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Evaluating Collagen Matrix Degradation after ACL Reconstruction using Quantitative MRI

Logan K. Faux-Dugan¹, Jack R. Williams², Kelsey Neal², Ashutosh Khandha², Thomas S. Buchanan². ¹Delaware State University, Dover, DE, ²University of Delaware, Newark, DE

Forty percent of individuals who undergo anterior cruciate ligament (ACL) reconstruction develop knee osteoarthritis (OA) within eight years of the procedure. T2 magnetic resonance imaging (MRI) can be used to assess the cartilage's collagen matrix health. Higher T2 times, when compared to healthy cartilage, are indicative of cartilage matrix degradation. When the ACL is injured, a bruise develops on the central and posterior regions of the tibial plateau. It is not known if this bruising has a long-term effect on the cartilage health in this region. **PURPOSE:** To determine if T2 values at the site of initial ACL injury (central and posterior regions of tibial cartilage) would be higher in the involved vs. uninvolved limb, three months post ACL reconstruction. **METHODS:** Ten participants (8 men/2 women, age = 22 ± 5 years) underwent T2 MRI testing and analysis. Menisci boundaries were used to establish regions of interest (ROI). These ROI were further divided into deep and superficial sub-layers. The average T2 value for each ROI was calculated and each was compared in the involved vs. uninvolved limb using a paired t-test ($\alpha = 0.05$). **RESULTS:** For the tibial central deep region, the inter-limb difference (involved vs. uninvolved) approached significance (36±4 SD vs. 33±6 SD; $p = 0.06$, (Cohen's $d = .59$)), with higher T2 values in the involved limb cartilage. No statistically significant results were found for the other ROI. **CONCLUSION:** While not statistically significant, higher T2 values within the involved limb's central tibial cartilage indicate that bone bruising may result in collagen matrix degradation three months post ACL reconstruction. Future studies should include followup time points and a larger sample size.

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