scored for JSN (OARSI scores; available at http://oai.epi-ucsf.org). We used logistic regression models to evaluate if the presence of JSN or worsening of JSN (JSN progression), as dichotomous outcomes, were associated with BML volume while controlling for sex, body mass index, and age. We also used classification and regression trees (CART) to assess whether baseline BML volume or BML volume change was more influential in predicting JSN progression. To confirm the primary results we used data from the clinical trial (n = 103) and performed logistic regression models to examine the association between manually measured BML size change (classified as BML regression, no change, or BML progression) and the outcome of cartilage thickness derived from manual cartilage segmentation (stratified into tertiles).

Results: Among 362 knees with BML and JSN data, 240 (66%) had JSN at baseline including 25 knees with severe JSN (grade 3) that were excluded from analyses of JSN progression. Larger baseline BML volume was associated with the presence of baseline JSN (odds ratio [OR] = 1.5; 95% confidence interval [CI] = 1.2 - 1.8) and JSN progression in the same TF compartment (OR = 1.3; 95% CI = 1.1 - 1.5). There was a trend that BML regression and BML progression may be associated with greater odds of JSN progression relative to knees with no or minimal changes in BML volume (Table). Sensitivity analyses, excluding knees with more severe lateral JSN, revealed that BML regression in the medial TF compartment was associated with greater odds of medial JSN progression (Table). In CART analyses baseline BML volume was the variable best able to discriminate between those who did and did not have JSN progression. Finally, confirmatory analyses demonstrated that knees with BML regression (OR = 2.7; 95% CI = 1.0 - 7.1) or BML progression (OR = 2.0; 95% CI = 0.9 - 4.6) had greater odds of cartilage thickness loss.

Conclusions: Baseline BML size is an important assessment in knee OA but a reduction of BML size, as measured on traditional MRI, may not be associated with reduced odds of structural changes.

Table. Association between Joint Space Narrowing (JSN) Progression and Bone Marrow Lesion (BML) Volume Change

Rank for Change in BML Volume	Median (Min, Max) cm^3	JSN Progression		Odds Ratio* (95% CI)	Overallp-value
		No	Yes		
Medial or Lateral JSN Progression					
BML Regression (n = 84)	-0.97 (-12.59, -0.46)	63 (75%)	21 (25%)	1.85 (0.96 to 3.60)	
No to Minimal BML Change (n = 169) (middle two quartiles collapsed)	-0.05 (-0.46, 0.23)	143 (85%)	26 (15%)	Reference	0.08
BML Progression (n = 84)	0.69 (0.24, 10.02)	63 (75%)	21 (25%)	1.79 (0.92 to 3.48)	
Medial JSN Progression					
Medial TF BML Regression (n = 72)	-0.97 (-9.68, -0.46)	53 (74%)	19 (26%)	3.36 (1.55 to 7.28)	
No to Minimal Medial TF BML Change (n = 146) (middle two quartiles collapsed)	-0.08 (-0.46, 0.18)	130 (89%)	16 (11%)	Reference	0.01
Medial TF BML Progression (n = 72)	0.65 (0.23, 4.76)	58 (81%)	14 (19%)	1.93 (0.86 to 4.31)	

* Models were adjusted for sex, body mass index, and age. TF = tibiofemoral.

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MENISCUS BODY POSITION IN THE NORMAL KNEE AND ITS CHANGE OVER 4 YEARS

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Purpose: To provide reference values on MRI for meniscal body position in knees of asymptomatic persons without radiographic knee osteoarthritis (OA) or major risk factors for OA. Further, to gain new insights on potential change in meniscal body position over a 4-year period in these knees.

Methods: Both knees of 118 subjects of the "non-exposed" OAI subcohort (KL≤1; mean [SD] age: 55 [7.5] yrs) were measured on the longitudinal (baseline [BL], 2- and 4-yr) mid-coronal intermediate-weighted TS-echo MRIs, using a 2D quantitative measurement technique (Fig.1). All BL images were studied for medial or lateral meniscal tear or destruction on sagittal and coronal MRIs using the same sequences. Meniscal extrusion and overlap distance were related to ipsilateral tibia plateau width to provide data normalized for knee size.

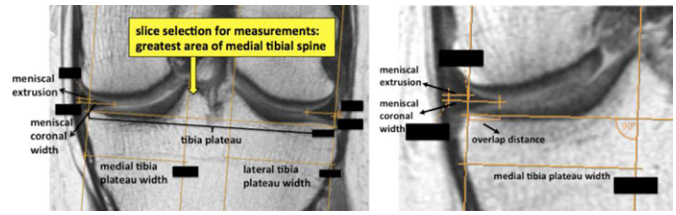

Figure 1. Measures on coronal 3T intermediate weighted knee MRI (eFilm 3.4 software).

Meniscal body extrusion ratio was calculated as [meniscus body extrusion]/[ipsilateral tibia plateau width] and coverage as the proportion (%) of the width of the ipsilateral tibial plateau covered by meniscus: ([meniscus body width]-[meniscus body extrusion])/[ipsilateral tibia plateau width]. We also stratified data by meniscal tear (have been reported to be associated with more meniscal extrusion). To evaluate potential differences between unpaired groups we used a 2-level linear mixed regression model with a patient as a random effect to control for correlation of measures made in the same patient with adjustment for age and sex. Potential changes in meniscal body extrusion, overlap distance or coverage over the 4-yr period were analyzed using a linear 3-level mixed effects regression model to account for correlation between measures in the same person and knee. We considered a two-tailed p-value of ≤0.05 as significant.

Results: The mean (SD) meniscal body extrusion at BL was medially 1.64 (0.92) mm and laterally 0.63 (0.73) mm. The normalized mean (SD) extrusion ratio was 0.057 (0.032) and 0.020 (0.024), respectively. While absolute values did not differ between men and women, the normalized ratio showed medially a tendency for more extrusion in women (0.060 (0.029) vs. 0.051 (0.036); p=0.059). We found knees with medial meniscal tear to have a tendency to more medial body extrusion than knees with intact medial menisci (mean [SD] 2.0 [0.87] mm vs. 1.62 [0.92] mm; p=0.10). The mean (SD) overlap distance was medially 10.14 (3.53) mm and laterally 9.76 (2.42) mm, which correspond to 34.4% (11.9) and 31.0% (7.7) coverage of the ipsilateral tibia plateau width, respectively (Table 1). Meniscal coverage did not differ significantly between sexes. During the 4-yr follow up, there was a trend for an annually increase in medial meniscal extrusion of 0.040 mm (95% CI: 0.019-0.062). The corresponding results laterally did not show any statistically significant trends. No essential change during the 4-yr interval was detected in medial or lateral overlap distance and coverage.

Conclusion: Medial and lateral meniscus body positions are in a relatively narrow range in knee-healthy middle-aged persons. A slight increase of extrusion values over time was noted for the medial body. The findings will aid the development of cut-offs for pathological meniscus position in both research and clinical use.