Loading of the knee during 3.0T MRI is associated with significantly increased medial meniscus extrusion in mild and moderate osteoarthritis.

Abstract:

PURPOSE: Standard knee MRI is performed under unloading (ULC) conditions and not much is known about changes of the meniscus, ligaments or cartilage under loading conditions (LC). The aim is to study the influence of loading of different knee structures at 3Tesla (T) in subjects with osteoarthritis (OA) and normal controls. MATERIALS AND METHODS: 30 subjects, 10 healthy and 20 with radiographic evidence of OA (10 mild and 10 moderate) underwent 3T MRI under ULC and LC at 50% body weight. All images were analyzed by two musculoskeletal radiologists identifying and grading cartilage, meniscal, ligamentous abnormalities. The changes between ULC and LC were assessed. For meniscus, cartilage and ligaments the changes of lesions, signal and shape were evaluated. In addition, for the meniscus changes in extrusion were examined. A multivariate regression model was used for correlations to correct the data for the impact of age, gender, BMI. A paired T-Test was performed to calculate the differences in meniscus extrusion. RESULTS: Subjects with degenerative knee abnormalities demonstrated significantly increased meniscus extrusion under LC when compared to normal subjects (p=0.0008-0.0027). Subjects with knee abnormalities and higher KL scores showed significantly more changes in lesion, signal and shape of the meniscus (80% (16/20))
vs. 20% (2/10); p=0.0025), ligaments and cartilage during LC. CONCLUSION: The study demonstrates that axial loading has an effect on articular cartilage, ligament, and meniscus morphology, which is more significant in subjects with degenerative disease and may serve as an additional diagnostic tool for disease diagnosis and assessing progression in subjects with knee OA.