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Repair results of 2-tendon rotator cuff tears utilizing the transosseous equivalent technique

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Background: The purpose of this study was to examine the healing rate of 2-tendon rotator cuff tears repaired by the use of a transosseous-equivalent (TOE) suture bridge technique.
Materials and methods: Forty-three patients with combined supraspinatus and infraspinatus tendon tears underwent arthroscopic repair using TOE technique. Forty of these patients were then evaluated by MRI and clinical exam at a minimum of 1-year follow-up to determine the rate of healing of the repair and clinical outcomes associated with healing.
Results: Eighty-three percent of the repairs demonstrated intact rotator cuff repairs at a mean of 16 months post-op. Larger tears (3.5 vs 2.8 cm) were associated with failure ($P = .01$), as was more advanced fatty infiltration (Goutallier 1.3 vs 0.3, $P = .01$). Age was not different between intact and nonintact tendons. Strength was the only clinical finding that differed between intact and nonintact tendons.
Conclusion: Two-tendon tears of the rotator cuff can heal at a high rate with the use of TOE suture bridge repair technique. Furthermore, tear size and Goutallier grading were negatively correlated with postoperative healing. The incremental improvement in the rate of observed rotator cuff healing still does not translate to statistical differences in the objective shoulder scoring systems.
Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Rotator cuff; arthroscopic repair; double-row; transosseous-equivalent

Rotator cuff surgery has experienced numerous advances over the past decade yielding ultra-strong implants, suture anchors, and suture material. Surgical repair, performed arthroscopically or open, provides a variable (24-94%)[24] rate of healing.[4,12] While most studies have shown improved clinical outcomes after repair, patients with failure of tendon healing to bone demonstrate decreased postoperative strength.[1,23] As the tear size gets larger, retear, or failure of healing occurs at higher rates.[12,18] Nho et al examined the results of rotator cuff repair. The majority if failures (74%) were two tendon tears.[17] Galatz et al reported retears in 17 out of 18 patients who underwent arthroscopic repair for large and massive (>2cm in the transverse dimension) RTC tears when evaluated by US at a minimum of 1-year follow-up.[12] In an effort to improve the rotator cuff healing rates, Park et al[21] described a transosseous-equivalent suture bridge (TOE) that uses multiple linked anchor points both medially and laterally to provide fixation, as well as

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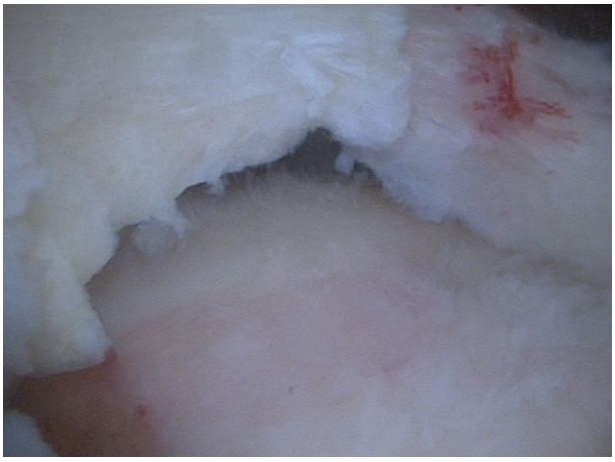

Figure 1 Arthroscopic picture of 2-tendon rotator cuff tear.

Figure 2 Arthroscopic picture of repaired cuff and transosseous equivalent suture bridge technique.

compression to the tendon in an attempt to restore the native footprint.[20]

Our hypothesis was that the biomechanical advantages of the TOE repair would result in a higher rate of healing (clinical exam and MRI) than the current reports on single and traditional double row repairs, specifically in 2-tendon tears of the rotator cuff.

Materials and methods

Between 2006 and 2007, 156 consecutive TOE rotator cuff repairs were identified retrospectively from Orthopaedic & Neurosurgery Specialists PC Shoulder Surgery Registry; 40 of these patients met the criteria for this study. There were 23 men and 17 women with an overall mean age of 61.4 years (range, 34-79). Twenty-seven procedures were performed on the right shoulder, 13 were performed on the left shoulder. All 40 shoulders had both supraspinatus and infraspinatus tears and clinically intact contralateral shoulders as defined by our criteria. During the course of this study, none of the patients had any complaints nor had any interventions performed on their contralateral shoulders.

Twenty-three patients could recall the initiation of their pain/symptoms to a specific traumatic event, prior to which they had no reported symptoms; while 13 patients had chronic shoulder pain and were unable to relate it to a specific event. Nine patients reported initiation of pain following a sporting activity, while 10 patients recalled the onset of symptoms due to a fall. Two patients had chronic pain status post previous rotator cuff repair.

Forty patients returned for MRI evaluation along with subjective and objective clinical evaluations by an attending orthopedic surgeon. Three patients did not return for the study: 1 patient moved out of the area and the other 2 patients did not want to have a repeat MRI. Inclusion criteria for TOE repairs in this study included patients with combined supraspinatus and infraspinatus rotator cuff tears repaired in a spanning fashion with a minimum of 4 suture anchors (Figures 1 and 2). We used a minimum tear length of 2.5 cm in the AP dimension to allow us to exclude smaller single tendon tears. This is based on an anatomical study, which reported a supraspinatus footprint mean AP width of 2.3 cm from Curtis et al,[7] and more recent updates from Mochizuki et al, which describe an even smaller AP (1.2 cm) dimension of the supraspinatus.[16] Even though it appears that Mochizuki et al presented a more accurate description, we chose 2.5 cm as our cutoff for a 2-tendon tear for the purpose of this study to keep consistent with previous studies. This method of describing tear morphology relies more on anatomy than the subjective Deorio classification[8] and does not have the same limitation of fair interobserver reliability.[15] Tear size was determined arthroscopically after subacromial debridement and bursectomy with the use of a calibrated probe. The posterior aspect of the biceps tendon (or bicipital groove when biceps absent) was used as a landmark to measure starting point of the tears. The 3 senior authors performed all repairs. All patients returned for a postoperative MRI, objective scoring and physical examination at a minimum of 1-year post-surgery.

Surgical technique

Surgical technique was similar in all cases and was performed in the beach chair position after interscalene block. Diagnostic arthroscopy and intra-articular evaluation were performed with intra-articular procedures, as indicated in Table I. Attention was then turned to the subacromial space where a bursectomy and subacromial decompression was performed. Acute traumatic tears with no evidence of coracoacromial ligament fraying did not undergo decompression. The rotator cuff was evaluated from multiple portals and the ideal pattern of reduction was determined. If a biceps tenodesis was required, it was performed at this point using a suture anchor below the bicipital groove. The rotator cuff footprint was then denuded of soft tissue and excoriated, leaving behind cortical bone. Two- to 3-suture anchors (5.5 FT; Arthrex, Naples, FL) were placed in the medial row. Sutures were passed through the reduced tendon in a mattress configuration, shuttled through the tendon, and were always tied. After completing the medial row, alternating limbs were linked into the lateral anchors (3.5 Pushlock anchor; Arthrex) and placed into the tuberosity.