men and 19% in women. In men the mean (SD) extrusion of the medial and lateral meniscus body was 3.0 (1.7) mm and 2.1 (1.3) mm, respectively. In women corresponding mean values were 2.9 (1.6) mm and 1.9 (1.3) mm. The absolute value of medial meniscal extrusion was associated with TF OA and meniscal damage (Tables and Figure). In the multivariable regression models, medial meniscal damage was strongly associated with higher absolute value for medial meniscal extrusion in both men and women irrespective of TF OA status ($p<0.001$). In men without OA older age was associated with higher value of extrusion ($p<0.004$). In men and women with OA, higher BMI was associated with more medial meniscal extrusion ($p<0.02$).

Table 1. *The mean (SD) absolute value (mm) of medial and lateral meniscal body extrusion in middle-aged and elderly persons according to tibiofemoral OA status.*

	Men		Women	
	KL 0-1 n=349	KL ≥2 n=52	KL 0-1 n=432	KL ≥2 n=100
Medial	2.7 (1.4)	4.5 (2.4)	2.5 (1.1)	4.6 (2.4)
Lateral	2.1 (1.2)	2.0 (1.7)	1.9 (1.2)	1.7 (1.8)

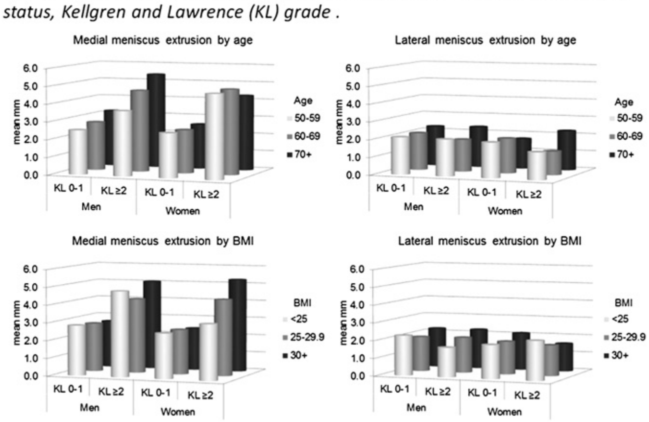
KL = Kellgren and Lawrence
Missing radiographic data for n=21 right knees

Table 2. *The mean (SD) absolute value (mm) of medial meniscal body extrusion in middle-aged and elderly persons according to tibiofemoral OA status and meniscal integrity.*

	Men		Women	
	KL 0-1	KL ≥2	KL 0-1	KL ≥2
No meniscal damage				
n	249	10	389	35
mm (SD)	2.4 (1.1)	3.5 (1.6)	2.4 (1.0)	3.7 (1.9)
Meniscal damage				
n	100	42	43	65
mm (SD)	3.6 (1.5)	4.8 (2.5)	3.4 (1.7)	5.2 (2.5)

KL = Kellgren and Lawrence
Missing radiographic data for n=21 right knees

Figure. *Mean extrusion (mm) of the medial and lateral meniscus body in men and women according to age, body mass index, and radiographic tibiofemoral status, Kellgren and Lawrence (KL) grade .*



Conclusions: In middle-aged and elderly women and men free of radiographic knee OA and no meniscal damage, the mean value of medial meniscal body extrusion is about 2.4 mm. Extrusion of the body of the medial meniscus is strongly associated with meniscal damage and radiographic knee OA. However, meniscal extrusion may also explain in part the relation of older age and high BMI with the development of OA.

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ASSOCIATIONS OF HIP DYSPLASIA AND FAI ON MODES OF ACETABULAR LABRAL TEARS -3 DIMENSIONAL ANALYSIS BY HIGH-RESOLUTION CT ARTHROGRAPHY-

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Purpose: Previous reports indicated high frequency of acetabular labral tears in hips with dysplasia and femoroacetabular impingement (FAI). However, modes of labral tears may be different between dysplastic hips and FAI hips due to differences in load transmission environment and probable mechanisms of labral tears. The purpose of this study was to compare shapes of labrum and modes of labral tears in symptomatic hips with dysplastic hips and FAI hips.

