Superior Capsular Reconstruction for Failed Previous Rotator Cuff Repair: A Case Report

Yi-Chen Lin, MAT, ATC
Jennifer Volberding, Ph.D., LAT, ATC
H. Jake Whitener, DO
Brian A. Chalkin, DO

Abstract

Within a subset of patients with rotator cuff repair, optimal healing does not occur, and pain and dysfunction continue. The current patient failed to properly heal six months after an initial rotator cuff repair and, sustained a re-tear of the rotator cuff. Reverse total shoulder arthroplasty (RSA) is often recommended for patients with poor previous surgical outcomes. However, due to the age, the permanent destruction of the glenohumeral articular surfaces, complications rates and functional level of the patients[1,2], it was determined the patient would benefit from the superior capsular reconstruction (SCR) instead. Patient reports immediate improvements in pain scores and shoulder flexion both actively and passively at 4 weeks follow-up session. Early results are promising, and we seek further evaluation to demonstrate that this technique modification will lead to a long-term improvement.

Key Words: superior capsular reconstruction, rotator cuff repair, shoulder outcomes

Introduction

Rotator cuff tears are common shoulder injuries, and up to 500,000 rotator cuff repairs are performed in the United States every year.[1] Among these rotator cuff tears, up to 40% are chronic massive and irreparable tears[2], and in these tears, ranging from 25% to 94% might result in failure and re-tear in initial management (i.e. partial or complete rotator cuff repair, biceps tenotomy, bridging patch grafts, tendon transfers.) due to tendon retraction with elasticity, muscle atrophy, and fatty infiltration.[2-5] Some authors recommended reverse total shoulder arthroplasty (RSA) for massive and irreparable tears.[1] However, RSA may not be ideal surgical options for patients given their age and/or functional level.[1,2] While knowing that the superior capsule is a key contributor toward the maintenance of passive stability of the glenohumeral joint [3-6], a novel procedure to restore superior stability of the humeral head has been developed. This procedure, superior capsular reconstruction (SCR) was first introduced by Mihata et al.[3,4] By anatomically replacing the superior capsule, SCR helps reduce superior translation of the humeral head and improves shoulder kinematics. [1,3,4] SCR has been well studied after first introduction, and early clinical results have been promising in patients with massive or irreparable rotator cuff tears.[1-4] However, there are limited studies

utilized SCR for cases with previous failed rotator cuff repairs. We believe that SCR in conjunction with partial rotator cuff repair is a viable joint-preserving procedure in these cases, as early clinical results showed noticeable improvement after the intervention.[2,4-7]

Case Presentation

Patient Background

A 53-year-old male presented to the clinic with a history of a previous rotator cuff repair of the right shoulder completed six months prior. The patient reported no new incident of injury but stated he had been experiencing shoulder pain with no relief since the surgery. The patient completed numerous physical therapy sessions but reported that the functional level had never improved.

Diagnostic Assessment

Upon exam, patient had positive empty can test and extremely limited range of motion in the flexion and abductions planes at the glenohumeral joint. Given the physical exam findings, a MRI arthrogram was ordered and revealed the patient had re-torn the supraspinatus with a large area of retraction.

Surgical and non-surgical options were discussed with the patient. Although reverse total shoulder arthroplasty (RSA) is a good surgical option, it would not be optimal for the patient due to the permanent destruction of the glenohumeral articular surfaces, complications rates and functional level of the patient.[2,3,4,7] Therefore, the decision was made to perform a SCR with partial rotator cuff repair if any residual tendon was viable and amenable to fixation. Informed consent has been given from the patient to conduct the surgery and to be included in the research publication.

Therapeutic Intervention

The surgical procedure was performed with the patient placed in the beach chair. The arm was held in 20 to 30 degrees of abduction combined with 20 degrees forward flexion. General anesthesia was used along with a supplementary suprascapular nerve block. Standard posterior and anterosuperior portals were used along with a mid-lateral portal created by using a 10-mm-diameter PassPort Cannula (Arthrex), a Neviaser portal made by using a 7-mm instrument cannula (Arthrex) and an accessory posterolateral viewing portal. An attempt to mobilizing the rotator cuff was conducted to determine if there was adequate residual tendon and the rotator cuff was reparable, then the decision was made to proceed SCR with a partial superior rotator cuff repair. Suture and suture anchors were visualized from the previous repair (Fig. 1). Two Anchors were removed as well as the suture tape, arthroscopically. The supraspinatus and majority of the infraspinatus were absent (Fig. 2).

The subscapularis and the most posterior portion of the infraspinatus were intact.

