

An Exploratory Analysis of Changes in Tibiofemoral Joint Contact Forces Between 6-12 Months Following an Anterior Cruciate Ligament Reconstruction

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Background: Individuals who undergo an anterior cruciate ligament reconstruction (ACLR) demonstrate aberrant gait biomechanical profiles; a factor linked to early osteoarthritis development. ACLR individuals exhibit lesser peak limb-level loading within the first 12 months following ACLR. However, traditional biomechanical analyses are limited in the ability to account for the individual contributions of muscles on loading at the knee joint level and changes in joint-level loading magnitudes within the first 12 months post-ACLR are unknown. **Purpose:** To determine the effect sizes of simulated, peak medial and lateral tibiofemoral joint contact forces between 6 and 12 months post-ACLR. **Methods:** Participants (n=4, age:22.25 ± 5.97 yrs., BMI:24.88 ±2.27) performed a gait biomechanical assessment at 6 and 12 months post-ACLR. Marker trajectories were utilized to scale an individualized musculoskeletal model and a concurrent approach was used to simultaneously solve for soft-tissue forces, contact pressures and joint kinematics (Concurrent Optimization of Muscle Activations and Kinematics). **Results:** ACLR participants demonstrated a moderate effect in medial contact force magnitude between 6 (4.03±1.14) and 12 months post-ACLR (3.63±0.59; g=0.441). A small effect size was observed in the lateral compartment between 6 (1.98±1.64) and 12 months post-ACLR (1.66±0.92; g=0.249). **Conclusion:** Our exploratory analysis suggests that peak medial and lateral tibiofemoral joint contact force magnitudes may differ with time post-ACLR. Future studies should determine the impact of kinematic profiles and quadriceps strength on joint level loading within the first year following ACLR.

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