

Arthroscopic Rotator Cuff Repair Failure Resulting From Decortication of the Rotator Cuff Footprint: A Case Report

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During the past decade, arthroscopic rotator cuff repair has become increasingly popular among sports medicine arthroscopists. At the same time, advances in arthroscopic technology have led to the development of innovative anchoring devices for the repair of rotator cuff tears. Device failure is probably a less common cause of either rotator cuff re-tears or initial failure to heal. However, arthroscopic rotator cuff repair failure involving the fixation device may occur at the level of the suture, at the suture–anchor junction, or at the anchor itself. Preclinical data suggest that normal rotator cuff healing occurs at the bone–tendon interface and that simple superficial decortication is probably all that is required to promote this healing.¹ Historically, however, several authors have popularized using bone troughs or aggressive decortication to ensure adequate blood supply for tendon-to-bone healing. Although this technique may not compromise outcomes after the traditional placement of trans-osseous sutures during open rotator repair, it may have far different consequences for suture anchor fixation, which depends on an intact cortical shelf for optimizing the biomechanical environment.

In this case report, we describe an arthroscopic rotator cuff repair failure most likely resulting from decortication of the rotator cuff footprint and subsequent biomechanical failure of the anchor. The authors have obtained the patient's written informed consent for print and electronic publication of the case report and accompanying images.

CASE REPORT

A right-hand–dominant man in his early 50s presented with left shoulder pain 12 weeks after arthroscopic rotator cuff

repair. His initial injury occurred 5 months earlier, when he was loosening a large bolt while resting a metal bar on his shoulder and felt immediate pain in the lateral aspect of the shoulder. He was unable to lift with the left arm and had difficulty with overhead motions as well as severe night pain. He denied any previous injury to the shoulder. His past medical history was significant only for hypertension. Initial magnetic resonance imaging (MRI) showed a large full-thickness tear of the supraspinatus tendon with minimal retraction and no fatty infiltration or muscle atrophy. An arthroscopic rotator cuff repair was performed.

During the index procedure, a large crescent-shape tear involving the anteroposterior dimension of the supraspinatus tendon was found. Two absorbable suture anchors (Spiralok; DePuy Mitek, Raynham, Mass) were placed at the articular margin, and a suture anchor (Versalok; DePuy Mitek) was placed laterally. Adequate fixation was noted.

The patient's upper extremity was immobilized in a sling for 4 weeks, and he underwent physical therapy over the next 8 weeks, but the left shoulder pain continued. There was continued functional limitation caused by decreased left shoulder range of motion and strength. The patient was referred to us for second-opinion evaluation. Physical examination of the left shoulder revealed mild supraspinatus and infraspinatus atrophy. The point of maximal tenderness was over the greater tuberosity. Active forward elevation was 55°, external rotation with elbow at the side was 35° (80° on the right), internal rotation was to the level of the buttocks (T8 on right), and abduction and external rotation motor strength

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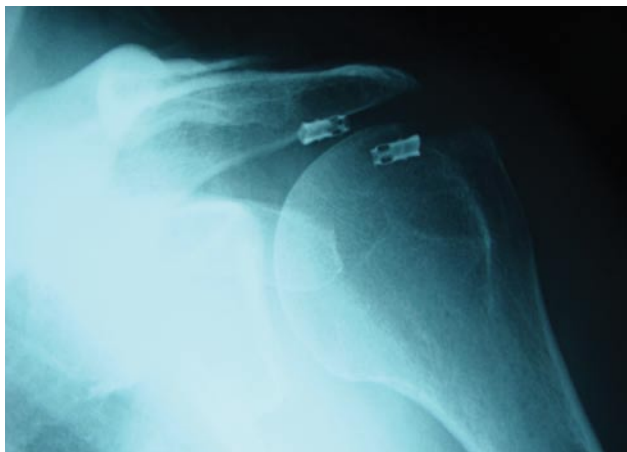


Figure 1. Plain radiograph shows suture anchors in subacromial space.



Figure 2. Rotator cuff footprint showing compromise of the cortical shelf.

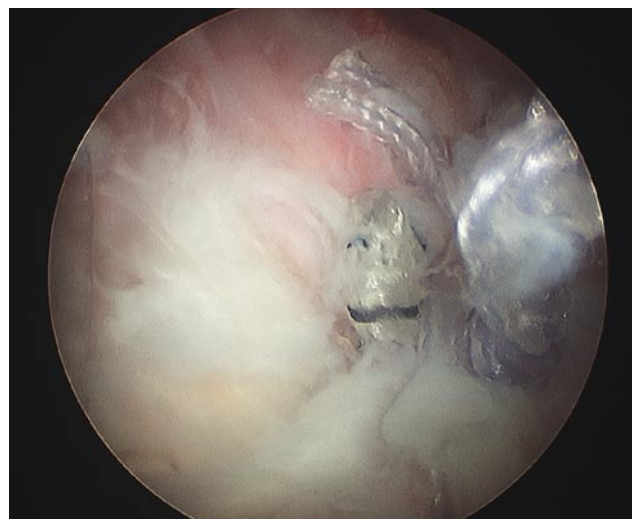


Figure 3. Anatomical repair of the rotator cuff tendon under minimal tension.

were graded 4/5. Impingement signs and the drop-arm sign were positive.

