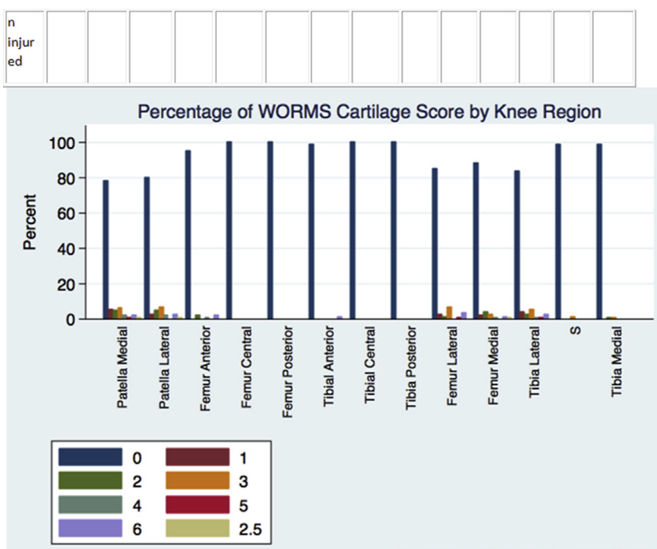
Conclusions: Medial and lateral patellar regions were the most injured regions. We also found a relationship between sex and cartilage lesion and between posterior cruciate ligament lesion and cartilage lesion. When there is a posterior cruciate ligament injury, the odds of having cartilage lesion (OR=12.20, SE=9.93, p=<0.01), and the odds of being female and having cartilage lesion (OR=4.10, SE=1.63, p=<0.01). Cartilage lesion can be explained in a 14% by this variables adjusted by age. In our study, being female, having a posterior cruciate ligament lesion can predict if a cartilage lesion will occur.

% of WORMS Cartilage Lesion Score by Injured Knee Region

WORM SCORE	Patella Medial	Patella Lateral	Femur Anterior	Femur Central	Femur Posterior	Tibial Anterior	Tibial Central	Tibia Posterior	Femur Lateral	Femur Medial	Tibia Lateral	S	Tibia Medial	Total of score % present by region
0	6.48 %	6.65%	7.89 %	8.29 %	8.29 %	8.17 %	8.29 %	8.29 %	7.05 %	7.33 %	6.93%	8.17%	8.17%	
1	32 %	16 %	0 %	0 %	0 %	0 %	0 %	0 %	16 %	12 %	24 %	0 %	0 %	
2	23.33 %	23.33 %	10 %	0 %	0 %	0 %	0 %	0 %	6.67 %	20 %	13.33 %	0 %	3.33 %	
2.5	33.33 %	33.33 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	33.33 %	0 %	0 %	0 %	
3	20.45 %	22.73 %	0 %	0 %	0 %	0 %	0 %	0 %	22.73 %	9.09 %	18.18 %	4.55	2.27 %	
4	33.33 %	33.33%	11.11 %	0 %	0 %	0 %	0 %	0 %	0 %	11.11 %	11.11 %	0 %	0 %	
5	33.33 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	33.33 %	0 %	33.33 %	0 %	0 %	
6	13.04%	17.39 %	13.04%	0 %	0 %	8.70 %	0 %	0 %	21.74 %	8.70 %	17.39 %	0 %	0 %	
Total of region injured														



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A STAND-UP MAGNETIC RESONANCE IMAGING SCANNER IS FEASIBLE AND RELIABLE FOR ESTIMATING WEIGHTBEARING KNEE ALIGNMENT IN PATELLOFEMORAL OSTEOARTHRITIS

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Purpose: MRI evaluation of knee alignment in patellofemoral osteoarthritis (PFOA) currently relies on closed bore magnetic resonance imaging (MRI) where participants are in supine and non-weight bearing. Since alignment may be strongly influenced by pain provocation/avoidance, loading strategies or muscle activity in weight-bearing, open MRI affords the opportunity to gather potentially important new information of key modifiable alignment measures.
We aimed to evaluate the feasibility and reliability of a stand-up open bore MRI protocol to evaluate patellofemoral and tibiofemoral alignment in full weight-bearing standing and squatting.

