ATFL repair alone versus combined repairs of ATFL and CFL: A Biomechanical Comparison of Repair Techniques
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Introduction/Purpose: The standard for lateral ligament stabilization is direct repair of the ATFL by open or arthroscopic technique. The implications and necessity of repairing the CFL are not well understood. The purpose of this study was to assess the impact of repairing the ATFL alone compared to repairing both the ATFL and CFL, in a biomechanical cadaver model. We hypothesized that repairing the CFL will substantially augment ankle and subtalar joint stability during weight-bearing ankle inversion compared to ATFL repair alone.

Methods: Ten matched pairs of fresh frozen human cadaveric ankles were dissected to expose intact ATFL and CFL. Ankles were mounted to an Instron at 20° plantar flexion and 15° of internal rotation. Each ankle was loaded to body weight and then tested from 0 to 20° of inversion for three cycles; stiffness and torque were recorded, peak pressure and contact area were recorded using a calibrated Tekscan sensor system, and rotational displacement of the talus and calcaneus relative to the ankle mortise was recorded using a three-dimensional motion capture system. Ankles then underwent sectioning of ATFL and CFL and were randomly assigned to ATFL only repair using two arthroscopic Broström all-soft anchors, or combined ATFL and CFL repair. Testing was repeated after repair to 20° of inversion, then load-to-failure (LTF).

Results: The predominant mode of failure after repair was at the tissue/suture. There were no instances of anchor pullout. There was an 11.7% increase in stiffness in combined repairs, and only a 1.6% increase in ATFL-only repairs. CFL failed at lower torque and rotation than the ATFL in combined repairs. There were strong correlations between intact stiffness and stiffness after repair (r=.74) and ATFL torque in LTF testing (r=.77), across both groups. There was no significant difference in peak pressure or contact area in the tibiotalar joint between the intact ankle and ATFL or combined repair.

Conclusion: We found a greater increase in stiffness following combined ATFL and CFL repair compared to ATFL repair alone. This added stability is due to complimentary contributions of the CFL, not augmented LTF strength of the ATFL. Intact specimen stiffness correlated strongly with stiffness after repair and LTF torque, suggesting that a patient’s inherent tissue laxity or inelasticity is likely a meaningful predictor of strength after repair. Restoring the CFL plays a relevant role in lateral ligament repair, however sufficient time for ligament healing should be allowed before substantial inversion stresses are applied.

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