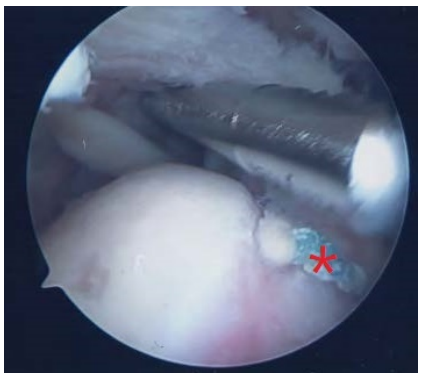


Fig. 1

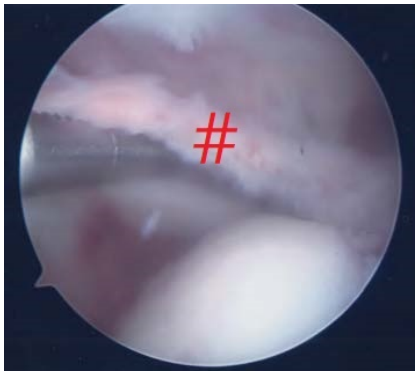


Fig. 2

Fig. 1 View of the humeral head, showing the suture anchors (*) from previous rotator cuff repair. **Fig. 2** View of the glenoid and the rotator cuff remnant, showing the re-torn supraspinatus (#).

Acromioplasty was performed using the cutting block technique with a high-speed burr. This allowed for much greater acromiohumeral space to avoid abrasion of the graft under the acromion. The high-speed burr was then used to decorticate the greater tuberosity as well as the superior glenoid neck of the scapula.

After debriding the remaining soft tissue, suture anchors were placed for dermal allograft. Two medial anchors were placed to the superior glenoid neck (Fig. 3). The anterior anchor was secured in line with the base of the coracoid (at the 10 o'clock position). The posterior anchor was screwed at approximately the 2 o'clock position from posterior portal. Two anchors were then placed laterally in the humeral head overlying the greater tuberosity (Fig. 4).

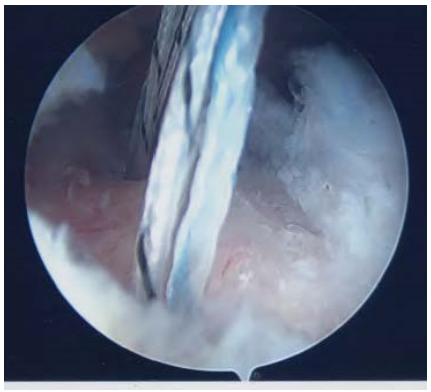


Fig. 3

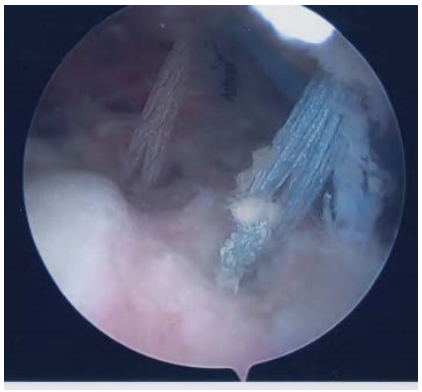
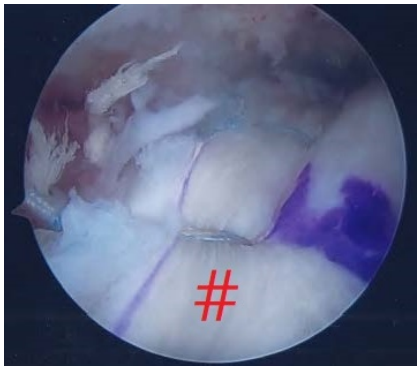


Fig. 4

Fig. 3 View of the superior glenoid neck, showing the placement of the two medial anchors. **Fig. 4** View of the lateral humeral head, showing the placement of the two lateral anchors.

A 3.0-mm acellular dermal allograft (Arthrex) was thawed and hydrated, and the appropriate dimensions were precisely measured arthroscopically using a calibrated probe. The medial-

to-lateral distance was measured from the glenoid neck to the lateral rotator cuff footprint on the greater tuberosity. The anterior-to-posterior distance was measured at glenoid neck and at the lateral rotator cuff footprint. Based on these measurements, the graft was cut to size and the exact positions of the anchors were marked on the graft. The graft was oversized 5 mm medial, anterior, and posterior to the anchors. After preparation of the graft, the previously retrieved sutures were passed through the respective corners of the graft. Each of these sutures were placed back into the joint and retrieved out of their respective portals. The medial sutures were placed back into the joint and retrieved from the Neviaser portal. The graft was fold lengthwise by using an arthroscopic grasper and was manually pushed through the PassPort Cannula while pulling on the sutures from the anterior, posterior, and Neviaser portals. The anchors used were 3.0 mm knotless anchors. Suture bridge technique was used to secure the graft to the scapula and humerus (Fig. 5). Number two orthocord was then used to place margin convergence stitches through the graft and remaining infraspinatus (Fig. 6).



