Arthroscopic in Situ Repair of Partial Bursal Rotator Cuff Tears Without Acromioplasty

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Purpose: To evaluate functional outcomes and complications in a consecutive group of patients with partial bursal rotator cuff tears (PBRCTs) treated with in situ repair without acromioplasty. Methods: Seventy-four patients who had undergone an arthroscopic single row in situ repair for bursal-sided rotator cuff tears were evaluated. Clinical assessment consisted of glenohumeral range of motion measurement, the American Shoulder and Elbow Surgeons score, and the University of California at Los Angeles score. Pain was recorded using a visual analog scale. Postoperative complications were also assessed. Results: Mean age was 55.2 years (±6.3) with a minimum of 2-year follow-up. After arthroscopic repair, all active range of motion parameters improved significantly (P < .0001). The American Shoulder and Elbow Surgeons scores improved from 42.5 to 86.1; the University of California at Los Angeles scores improved from 15.8 to 31.4, and the visual analog scale scores improved from 6.6 to 0.7 (P < .0001). Only 3 patients developed a postoperative adhesive capsulitis that responded to physical therapy. Conclusions: In the midterm follow-up (42 months), arthroscopic in situ repair of PBRCTs without acromioplasty is a reliable procedure that produces significant functional improvements and pain relief. Level of Evidence: Level IV, therapeutic case series.

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The current evidence does not provide guidance as to the best management plan for symptomatic partial bursal rotator cuff tears (PBRCTs). After failed conservative management, operative intervention is typically indicated for patients with persistent pain and disability symptoms. Generally, PBRCTs are considered for repair when they extend to more than 50% of the tendon thickness.

There is no widely accepted technique to repair PBRCTs. Some surgeons prefer conversion from partial into full thickness tear, and then repair in a traditional fashion, while others advocate in situ repair preserving the normal articular-side tendon. Most of the authors associate a subacromial decompression at the time of surgery.

Despite theoretic benefits of acromioplasty in the setting of rotator cuff repair, previous studies showed that acromioplasty does not improve functional outcomes or decrease complications.

The current literature indicates that patients with full-thickness rotator cuff repair have similar outcomes whether or not acromioplasty is performed. Nevertheless, we are not aware of any study that has evaluated the results of in situ PBRCT repair without acromioplasty.

The purpose of this study was to evaluate functional outcomes and complications of a consecutive group of patients with PBRCTs treated with in situ repair without acromioplasty. Our hypothesis was that in situ PBRCT repair is a reliable procedure that produces significant functional improvement without the need of a concomitant acromioplasty.

Methods

Patients who underwent arthroscopic repair of bursal-sided rotator cuff tears between March 2006 and April 2013 were retrospectively identified. The inclusion criteria were (1) an unsuccessful minimum 3-month course of conservative treatment consisting of activity modification, anti-inflammatory medication, and a
physical therapy, and (2) tears of >50% of the tendon thickness on the bursal side (or 6 mm) diagnosed with preoperative MRI and confirmed during surgery.

Exclusion criteria were (1) less than 2 years’ follow-up, (2) previous surgeries in the affected shoulder, and (3) associated procedures at the time of surgery.

**Surgical Technique**

All our patients were operated on in beach chair position under regional anesthesia (Fig 1). Two surgeons (M.R. and G.D.M.) of our team performed all the procedures. Glenohumeral joint examination was performed through a standard posterior portal, identifying integrity of articular tendons fibers.

A subacromial inspection through the same portal was done and a lateral portal was established. The arthroscope was switched to the lateral portal and an anterolateral working portal was placed. Enough bursectomy was performed to allow good visualization of the cuff tear and manage arthroscopic tools. Once the rupture was discovered, the degenerative tissue was removed (Fig 1A). The thickness of the tear was measured with a calibrated probe (Fig 1B).

Next, the greater tuberosity was prepared to promote healing of the reattached cuff using the Crimson Duvet procedure previously described by Snyder. Only the detached layer was reattached to the greater tuberosity using a 5.5-mm CrossFT anchor with 2 HiFi Sutures (Conmed, Linvatec, Largo, FL). All patients received a single-row repair. All sutures were passed with a simple repair (Fig 1 C and D). If the tear involved less than 1 cm of the footprint in an anterior-to-posterior direction, 1 anchor was used. If the tear involved more than 1 cm, 2 anchors were used—one placed anteriorly and the other posteriorly. In 68 patients, 1 anchor was used and in 6 patients, 2 anchors.

