ISAKOS

International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine

11th Biennial ISAKOS Congress • June 4-8, 2017 • Shanghai, China

Paper #138

Is CFL Repair Necessary During Lateral Ankle Ligament Stabilization? A Biomechanical Comparison of Repair Techniques

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Summary:
There was a greater increase in stiffness following combined ATFL and CFL repair compared to ATFL repair alone. The intact stiffness of the ankle is highly predictive of repair stiffness and load to failure. Restoring CFL plays a relevant role in lateral ligament repair, however sufficient time for ligament healing should be allowed before inversion stresses are applied.

Abstract:
BACKGROUND:
Lateral ankle sprain is a common athletic injury. At least 20% of patients with severe ankle sprains will develop chronic ankle instability, and possibly require surgical repair. The most common mechanism of injury in ankle sprain is ankle inversion with a plantar flexed foot. The ATFL is injured most frequently, and higher grade injuries result in rupture to the CFL as well. The standard for lateral ligament stabilization is direct repair of the ATFL by open or arthroscopic technique. However, 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 add significant 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 inverted from 0 to 20° for three cycles; torque was recorded and stiffness was calculated. 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 (17/20) after repair was at the ligament/suture interface – there were no occurrences of anchor pull-out. There was an 11.7% increase in stiffness in combined repairs, and only a 1.6% increase in single repairs, compared to the complete injury condition, although this did not reach statistical significance (p=.158). The CFL failed at lower torque (p=.017) and rotation (p=.01) than the ATFL in combined repairs. However, there was no difference between groups in inversion degrees or torque at failure of the ATFL during LTF. There was a strong correlation (r=.74) with intact stiffness and stiffness after repair, across both groups, and a strong correlation (r=.77) with intact stiffness and ATFL torque in LTF testing, across both groups.

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CONCLUSION:

In a biomechanical weight-bearing inversion model, we found a greater increase in stiffness following combined ATFL and CFL repair compared to ATFL repair alone, although this did not reach statistical significance. This added stability is likely due to complimentary contributions of the CFL, not augmented strength of the ATFL, since ATFL rotation and torque at LTF were unaffected by CFL repair. Intact specimen stiffness correlated strongly with both stiffness after repair, and LTF torque of ATFL. Thus, a patient's inherent laxity or stiffness is likely a meaningful contributor to strength after repair. The CFL fails before the ATFL, potentially indicating its vulnerability immediately following repair. Restoring the CFL likely plays a relevant role in lateral ligament repair, however sufficient time for ligament healing should be allowed before inversion stresses are applied.