

Femoral Articular Cartilage Quality, but Not Thickness, Is Decreased for Anterior Cruciate Ligament Reconstruction Patients Relative to Control

DALLIN CLINGER, HYUNWOOK LEE, PHD ATC, MINSUB OH, MS ATC, SEUNGUH HAN, PHD ATC, STEVEN P. ALLEN, PHD, GARRITT L. PAGE, PHD, DUSTIN A. BRUENING, PHD, ROBERT D. HYLDAHL, PHD ATC, J. TY HOPKINS, PHD ATC FACSM, & MATTHEW K. SEELEY, PHD ATC FACSM

Department of Exercise Sciences; Brigham Young University; Provo, UTAH

Category: Undergraduate

Advisor / Mentor: Seeley, Matthew (matt_seeley@byu.edu)

ABSTRACT

Anterior cruciate ligament reconstruction (ACLR) patients are at risk of developing posttraumatic knee osteoarthritis (OA). The etiology of posttraumatic knee OA is complex, potentially involving biomechanical and biochemical factors. Changes in femoral cartilage thickness and composition are associated with knee OA, while current research is ambiguous on cartilage in ACLR patients. **PURPOSE:** This study aimed to compare femoral cartilage thickness and T2 relaxation time (a compositional measure) between ACLR patients and healthy controls in a resting state. We hypothesized that ACLR patients would exhibit thinner femoral cartilage and increased T2 relaxation times. **METHODS:** Twenty ACLR patients (6-24 months post-surgery) and 20 matched healthy controls were recruited following institutional board approval. Ultrasound and magnetic resonance imaging data were collected on two separate days, allowing cartilage thickness and composition measurements to be made, respectively. Statistical analyses, including independent t-tests and Holm-Bonferroni corrections, were performed on selected regions of interest. **RESULTS:** The ACLR group showed increased T2 relaxation times in four of eight femoral regions compared to controls. No significant differences in femoral cartilage thickness were observed between the groups. The primary finding from this study is that ACLR patients did not show differences in femoral cartilage thickness (a morphological measure), but displayed prolonged T2 relaxation times (a compositional measure) compared to controls, at rest. This finding suggests that compositional changes precede morphological shifts in femoral cartilage in early post-ACLR periods (6-24 months). **CONCLUSION:** These early compositional changes may indicate cartilage that is more compressible and subject to increased strain on the solid components of the joint. While ultrasound is a more accessible imaging method, magnetic resonance imaging may provide a more accurate and early evaluation of cartilage quality. Further research is needed to develop practical tools for early detection and monitoring of cartilage degradation in ACLR patients before progression into knee osteoarthritis.