Methods: Sixty symptomatic hips receiving high-resolution CT arthrography with an image resolution of 0.5 mm in any orthogonal direction were included. All hips were at KL grade 0 or 1 on radiographs, and the mean age of patients was 32.9 years including 46 hips in female. From CT arthrography, multiple radial planes around the central axis of the aceatabular dome were reconstructed at interval of 30 degrees from anterior 90 degrees to posterior 90 degrees. Length of labrum measured as the distance between the tip of labrum and the edge of acetabulum (Figure 1), and existence and location of labral tears were evaluated. The labral tears were divided into 2 modes by location, including tear at the base of labrum (Mode 1) and tear at the body of labrum (Mode 2) (Figure 2). As a FAI index, the alpha angle was measured on each multiple radial plane reconstructed through the femoral neck axis at 15 degrees increments. Labral length and modes of labral tears were compared among 3 groups divided by center edge (CE) angle on atnteroposterior radiograph, as Group A ($CE<0$, 9 hips), Group B ($0\leq CE<20$, 29 hips) or Group C ($20\leq CE$, 21hips).

Results: There were significant differences in the length of labrum at anterior 30, 0, posterior 30, 60 and 90 degrees among Group A, B and C ($A>B>C$) (Figure 3). There were no significant differences in the frequencies of labral tears (78% in Group A, 62% in Group B and 64% in Group C). All labral tears in Group A were located between anterior 60 degrees and 0 degrees, while the locations of labral tears in Group C were variable between anterior 90 degrees and posterior 90 degrees. The ratio of Mode 2 in Group A was higher than that in Group C (Mode1/2; Group A: 28/72%, Group B: 39/61%, Group C: 43/57%). The frequency of hips with large alpha angle more than 55 degrees were 0% in Group A, 41% in Group B and 72% in Group C. There were no significant correlation between alpha angle and the modes of labral tears.

Conclusions: Severe dysplastic hips had longer shape of labrum, higher frequency of tear at the body, and limited location of labral tear at anterosuperior area, as compared with non-dysplastic hips. These findings may be related with load transmission environment in hip dysplasia. Further studies will be necessary to assess the influence of the modes of labral tear on the surgical or conservative treatment.

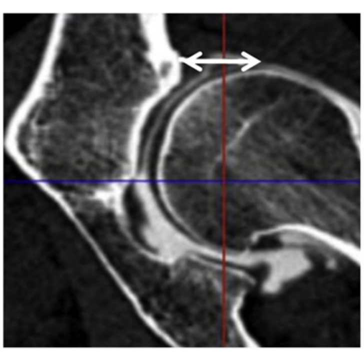

Figure 1
The length of labral was measured as the distance between the tip of labrum and the edge of acetabulum (white arrow)

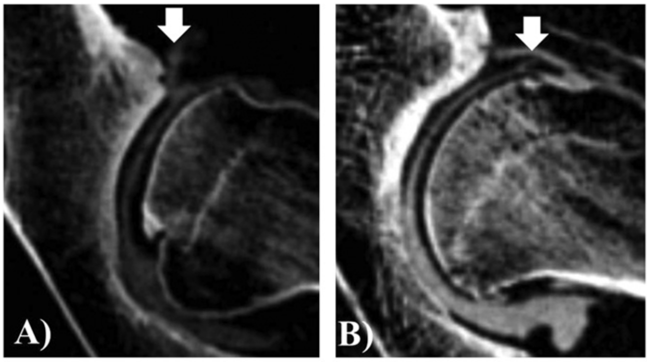

Figure 2 Two modes of labral tears
A) labral tear at the base of labrum (Mode 1)
B) labral tear at the body of labrum (Mode 2)

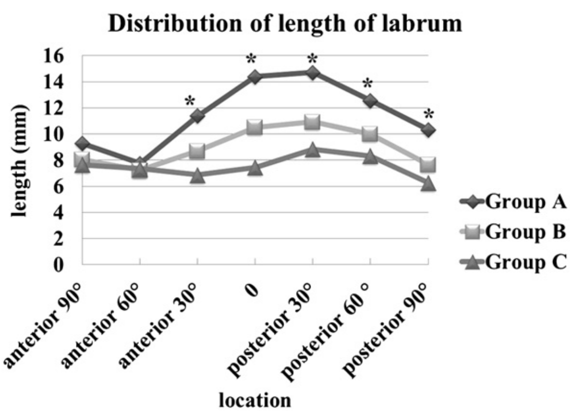

Figure 3 Distribution of length of labrum
*: significant differences in the length of labrum among Group A, B and C (p<0.05, unpaired t-test)

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THIGH MUSCLE CROSS-SECTIONAL AREAS AND STRENGTH ARE NOT REDUCED IN ADVANCED VERSUS EARLY PAINFUL KNEE OSTEOARTHRITIS - A BETWEEN-KNEE WITHIN-PERSON COMPARISON IN OAI PARTICIPANTS

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Purpose: Patients with knee osteoarthritis (OA) display lower quadriceps muscle strength than healthy subjects. However, it is currently unclear whether thigh muscle weakness precedes cartilage degradation and represents an independent risk factor for structural progression in knee OA. The current study attempts to provide a step in disentangling the above relationship by testing whether anatomical thigh muscle cross-sectional areas (ACSAs) and strength are reduced in painful knees with advanced OA vs painful knees with early OA. To avoid confounding by differences in body size (and other whole-body specific factors), a between-knee, within-person study design was used to directly compare painful knees with radiographic joint space narrowing (JSN) with painful contra-lateral knees without JSN.