Methods: We recruited nine people, six with PFOA (aged ≥ 40 years, knee pain severity ≥3/10 during activities that load the PF joint, pain on most days during the past month, radiographic PFOA severity ≥ Grade 1 on Kellgren & Lawrence) and three asymptomatic people. We scanned each participant in a weightbearing 0.5T vertical gap open scanner (MROpen, Paramed Genoa, Italy) using a sagittal GFE sequence (SE:415/10, 300 mm FOV, 4.0 mm/0.4mm, scan 58 seconds) with a knee coil. For scanning, participants stood two-legged on a foot map with knees flexed to about 30○ using a 12-inch goniometer to estimate position (Fig. 1). They held still with the use of support bars (shins, buttocks, hands) for proprioceptive input but were instructed not to bear weight through the bars. We scanned each participant three times for estimating reliability.
We also obtained a knee scan for each participant in a 3.0T scanner (Achieva, Philips, Netherlands) using a sagittal T1 weighted TSE sequence (SE:700:10, 320 mm FOV, 2.0mm/2.0mm, scan ~16 minutes) and a dual SENSE Flex-M coil configuration.
We manually segmented the bony outlines of the femur, tibia and patella on the 3T images to create participant specific 3D anatomical surface models. We then segmented the standing images and registered them to the high-resolution models. Segmentation was done in Analyze 10.0 (Analyze Direct, KS, USA). We determined 3D patellofemoral and tibiofemoral alignment (three rotations, three translations) using a validated method. Finally, we estimated reliability using intraclass correlation coefficient (ICC[3,1]) and standard error of measure (SEM) in STATA 13 (StataCorp, TX, USA).

Results: We obtained complete imaging for nine participants (eight women), age ranged from 26 to 72 years, mean (SD) 50 (14). No one reported pain or discomfort during image acquisition. Motion artefact was not an issue in any participant despite occasional reports of fatigue. Tibiofemoral flexion ranged from 23.3° to 47.2°, mean (SD) 35.3° (7.8°). Reliability was good to excellent with ICC values of at least 0.75. Patellofemoral ICC (95%CI) and SEM values were: anterior tilt/flexion 0.75 (0.42, 0.93), SEM 2.2°; spin 0.90 (0.72, 0.97), SEM 2.3°; lateral tilt 0.99 (0.97, 1.00), SEM 0.8; proximal translation 0.94 (0.84, 0.99), SEM 2.2 mm; lateral translation 0.96 (0.88, 0.99), SEM 0.8 mm; and anterior translation 0.92 (0.78, 0.98), SEM 1.3 mm. Tibiofemoral values were: flexion 0.85 (0.61, 0.96), SEM 3.1°; adduction 0.98 (0.94, 1.00), SEM 0.8°; internal rotation 0.96 (0.89, 0.99), SEM 1.4°; proximal translation 0.86 (0.63, 0.96), SEM 0.7 mm; lateral translation 0.99 (0.98, 1.00), SEM 0.4 mm; and anterior translation 0.97 (0.90, 0.99), SEM 0.8 mm.

Conclusions: This study demonstrated that evaluation of 3D knee alignment in full weight-bearing using a stand-up MRI scanner is feasible and reliable. Given the range of tibiofemoral flexion angles, it may not be feasible to achieve a standing position of 30○ in a single attempt, thus multiple scans may be required. However, our positioning protocol enables repeatable positioning and alignment, suggesting strategies for participants to achieve a given position are consistent.

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SPECTRUM OF MENISCAL PATHOLOGY IN OSTEOARTHRITIS REVISITED - FROM SIGNAL CHANGE TO COMPLETE DESTRUCTION.

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Purpose: Knee menisci are fibro-cartilaginous structures, which have important functions in knee biomechanics including load distribution, shock absorption, lubrication, and joint stability. The important role of the menisci in disease onset and progression of knee osteoarthritis (OA) has gained increasing attention.

Our aim is to give an illustrative overview of the different types of meniscal pathologies including different tear types, signal changes, perimeniscal lesions and meniscal extrusion based on images from the Osteoarthritis Initiative (OAI).