Subacromial decompression was not performed in any patient. For each of the 74 patients, data related to clinical history, preoperative medical evaluation, and intraoperative findings was recorded. Partial rotator cuff tears were classified according to Ellman19 as follows: A, articular; B, bursal; and I, interstitial; grade 1, less than 3 mm of the tendon thickness; grade 2, 3 to 6 mm of the tendon thickness, and grade 3, more than 6 mm of the tendon thickness. All tears included in this study were B3.

Pre- and postoperative evaluation was performed by a physical therapist specialized in shoulder pathology blinded to the type of surgery. Each patient was evaluated before surgery, and at follow-up after 3, 6, and
12 months and annually thereafter. Only the final follow-up evaluation was used for data analysis in this study.

Clinical assessment consisted of the measurement of active glenohumeral range of motion (ROM) using a goniometer, the American Shoulder and Elbow Surgeons (ASES) score, and the University of California at Los Angeles (UCLA) score. Pain was recorded using the visual analog scale (VAS); a score of 0 indicated no pain, and 10 points indicated the worst possible pain.

All patients underwent preoperative radiographs (anterior-posterior, axillary, and arch view) and MRI evaluation. The MRI studies revealed a bursal partial-thickness tear of the rotator cuff. The study protocol was approved by our Institutional Review Board.

**Postoperative Management**

All patients followed a standard postoperative rehabilitation protocol. The arm was supported in a standard sling for 4 weeks with elbow and hand exercises when tolerated. After 4 weeks, supervised gentle physical therapy consisting of passive pendulum and gradual passive and active-assisted ROM exercises was begun. When the patient could perform active forward elevation above the shoulder level, shoulder-strengthening exercises were started. Patients started with bands and then with weights progressively once they recovered active ROM. Rehabilitation continued for 3 to 6 months from the time of surgery. Heavy manual work and overhead activities were allowed after good restoration of shoulder ROM and strength, not before 4 months.

**Statistical Method**

Continuous variables are presented as means ± standard deviations. Pre- and postoperative clinical scores were compared by paired t-test. Statistical analysis was performed using Stata, version 12 (Stata Corporation, College Station, TX). A P value less than .05 was considered statistically significant.

**Results**

From the 88 consecutive arthroscopic repairs performed during the study period, 14 patients were excluded. Of the 74 patients studied, there were 39 men and 35 women, with a mean age of 55.2 years (range, 34-77 years). The injured shoulder was the dominant side in 43 cases (56.5%).

Four patients who underwent subscapularis repair, 3 patients with concomitant biceps procedures (2 tenotomies and 1 tenodesis), and 2 patients with repairs of type II SLAP were excluded. Four patients did not participate in follow-up for 2 years and 1 patient died of an unrelated disease. The final evaluation thus was carried out in 74 patients.

The mean follow-up was 42 months (range 24-84). All tears were graded as B3. At final follow-up, we observed a statistically significant improvement of the active ROM and all the functional scores evaluated. No intraoperative complications occurred in this group of patients. Table 1 shows a summary of preoperative and final follow-up values of active ROM and shoulder scores.

Three patients developed an adhesive capsulitis. All resolved with physical therapy within the first 3 months.

**Discussion**

The most important finding of this study was that in the midterm follow-up, arthroscopic in situ repair of PBRCTs without acromioplasty provides functional improvements and pain relief in most patients. A low rate of complications was observed.

Significant controversy exists regarding the most appropriate method to surgically repair PBRCTs. Some surgeons prefer to convert a partial tear to a full-thickness one, followed by repair. Satisfactory clinical outcomes have been reported, with a high rate of tendon healing. However, some biomechanically functional, healthy tendon may have to be sacrificed, making the repair weaker. Moreover, complete removal of the cuff insertion makes it difficult to anatomically repair the lesion, possibly causing a higher length-tension mismatch, which can increase the risk of retears and postoperative pain.

Other authors preserve as much of the healthy articular-sided tendon as possible and repair only the avulsed bursal flap into the footprint. The advantages of this technique are that it restores anatomically the rotator cuff footprint and preserves the intact

| Table 1. Summary Preoperative and Final Follow-up Values of ROM and Shoulder Scores |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                  | Preoperative    | Final Follow-up | P Value        |
| Forward elevation | 116.7 (9.2)     | 172 (10.4)      | <.001           |
| External rotation | 62.4 (7.5)      | 75.3 (8.5)      | <.001           |
| Abduction, °      | 124 (9.3)       | 168 (7.4)       | <.001           |
| Internal rotation | 4              | 5               |                |
| Thigh             | 26              | 31              |                |
| Buttock           | 35              | 19              |                |
| Lumbar 3          | 4               | 15              |
| Thoracic 12       | —               | 9               |
| Thoracic 7        | —               | —               |
| ASES score, mean (SD) | 42.5 (11)    | 86.1 (5)       | <.001           |
| UCLA score, mean (SD) | 15.8 (2)     | 31.4 (2)       | <.001           |
| VAS, mean (SD)    | 6.6 (1)         | 0.7 (1)         | <.001           |