Methods: The subsample studied was drawn from the first half (2678 cases) of the OAI cohort (clinical data set 0.2.1 and imaging sets 0.C.1) with the following criteria: BMI>25, frequent knee pain (most days of at least one month in the past 12 months) in both knees; medial JSN OARSI grades 1-3 in one knee, no medial (or lateral) JSN in the other (contra-lateral) knee. The participants were selected based on the radiographic OAI site readings; these were confirmed by a musculoskeletal radiologist (A.G.), and were adjudicated by a rheumatologist (D.H.) in case of discrepancies. A total of 70 cases fulfilled these specific inclusion criteria, and 44 of these had axial acquisitions of the thighs (T1-weighted spin-echo MRI sequence) available. Custom software was used to determine the ACSAs and signal (mean and SD) of the quadriceps, hamstrings and adductor muscles in an axial image located at 33% (from distal) of the total femoral length (estimated by body height). Maximal isometric extensor and flexor strength (Isometric chair, Metitur Oy, Jyvaskyla, Finland) were available for 40 of these participants from the OAI data base. A paired t-test was used to compare painful JSN versus contra-lateral painful no-JSN knees.

Results: The subsample of 44 participants included 13 men and 31 women aged 63.6±8.9 years [mean±SD], with a BMI of 30.8±4.3 kg/m^2. 27 participants showed medial JSN grade 1, 13 grade 2, and 4 grade 3 in the JSN knees (Table 1).There were no significant differences (p<0.05) in thigh ACSAs and muscle strength between JSN vs contra-lateral no-JSN knees; this also was the case when stratifying for JSN1 vs contralateral and JSN2/3 vs contralateral no-JSN knees (Table 2), except for the ACSAs of the adductors.

ACSA and muscle strength (mean ± SD) in painful OA knees with and without radiographic JSN

	Anatomical muscle cross sectional area - ACSA (cm^2)			Muscle strength (N)	
	Quadriceps	Hamstrings	Adductors	Extensors	Flexors
JSN0 (n=44)	47.0±12.0	32.0±8.1	9.4±4.5	292.0±111.9	123.3±47.9
JSN1 (n=27)	48.0±13.0	31.3±7.2	9.8±5.4	302.0±119.4	131.1±59.1
JSN2/3(n=17)	44.2±12.6	33.5±8.8	10.2±5.1	275.4±88.6	118.8±41.1

Table2: Side differences between contra-lateral painful knees with and without radiographic JSN

	Anatomical muscle cross sectional area (ACSA in %)			Muscle strength (%)	
	Quadriceps	Hamstrings	Adductors	Extensors	Flexors
JSN1 vs no JSN (n=27)	+0.9±12	+0.5±7.8	-0.6±25	+3.8±22	+2.9±26
JSN2/3 vs no JSN (n=17)	-3.4±16	+1.7±9.0	+21.0±22*	+0.1±25	-1.2±22

mean **± SD;** * p<0.05 without adjustment for multiple comparisons; JSN = radiographic joint space narrowing

Further, no differences in muscle signal intensity (as a potential estimate of intramuscular fat) were detected between JSN and no-JSN knees (data not shown).

Conclusions: The results show that when both knees exhibit frequent pain, no differences in thigh muscle ACSAs and strength can be detected between those with advanced radiographic knee OA (JSN) and those with early OA (no JSN). These findings should be confirmed in longitudinal studies with greater statistical power and may be specific to a between-knee, within-person comparison. Although muscle weakness may be associated with the onset of painful knee OA, the current findings do not support that loss of muscle ACSA and strength play an important role in the progression from painful early to painful advanced radiographic knee OA, or that radiographic progression is directly associated with a reduction in muscle ACSAs and strength.

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ENHANCING SENSITIVITY TO DETECT CHANGE IN CARTILAGE MORPHOLOGY ASSOCIATED WITH KNEE OSTEOARTHRITIS BY ASSESSING THICKNESS DISTRIBUTION