Methods: We looked at 520 random magnetic resonance images (MRI) of the knee from the baseline OAI visit (220 male, mean age 60.6 years, mean BMI 29.5). MRIs were obtained on 3T magnets (Siemens Erlangen, Germany) at four different clinical sites. One experienced musculoskeletal radiologist assessed these according to the MOAKS scoring system. Another expert musculoskeletal radiologist re-read 100 random cases for inter-reader reliability assessment. Meniscal pathology was assessed using at least 2 sequences of orthogonal planes, i.e. coronal proton density-weighted and sagittal intermediate-weighted fat-suppressed MRI. For particular lesions such as radial tear or posterior root tear, the axial DESS reformatted MRI was also used.

Results: We found 380 lesions (i.e. meniscal tear or maceration/destruction or prior resection) in 321 knees; 14 posterior medial meniscus root tears (3.7%), 212 partial/complete maceration/destruction (55.8%), 121 horizontal/complex tears (31.8%), 28 vertical (radial and longitudinal) tears (7.4%), 5 bucket handle/flap tears (1.3%). We also found 147 intra-meniscal signal changes (14.1%) (Figures 1 and 2). In addition to these morphological lesions, 460 menisci showed any meniscal extrusion according to the MOAKS scoring system (44.2%). 23 menisci showed meniscal cysts (2.2%). When meniscal pathology was present in the knee, it involved the medial compartment in 78%. Inter-reader reliability of reading the different meniscal pathologies varied from 0.72 to 1.00.

Conclusions: Imaging is paramount in identifying different types of meniscal injuries and their locations. Recognizing the different types of meniscal tears and other pathology including cysts and extrusion are important to define the role of meniscal damage in regard to structural progression and clinical manifestations of the OA disease process.

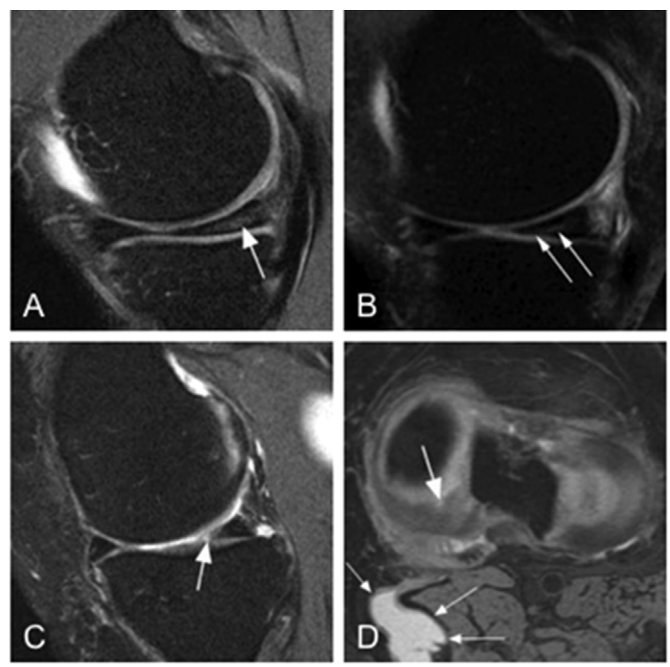

Figure 1. Different types of meniscal damage. A. Sagittal intermediate-weighted fat-suppressed MRI depicts intrameniscal high signal in the posterior horn of the medial meniscus that does not reach the meniscal surface (arrow). Clinical relevance of meniscal signal is being discussed controversially. B. Example of a horizontal tear reaching the meniscal undersurface (arrows). This tear type is part of the spectrum of structural MRI manifestations of OA. A tear is defined on MRI as linear meniscal signal that reaches the meniscal surface on at least two consecutive slices. C. Example of a radial tear. A radial tear involves the so-called “white”, non-vascularized inner zone of the meniscus. A small substance defect is seen on the sagittal intermediate-weighted fat suppressed image (arrow in C) that is confirmed and well-visualized on the corresponding high resolution axial dual-echo at steady-state (DESS) image in D (large arrow). In addition, there is a popliteal cyst in the typical medial location between the tendons of the medial head of the gastrocnemius and the semimembranosus (small arrows).