

Rotator Cuff Repair: SpeedBridge vs. Standard SutureBridge

Arthrex Research and Development

Objective

The purpose of this testing is to determine the fixation strength of a traditional SutureBridge compared to a repair using the SpeedBridge technique.

Methods and Materials

Description of SutureBridge Technique:

Two 5.5 mm Bio-Corkscrew FT's loaded with #2 Fiber-Wire were inserted just lateral of the articulating surface of the humeral head. One suture from each anchor was passed in a mattress stitch configuration using a Scorpion Suture Passer. Knots were tied and the suture tails were fixated laterally using the 3.5 mm Bio-PushLocks as seen in Figure 1.

Description of SpeedBridge Technique using SwiveLock C's loaded with FiberTape:

Two 4.75 mm SwiveLock C anchors single-loaded with FiberTape, were inserted just lateral of the articulating surface of the humeral head. Both tails of the FiberTape were passed simultaneously through the tissue using a FiberLink and a Scorpion Suture Passer. No knot was tied and the free tails of the mattress stitch were fixated laterally using two more 4.75 mm SwiveLock C's as seen in Figure 2.

Figure 1: SutureBridge



Figure 2: SpeedBridge



Mechanical Testing of the Repaired Constructs:

Six pairs of human cadaver humeri (54 ± 5 , all male) were stripped of all soft tissue except the rotator cuff. The supraspinatus was transected. One humerus from each pair was repaired using the Standard SutureBridge technique, and the contralateral humerus received the SpeedBridge repair. Each sample was positioned in the Instron with the humerus at a 45° angle to simulate the anatomical direction of the load applied to the supraspinatus, as shown in Figure 3.

The repaired tendon was preloaded to 10 N then held for 5 seconds. The tendon was cycled from 10 to 100 N at 1 Hz for 500 cycles followed by a single cycle pull-to-failure at 33 mm/sec. Force data were recorded at 500 Hz. Cyclic displacement was determined using digitized video recordings, and was calculated as the total displacement from the first cycle maximum to the last cycle maximum. Ultimate load, cyclic displacement and the mode of failure were recorded for each sample.

Figure 3: Position of a repaired humerus for mechanical testing.



Results

The ultimate load of the standard SutureBridge constructs was 475 ± 84 N, and the cyclic displacement was 1.6 ± 0.7 mm. The ultimate load of the SpeedBridge constructs was 482 ± 126 N, and the cyclic displacement was 1.1 ± 0.5 mm. The mode of failure for all samples was the FiberWire or FiberTape tearing through the tendon. The results for each sample are listed in Table 1.

Results (cont.)

A Paired t-test ($\alpha = 0.05$) was performed to compare differences between the two groups. There was no statistical difference between the ultimate load ($p = 0.913$, $P = 0.05$), or the cyclic displacement ($p = 0.413$, $P = 0.05$) of the standard SutureBridge and the SpeedBridge.

Conclusion

As demonstrated by the mode of failure for all six matched pairs used in this testing, the limiting factor for ultimate load is the tendon tissue and not the repair technique. The cyclic displacement and ultimate load is similar for both the standard SutureBridge and the SpeedBridge. The data suggest that the SpeedBridge is a robust repair and provides adequate fixation of rotator cuff repairs.

Table 1: The results of the mechanical testing of the two rotator cuff repairs.

Standard SutureBridge			
Sample #	Ultimate (N)	Cyclic Disp. (mm)	Mode of Failure
07-07017L	431	0.9	tendon torn by suture
07-07023R	531	1.8	tendon torn by suture
07-02060R	395	1.0	tendon torn by suture
07-02400L	462	na	tendon torn by suture
07-05073R	616	1.5	tendon torn by suture
07-05074R	413	2.8	tendon torn by suture
Average	475	1.6	
St. Dev.	84	0.7	

SpeedBridge			
Sample #	Ultimate (N)	Cyclic Disp. (mm)	Mode of Failure
07-07017R	391	1.3	tendon torn by suture
07-07023L	458	2.1	tendon torn by suture
07-02060L	358	1.1	tendon torn by suture
07-02400R	494	0.9	tendon torn by suture
07-05073L	474	0.8	tendon torn by suture
07-05074L	717	0.6	tendon torn by suture
Average	482	1.1	
St. Dev.	126	0.5	