Associations Between Preoperative Tibiofemoral Articular Cartilage Composition and Cumulative Loading 2 Months Following ACL Reconstruction

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BACKGROUND: Lower proteoglycan density (PGD) of the tibiofemoral articular cartilage is a marker of cartilage degeneration that is of concern following ACL injury. Cumulative joint loading is a metric characterizing both habitual loading magnitude and frequency; however, the link between MRI-assessed PGD after ACL injury and cumulative loading early after ACL Reconstruction (ACLR) is unknown.
PURPOSE: To determine the association between preoperative PGD interlimb ratios and cumulative loading 2 months post-ACLR.
METHODS: Twenty-one individuals with unilateral ACLR (21.03.4) underwent a bilateral T1 MRI scan preoperatively, utilizing a Magnetom Prisma 3T PowerPack scanner. A biomechanical gait assessment and physical activity monitoring (ActiGraph GT9X) were collected at 2 months post-ACLR. Pearson product correlation coefficients (r) were used to estimate the strength of associations between pre-operative T1 relaxation times in the medial and lateral tibiofemoral cartilage (LTC) and cumulative loading at 2 months post-ACLR.
RESULTS: Lesser cumulative loading (p=0.006;r=0.577), and steps per day uniquely (p=0.003;r=0.616), were moderately associated with greater T1 interlimb ratios in the anterior LTC region.
CONCLUSIONS: Concomitant injuries and non-weightbearing status preoperatively may contribute to the earliest compositional changes within the anterior LTC cartilage. Future studies should develop interventions that seek to modify cumulative loading early post-ACLR.