MRI arthrogram showed a full-thickness retracted supraspinatus tendon tear. Radiographs of the shoulder showed the metal anchor in the subacromial space (Figure 1). The diagnosis was recurrent rotator cuff tear caused by mechanical failure of the anchors.

We performed a shoulder arthroscopy through standard posterior and anterior arthroscopic portals with the patient in the beach-chair position under interscalene regional anesthesia. Diagnostic arthroscopy showed 2 intra-articular anchors and 1 anchor that was in the subacromial space but still partially in bone. The intra-articular anchors were released from the sutures and retrieved through an accessory anterolateral cannula. The other anchor was released from the suture in the subacromial space and similarly removed. A large trough with complete decortication of the rotator cuff footprint had been previously made (Figure 2). We placed one 4.5-mm and two 5.5-mm fully threaded Bio-Corkscrew suture anchors (Arthrex, Naples, Fla) in the best-quality bone where the cortex was still intact. We used a configuration of 3 horizontal and 3 simple sutures through the rotator cuff to achieve a single-row repair (there was not enough bone for a double-row repair). We achieved anatomical repair under minimal tension (Figure 3).

DISCUSSION

For high initial fixation strength and maintenance of mechanical stability under cyclic loading, the anchors used for arthroscopic rotator cuff repair must be securely positioned in proximal humeral bone. Many factors (bone density, anchor configuration and angle of insertion, biological healing capacity) determine the biomechanical stability of anchors at this site. Other investigators have reported suture anchor fixation failure resulting from suture anchor pullout.² Mahar and colleagues³ described suture breakage at the anchor eyelet. Bynum and colleagues⁴ found that suture anchor depth changed the mechanical properties and mode of failure of suture

anchor constructs. More specifically, deeper anchor placement led to suture degradation.

In a study on the relationship between the cortical thickness of the glenoid and the failure properties of suture anchors, Roth and colleagues⁵ found that the ultimate pullout strength and fatigue life of suture anchors depend directly on cortical thickness. We believe that a similar concept is applicable to the footprint of the rotator cuff. Anchors rest on the cortical margin for stability.⁴ Decortication of this area results in a decrease in the ability of the anchor to maintain its fixation in the proximal humerus. As a result, loss of anchor fixation leads to failure of the rotator cuff repair, a poor clinical outcome, and the need for revision surgery. Therefore, the footprint of the rotator cuff should not be completely decorticated in order to preserve the biomechanical stability of the anchor.

In our patient's case, findings on diagnostic arthroscopy showed that mechanical failure of the anchor had been caused by complete decortication of the rotator cuff footprint. Surgeons performing arthroscopic rotator cuff repair should be aware of this issue and realize its importance when preparing the rotator cuff footprint.

AUTHORS' DISCLOSURE STATEMENT

Dr. Cole wishes to note that he is a consultant to and receives royalties from Arthrex, Inc. The other authors report no actual or potential conflict of interest in relation to this article.

REFERENCES

1. St Pierre P, Olson EJ, Elliott JJ, O'Hair KC, McKinney LA, Ryan J. Tendon-healing to cortical bone compared with healing to a cancellous trough. A biomechanical and histological evaluation in goats. *J Bone Joint Surg Am.* 1995;77(12):1858-1866.
2. Brislin KJ, Field LD, Savoie FH 3rd. Complications after arthroscopic rotator cuff repair. *Arthroscopy.* 2007;23(2):124-128.
3. Mahar A, Allred DW, Wedemeyer M, Abbi G, Pedowitz R. A biomechanical and radiographic analysis of standard and intracortical suture anchors for arthroscopic rotator cuff repair. *Arthroscopy.* 2006;22(2):130-135.
4. Bynum CK, Lee S, Mahar A, Tasto J, Pedowitz R. Failure mode of suture anchors as a function of insertion depth. *Am J Sports Med.* 2005;33(7):1030-1034.
5. Roth CA, Bartolozzi AR, Ciccotti MG, et al. Failure properties of suture anchors in the glenoid and the effects of cortical thickness. *Arthroscopy.* 1998;14(2):186-191.