjusted for age, gender and body mass index, with all MRI features simultaneously in the model. OR = odds ratio.

Table 2. The associations of combinations of MRI features exhibiting worsening with progression of radiographic joint space narrowing (JSN) from baseline to 30-month follow-up. The percentages presented refer to a total of 528 tibiofemoral compartments included in the analysis.

MRI predictor	Progression of JSN (Outcome)		Adjusted OR** (95% confidence intervals)
	Absence	Presence	
Number of features showing worsening*			
No worsening of all 3 MRI features	366 (69.3%)	18 (3.4%)	1.0 (reference)
Worsening of 1 of the 3 MRI features	85 (16.1%)	27 (5.1%)	6.5 (3.4, 12.2) p<.0001
Worsening of 2 of the 3 MRI features	10 (1.9%)	11 (2.1%)	22.5 (8.8, 57.5) p<.0001
Worsening of all 3 MRI features	2 (0.4%)	9 (1.7%)	92.6 (18.7, 457.4) p<.0001

* Adjusted for age, gender and body mass index, with all MRI features simultaneously in the model. OR = odds ratio.

Results: A total of 276 knees (260 medial and 268 lateral tibiofemoral compartments) were included (women 68.5%, mean age 62.9 \pm 7.8, mean BMI 30.2 \pm 5.0). Worsening of all three MRI features were similarly and independently associated with increase in JSN in the same compartment (p < 0.01) (Table 1). Additionally, worsening of all three MRI features was independently associated with the risk of both slow JSN (odds ratios (ORs) from 2.9 to 4.8) and fast JSN increase (ORs from 5.8 to 20.3). An increasing risk of any JSN increase was directly associated with the number of worsening MRI features (p for trend < 0.00001) (Table 2).

Conclusions: Worsening of cartilage damage, meniscal damage, and meniscal extrusion in a tibiofemoral compartment are each strong and independent predictors of any, slow and fast tibiofemoral JSN increases in the same compartment. These associations also need to be evaluated in knees with more severe BL radiographic OA. Tibiofemoral JSN is a result of complex multi-tissue articular degeneration, which is of relevance in patient treatment approaches and interpretation of radiography as a structural outcome in clinical trials and longitudinal OA studies.

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A SIMPLIFIED ULTRASOUND SCORE TO ASSESS KNEE OSTEOARTHRITIS

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Objective: To propose a simplified, valid and reliable ultrasound (US) score for knee osteoarthritis (KOA) severity.

Patients and methods: We included 104 female patients from an OA cohort with symptomatic KOA. Mean age 60.4 \pm 9.0 years. Mean weight 67.1 \pm 12.7 kg. Mean height 1.52 \pm 0.06 m. BMI 28.8 \pm 4.8. Content validity was obtained by an expert rheumatologists' opinion. Initially a 66 items score was design and applied, then reduced to 33, 29 and finally 8 items. Criterion validity was established with the WOMAC index and construct validity with Kellgren-Laurence X-ray score (KL).

Results: Three US dimensions were identified: I. Presence and size of femoral and tibial osteophytes in lateral and medial compartments. II. Protrusion and length of the protrusion of the anterior horn of the medial meniscus with displacement of the medial collateral ligament. III. Protrusion and length of the protrusion of the anterior horn of the lateral meniscus. Cronbach's alpha revealed high internal consistency of only 8 items of dimension I (structural damage): 0.84 (CI 95% 0.79–0.88) for right knees; 0.84 (CI 95% 0.78–0.88) for left knees. One point was given when osteophytes were present; 1 point was added for small osteophytes, 2 for medium, 3 for large, and 4 for very large. Scores included both knees and a medial and lateral compartment; maximum score was 20 points for each knee (table 1). Criterion validity, K-L and US structural damage correlation shown for right knee K-L grade 0, 4.2 \pm 2.9; grade I 5.1 \pm 4.2; grade II, 6.2 \pm 3.9, grade III, 11.1 \pm 4.4; grade IV, 11.7 \pm 4.6; and for the left knee grade 0, 3.5 \pm 3.7; grade I 4.8 \pm 3.0; grade II, 6.8 \pm 3.8, grade III, 12.1 \pm 3.6; grade IV, 12.2 \pm 6.1.

The proposed US scoring system correlated with WOMAC stiffness subscale (r=0.19, p=0.05), function subscale (r=0.28, p=0.005) and total WOMAC (r=0.26, p=0.009). The global score and for each knee (104 right, 102 left) had normal distribution (Kolmogorov-Smirnov Z 1.1,