

Arthrex SpeedBridge and Tornier ArthroTunneler Biomechanical Cadaver Testing

Arthrex Research and Development

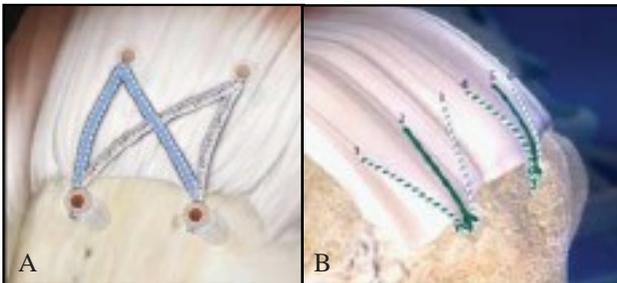
Objective

To compare the mechanical properties of two rotator cuff surgical repairs: the Arthrex SpeedBridge repair and the Tornier ArthroTunneler repair.

Methods and Materials

All repairs were performed by orthopaedic surgeons, Dr. Stephen Burkhart and Dr. Paul Brady. Five pairs of cadaver shoulders were used for this study. The humerus was dissected of all soft tissue and the supraspinatus tendon was transected from the footprint. The shaft of the humerus was potted in fiberglass resin. One shoulder from each pair received the Arthrex repair to reattach the supraspinatus, and the contralateral shoulder received the Tornier repair. The Arthrex SpeedBridge repair, shown in Figure 1A, utilizes 5.5 mm SwiveLocks and FiberTape, in a knotless transosseous-equivalent configuration. The Tornier ArthroTunneler repair utilizes Force Fiber in a transosseous pattern with six sutures, requiring six separate passes and six knots, as shown in Figure 1B. In order to recreate the physiological forces during the repairs, the tendons were tensioned in the medial direction, using a 2 lbf weight suspended from the sample over a pulley.

Figure 1A: (left) Illustration of the Arthrex SpeedBridge repair. **Figure 1B:** (right) Illustration of the Tornier ArthroTunneler repair.

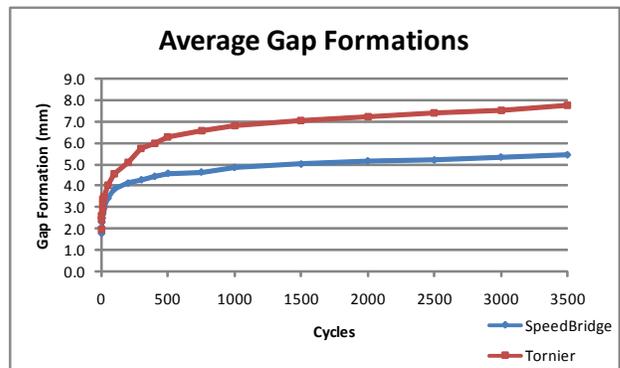


A nylon strap was sutured to the medial end of the supraspinatus tendon to facilitate mechanical loading. Each humerus was clamped to the materials testing machine (Instron 8871) surface in a fixed angle fixture, so that the direction of pull was at 45°. The nylon strap was secured to the cross-head using a clevis and dowel fixture. Each construct was preloaded to 5N, and cycled between 10 and 180N for 3500 cycles at 1 Hz. Digital video tracking was used to measure gap displacement at the repair site. A paired t-test ($\alpha = 0.05$) was used to compare the ultimate loads and gap formation of the two repair types.

Results

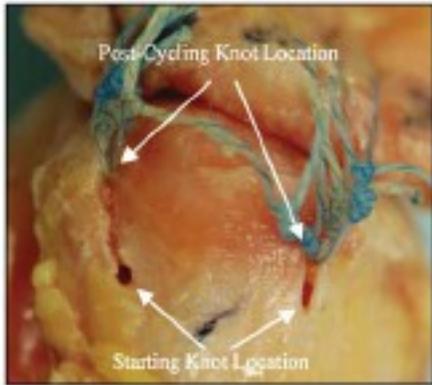
The SpeedBridge repair from each of the five pairs of shoulders had lower gap formation than the Tornier repairs, and the lower maximum gap formation of the knotless SpeedBridge repair was significantly different than that of the ArthroTunneler repair ($p = 0.010$). The average gap formation of the two repairs at each cycle is shown in Figure 2.

Figure 2: Graphical representation of the average displacement of the Arthrex and Tornier repairs.



The mechanism of displacement for the Tornier samples was always sutures cutting through the bone tunnels, as shown in Figure 3. On average, the amount of bone cut by the sutures was 6 ± 2 mm. Conversely, the knotless SpeedBridge repair did not show a tendency for the FiberTape to cut through the bone and moves the mode of failure from the bone to the tendon.

Figure 3: Tornier repair viewed from the lateral aspect, showing suture cut-through of humeral head.



Conclusion

Sutures in the Tornier ArthroTunneler repair consistently cut through bone, leading to significantly larger gap formation than the knotless SpeedBridge repair.