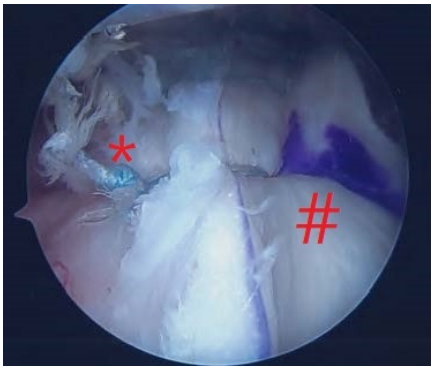


Fig. 5 **Fig. 6**

Fig. 5 View of the secured allograft (#), showing the use of suture bridge technique. **Fig. 6** View of the secured allograft (#) and remaining infraspinatus (*), showing the convergence stitches into the infraspinatus to incorporate into the allograft.

Follow-up and Outcomes

Prior to the procedure, the patient had positive empty can test and extremely limited range of motion in flexion and abduction. At current follow up four weeks after surgery, patient reports improved pain scores. He can forward flex to 45 degrees actively and 90 degrees passively. Postoperative rehabilitation physical therapy initiates at six weeks after surgery.

Discussion

Massive or irreparable rotator cuff tears remain a challenging condition for the orthopedic surgeons to repair due to muscle atrophy, rotator cuff retraction, and fatty infiltration.[2-6] Several surgical options have been introduced such as reverse total shoulder arthroplasty (RSA) and superior capsular reconstruction (SCR). Despite initial improvement in the early

post-operative period of some of these surgical options, they may not provide the most effective or optimal treatments for some patients.

SCR introduced by Mihata et al,[3,4] is a novel surgical technique for more problematic shoulder conditions. The superior capsular graft, when anchored onto the superior glenoid, anatomically prevents humeral head from superior translation and biomechanically provides a stable fulcrum for glenohumeral motion.[1,3,4] Clinical studies[4] included 24 cases of patients who suffered from massive rotator cuff tears and implementation of SCR technique. In the 31 months post-operative follow ups, they had dramatic improvements in active shoulder range of motion (especially in shoulder elevation increased from 84 degrees to 148 degrees and external rotation increased from 26 degrees to 40 degrees), and the acromiohumeral distance (increased from an average of 4.6 to 8.7 mm) comparing to the condition preoperatively. None of the cases in the study progressed to shoulder osteoarthritis or rotator cuff muscle atrophy. The graft or tendons in the most cases stayed intact without re-tears.

To date, this technique has demonstrated satisfactory outcomes with low complication risks.[1,2,4-6] Adams et al[1] utilized SCR on the patients with rotator cuff tendon that was either irreparable or very poor quality and unlikely to heal, but without degenerative changes on glenohumeral joint. They noticed early success of their patients as defined by having significant pain reduction, functional improvement and with very few complications. John et al[6] performed SCR with partial rotator cuff repair on a 70-year-old active woman with chronic massive rotator cuff tears treated conservatively at first with the patient reporting that she was very satisfied with the overall outcomes at 1 year follow-up post-operatively. She reported a visual analog pain scale 1 out of 10, along with 145 degrees of forward elevation, 30 degrees of external rotation, and 5 out of 5 strengths in both planes. The patient was gradually returned to activity when motion, strength, and confidence returned over a 6-month period. Hirahara et al[5] discussed 9 cases of irreparable rotator cuff tears managed with SCR. Comparing the results before surgery to 2 years after surgery, mean visual analog pain scale score decreased from 6.25 to 0.38, mean acromiohumeral distance increased from 4.5 mm to 7.6 mm, and mean American Shoulder and Elbow Surgeons shoulder index improved from 43.54 to 86.46. The results showed that SCR is an excellent alternative of RSA with outstanding clinical outcomes even 2 years post-operatively.

With the positive evidence of SCR, and a 53-year-old male with failed previous rotator cuff repair, we utilized SCR with partial rotator cuff repair rather than RSA due to the age and functional level of the patient. We found early success with the patient reporting significant pain relief and improvement in shoulder range of motion in forward flexion four weeks post-operatively. However, the case presented has not been long enough to present long-term

effectiveness of the technique. Overall, early results in this case report are promising. We look forward to studying whether this technique modification will lead to a long-term improvement in outcomes.

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