

Tape Versus Suture – A Biomechanical Analysis in an Ovine Model and Post-Operative Outcomes in Arthroscopic Rotator Cuff Repair

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Summary:

Rotator cuff repair with the wider tape provided a 3 fold increase in tendon to bone contact pressure and a 1.5 fold increase in pull-out strength compared to repair with #2 suture. However these superior biomechanical results did not translate to better clinical outcomes as post-operative re-tear rate of rotator cuff repair with tape and #2 suture were similar (16-17%) at six months post surgery.

Abstract:

BACKGROUND

Clinical studies have shown that rotator cuff repair with an arthroscopic tension band technique lead to a lower re-tear rate at six months and two years post surgery compared to simple suture-anchor technique, probably due to higher compression at the tendon-bone interface (footprint). Advances in suture anchor systems have allowed a wider tape to be used for rotator cuff repairs. Therefore the aims of this study were 1) to examine the biomechanical differences between rotator cuff repair using #2 suture and tape in an ovine model and 2) to compare early clinical outcomes between patient who had rotator cuff repair with tape and patient who had repair with #2 suture.

METHODS

Rotator cuff tears of the infraspinatus tendon were created in 16 ovine shoulders. The tendons were re-attached to the footprint using a tension band repair technique with two different types of sutures; 1) suture (Fiberwire, Arthrex) and 2) tape (FiberTape, Arthrex) with the same knotless anchor system. Following repair, footprint contact pressure was measured with 10, 20, 30 N applied to the repaired tendon and at -10deg, 0deg, 10deg of abduction. Repair strength was determined by a pull-to-failure test. A retrospective study of 150 consecutive patients who underwent arthroscopic rotator cuff repair with tear size larger than 1.5cm x 1cm by a single surgeon was conducted. There were 50 patients in the tape repair group and 100 patients in the suture repair group. Patients ranked pain and functional scores were recorded pre and post-operatively at one, six, 12 and six months with a modified L'Instalata Questionnaire. Shoulder strength and range of motion were also recorded at each visit. Ultrasound was used to evaluate the repair integrity at six months post surgery.

RESULTS

Rotator cuff repair using tape had higher footprint contact pressure ($0.33\text{MPa} \pm 0.03\text{MPa}$ vs $0.11\text{MPa} \pm 0.3\text{MPa}$, $p < 0.0001$, mean \pm SEM) compared to repair with #2 sutures at 0° abduction with a 30 N load applied across the repaired tendon. Ultimate failure load of tape repair was higher than suture repair (217 ± 28 N vs 144 ± 14 N, $p < 0.05$). Clinical data showed both group reported significantly lower frequency and magnitude of pain during overhead activity and sleep at six months compared to pre-surgery levels ($p < 0.001$). At six months post surgery the suture repair group had better internal rotation (+3 vertebral levels) and external rotation (+18deg) compared to the tape repair group ($p < 0.001$). Both groups had similar shoulder strength at six months. Re-tear rate was similar between the tape group (16%) (8/ 50) and the suture group (17%) (17/100).

CONCLUSION

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Results from our biomechanical study showed that rotator cuff repair with tape provides a 3 fold increase in footprint compression and a 1.5 fold increase in construct strength compared with repair using #2 sutures. In this clinical study of large rotator cuff tears, relatively good results were found for arthroscopic rotator cuff repairs performed using an inverted mattress knotless single row construct. However tape did not affect the re-tear rate at six month post surgery.