Biomechanical Comparison of Augmented Broström Repair Techniques to the Intact Anterior Talofibular Ligament

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Lateral Ankle Instability

• Broström repair of ATFL is typically 1st line surgical option
  – Relies on good quality native tissue & protected early rehabilitation
    ○ However, initial strength <50% of intact ATFL
      □ Waldrop et al. AJSM (2012).
• Additional options needed for specific situations w/ inadequate tissue quality:
  – Generalized ligamentous laxity
  – Long-standing ankle instability w/ attenuated native tissues
  – Very large patients or elite athletes w/ increased demands on repair
  – Graft reconstruction not feasible

Adapted from Waldrop. AJSM (2012).
Study Purpose & Hypothesis

• Controlled laboratory biomechanical comparison of:
  – (1) Nonabsorbable suture tape alone
    o Fixed to fibula & talus w/ suture anchors
  – (2) Broström repair of ATFL w/ suture tape augmentation
    o Two #0 nonabsorbable sutures & suture tape fixed to bone
  – (3) Intact ATFL

• Hypothesis: augmented techniques would have similar properties to the intact ATFL at time zero
  – Ultimate load to failure (N)
  – Stiffness (N/mm)
Materials & Methods

• 18 non-paired, fresh-frozen cadaveric specimen
  – No prior history or evidence of ankle injury or surgery
  – Mean age 53.2 years (range 31-65 years)
  – Random assignment to test groups

Suture tape alone

Broström w/ augmentation
Materials & Methods (cont.)

- Specimen stripped of tibia & other soft tissue attachments at ankle
  - Only native ATFL vs repair remain
- Instron testing
  - Specimen secured in custom jig
    - 20° inversion
    - 10° plantarflexion
  - Loaded to failure
    - Fibular displacement (rate 20 mm/min)
  - Video extensometer measurement of fibular displacement
Results: Ultimate Failure

- Intact ATFL
  - Mean 154.0 N (± 63.7 N)
- Augmentation alone
  - Mean 315.5 N (± 66.8 N)
  - p = 0.017
    [compared to intact]
- Broström w/ augmentation
  - Mean 250.8 N (±122.7 N)
  - p = 0.175
    [compared to intact]

*No significant difference between suture tape techniques*
Results: Stiffness

- Intact ATFL
  - Mean 14.5 N/mm (± 4.4 N/mm)
- Augmentation alone
  - Mean 31.4 N/mm (± 9.9 N/mm)
  - p = 0.008 [compared to intact]
- Brostrøm w/ augmentation
  - Mean 21.1 N/mm (± 9.1 N/mm)
  - p = 0.369 [compared to intact]

*No significant difference between suture tape techniques*
Conclusions

• Suture tape augmentation is at least as strong & stiff as the intact ATFL in a cadaveric model at time zero
  – Improved biomechanical properties at time zero compared to standard Broström repair of ATFL
    ○ Waldrop et al. AJSM (2012)

• Clinical role of suture tape augmentation in the lateral ankle remains to be determined
  – Further research necessary before clinical recommendations can be made
Selected References