ASES, American Shoulder and Elbow Surgeons; ROM, range of motion; SD, standard deviation; UCLA, University of California at Los Angeles; VAS, visual analog scale.
articular side of the tendon, protecting the repaired bursal side tissue.\textsuperscript{7-10}

There is a lack of studies directly comparing the in situ repair and the complete repair technique. Shin et al.\textsuperscript{21} in a retrospective study compared 84 consecutive patients with PBRCTs treated arthroscopically. A total of 47 patients were treated by the modified Mason-Allen single-row repair technique, preserving the articular-sided tendon, and 37 patients were treated by the double-row suture-bridge repair technique after conversion to a full-thickness tear. They found that shoulder functional outcomes and retear rate were similar in both groups.

Different techniques involving preservation of intact articular-side rotator cuff fibers for PBRCTs have been reported with favorable outcomes.\textsuperscript{7,8,21} Koh et al.\textsuperscript{8} retrospectively evaluated 38 patients with PBRCTs who received a full-layer repair on the bursal side for tears greater than 50\% thickness. They described satisfactory functional outcomes and an 87.9\% healing rate. Kim et al.\textsuperscript{7} reported favorable functional outcomes and an 89\% healing rate by magnetic resonance arthrography examination after a simple repair of the detached lateral cuff layer in 54 patients. More recently, Xiao and Cui\textsuperscript{10} also reported favorable outcomes with single repair of the lateral cuff layer. Fifty-nine patients were retrospectively evaluated as Ellman classification grade 2 (n = 11) or grade 3 (n = 48). Most patients achieved good functional and structural outcomes at a minimum of 2 years after surgery. Neither the clinical scores nor the retear rates on follow-up MRI were significantly different between the 2 groups.

In our series, as described,\textsuperscript{7,8,10} the unhealthy tissue on the edge of the tear was debrided. The remaining tissue on the footprint was completely removed and the greater tuberosity was prepared to promote tendon healing. Then the cuff was repaired.

We used a technique similar to that used in other studies, and our patients showed favorable clinical results with in situ repair of PBRCTs. The main difference between these studies and our series is the fact that we did not perform an acromioplasty or any procedure to the acromion or coracoacromial ligament as the others did.

Whether or not acromioplasty is necessary is unclear. During the last 10 years, acromioplasty as part of the treatment of cuff tears has been re-evaluated. Moreover, the American Academy of Orthopaedic Surgeons did not find strong evidence favoring a routine acromioplasty at the time of rotator cuff repair.\textsuperscript{22} Acromioplasty and release of the coracoacromial ligament are often included as part of a rotator cuff repair. Theoretic benefits of an acromioplasty in the setting of a rotator cuff repair include increasing the subacromial space available to facilitate the repair and relieving extrinsic compression on the repair after completion.\textsuperscript{22} Despite these theoretic benefits, 2 recently published systematic reviews of randomized controlled trials of patients undergoing arthroscopic rotator cuff repair treated with subacromial decompression found no difference from those treated without subacromial decompression.\textsuperscript{16,17} Furthermore, standard performance of the procedure has some theoretical disadvantages, including an increased surgical time and the potential superior subluxation of the humeral head.\textsuperscript{15} Finally, performing a concomitant acromioplasty did not lead to an improvement in structural healing or retear rates.\textsuperscript{21,23}

Limitations

Some limitations to this study should be mentioned. First, it was a retrospective study. Second, we did not have a control group and therefore could not compare the in situ repair technique with other arthroscopic rotator cuff repair methods. It would have been useful to have a control group with acromioplasty to compare results. Another limitation that should be mentioned is that sometimes it is difficult to accurately measure the injuries. We tried to be as accurate as possible using calibrated probes to measure the tears intraoperatively. An additional weakness is the lack of MRI at follow-up, which would have been useful to evaluate the integrity of the repair.

Conclusions

In the midterm follow-up (42 months), arthroscopic in situ repair of PBRCTs without acromioplasty is a reliable procedure that produces significant functional improvements and pain relief.

References


