

# The Role of Superior Capsule Reconstruction in Rotator Cuff Tears

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## KEYWORDS

- Massive rotator cuff repair • Dermal graft • Superior capsule reconstruction • Diagnosis
- Surgical technique

## KEY POINTS

- Massive and irreparable rotator cuffs are a challenging problem to treat.
- Although partial repair, debridement, and muscle transfer are all viable options, there is no clear algorithm to determine treatment plan for these patients.
- Superior capsule reconstruction may be an option for a specific subset of this population.

## INTRODUCTION

The treatment of massive irreparable rotator cuff tendon tears is a consistent challenge for physicians. When treating a patient with a chronic tear with a high grade of fatty degeneration,<sup>1–6</sup> tendon retraction,<sup>1,2</sup> and muscle atrophy,<sup>1,3–6</sup> the physician is left with only a few options because the risk of recurrent tear and persistent pain remain high.

Current nonprosthetic treatment options include debridement and subacromial decompression,<sup>7–10</sup> partial rotator cuff repair,<sup>11–17</sup> bridging rotator cuff reconstruction with a graft,<sup>18–23</sup> and latissimus dorsi transfer<sup>24–29</sup>; although each has different factors that limit their clinical application. Reverse shoulder arthroplasty is a reliable solution,<sup>30–33</sup> but it is not optimal for patients in their 40s and 50s. At the time of this publication, balloon interposition is not an available option in North America.

In 2007, Mihata<sup>34</sup> described the superior capsule reconstruction (SCR) as a method to restore superior stability and muscle balance in the shoulder joint without repairing the supraspinatus and infraspinatus tendon tears.<sup>35–38</sup>

This was as an alternative solution for the patient who had an irreparable rotator cuff with a low grade of glenohumeral arthritis, underscored by the inability to perform reverse shoulder arthroplasty in Japan during that same period. Since that time, Mihata has reported on more than 100 subjects. These reports, along with numerous (unreviewed) anecdotal reports, suggest significant clinical benefit.

## RELEVANT ANATOMY

The glenohumeral joint is a complex structure that is the most mobile joint in the human body. The rotator cuff, deltoid, and biceps muscles are the primary dynamic stabilizers of the shoulder and are responsible for the maintenance of the force couples and keeping the humeral head centered within the glenoid during movement.<sup>39,40</sup>

The superior capsule is continuous with the rotator cable. The shoulder capsule comprises the anterior band of the inferior glenohumeral ligament, the inferior pouch, the posterior band of the inferior glenohumeral ligament, the middle glenohumeral ligament, the superior

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glenohumeral ligament, and the superior capsule. The superior capsule is a thin fibrous structure that spans from the greater tuberosity across the joint space to the superior portion of the glenoid.<sup>41</sup> The superior capsule is connected to between 30% and 61% of the greater tuberosity and can have a larger footprint on the greater tuberosity than the supraspinatus. There is some debate about how thick the tissue is that makes up the superior capsule. One study found that it was between 1.32 mm and 4.47 mm, and another found the thickness to be between 1.6 mm and 0.4 mm.<sup>42–45</sup> The superior capsule has a reverse trampoline effect that keeps the humeral head from contacting the acromion.<sup>41</sup>

The function of the shoulder superior capsule is to act as the main static stabilizer of the glenohumeral joint. A defect in the superior capsule secondary to a large rotator cuff tear results in increased glenohumeral translation in all directions.<sup>46,47</sup>

## DIAGNOSIS AND INDICATIONS

The accurate diagnosis of an irreparable rotator cuff is made through patient history, physical examination, and MRI.

Advanced rotator cuff disease with corresponding Goutallier grade 3 and 4 changes and irreparable rotator cuff repairs that have not responded to nonoperative measures are candidates for this procedure.

Hamada 4 changes or greater, advanced arthritic changes, and poor deltoid function are all relative contraindications to this procedure.

## SURGICAL TECHNIQUE

The patient is positioned in either beach chair or lateral decubitus position per surgeon preference. After appropriate positioning, padding, surgical time out, and antibiotic administration, the procedure is started.

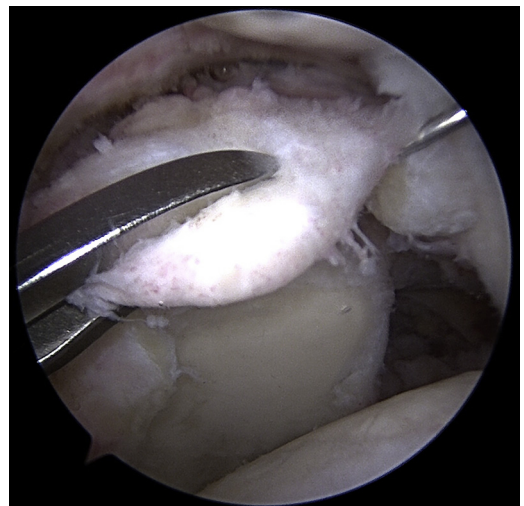
Arthroscopic evaluation of the glenohumeral joint is completed. Loose flaps, loose bodies, chondral flaps, suture material, and debris are debrided.

Careful evaluation of the subscapularis is carried out with a posterior lever push. The subscapularis is repaired as indicated, although a low threshold for repair is maintained to help address a balanced force couple.

The biceps is tenotomized or tenodesed per surgeon preference. The authors recommend that this is done early in the procedure (if arthroscopic tenodesis is selected) because it is progressively more difficult as the case evolves.

Evaluation of the subacromial space is performed. A comprehensive bursectomy is performed. Clear delineation between rotator cuff and bursa must be made. The tendon will not extend past the lateral tuberosity; this may help to define the residual infraspinatus. Assessment of rotator cuff mobility is carried out (Fig. 1). If there is reasonable quality tissue that may be repaired in a low-tension fashion, this repair is completed, and the SCR is aborted. Superior graft augmentation with a thinner 1 mm dermal graft is considered in this setting based on the preoperative assessment of tissue. Acromioplasty is routinely performed.

The arthroscope is placed in the posteromedial portal for viewing. The medial glenoid is then prepared. The superior labrum is thinned but not entirely debrided. The superior glenoid has soft tissue removed from the coracoid and then posteriorly. Residual rotator cuff is left intact. A probe can be used to lift up and move this tissue during the glenoid preparation. This bone is then excoriated but not decorticated. Two to 3 labral suture anchors are placed on the superior glenoid. In poor quality bone, a small screw in anchor may be considered. The most anterior anchor is placed just lateral to the base of the coracoid (Fig. 2B). This anchor is placed percutaneously, just off the edge of the acromioclavicular (AC) joint. Careful attention to aim medially, away from the glenohumeral joint is critical. The second and third anchors (when there is available space for a



**Fig. 1.** Assessment of rotator cuff mobility and tissue quality. If there is reasonable quality tissue that may be repaired in a low-tension fashion, this repair is completed and the SCR is aborted.

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