



Irreparable Tears: The Role for Debridement or Partial Rotator Cuff Repair

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Management of massive, retracted rotator cuff tear repair is a difficult task without a consensus algorithm for treatment. Although nonoperative management is appropriate in certain patients, surgical treatment is advocated for younger, more active patients or those with persistent pain. Aggressive surgical options such as rotator cuff repair with patch augmentation, tendon transfers, and reverse total shoulder arthroplasty are options for many patients in which complete anatomical repair of the massive rotator cuff tear is not always surgically possible because of poor tissue quality, tendon loss, severe retraction, or increased tension of the repair. Debridement of the rotator cuff or partial rotator cuff repair offer viable options for patients with goals of pain relief and improvement in range of motion. Although partial repair often does not restore full strength, most patients are satisfied with their overall improvement in function.

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Introduction

DeOrio and Cofield¹ classified massive rotator cuff tears (RCT) as tears that are greater than 5 cm in size in either the anterior-posterior or medial-lateral dimension, whereas Gerber defined massive tears as those involving complete tears of at least 2 tendons.² Regardless of classification, massive tears can present a management challenge, but multiple treatment options are available based upon a number of factors including both patient and tear characteristics. Nonoperative management includes activity modification, physical therapy to

strengthen the deltoid and periscapular muscles, and oral anti-inflammatories or corticosteroid injections. Surgical options include debridement, biceps tenotomy or tenodesis, partial rotator cuff repair, rotator cuff repair with patch augmentation, tendon transfers, and reverse total shoulder arthroplasty.

What constitutes a partial repair varies between studies, but a plausible definition would be that a partial rotator cuff repair is any surgical management that successfully reduces the gap created by the RCT but does not completely reduce the rotator cuff to the footprint, leaving a residual gap between some portion of the rotator cuff and the humeral head.³

Burkhart originally proposed the concept of a functional rotator cuff repair, which involves repair of the margins of the tear to restore the force couples and “suspension bridge” system of force transmission in the shoulder.^{4,5} The subscapularis and infraspinatus muscles represent the axial force couple, providing joint stability by a compressive joint reaction force in the axial plane. Likewise, the supraspinatus and the deltoid act as a force couple, in which the humeral head is compressed into the glenoid during abduction.⁶ Specific movements of the shoulder can be adversely affected by massive tears. Posterosuperior tears involving the infraspinatus or teres minor lead to weakness in active external rotation and an increase in passive internal rotation. Conversely, tears

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involving the subscapularis lead to weakness in active internal rotation and increased passive external rotation.⁷ In addition, subscapularis function appears critical to prevent anterior-superior humeral head migration, a factor in the development of pseudoparalysis.

Massive rotator cuff tears produce abnormal kinematics, such that in order to achieve shoulder abduction, greater forces are required by the deltoid and the remaining intact rotator cuff.⁸ The progression of a rotator cuff tear to disrupt the axial force couple leads to superior subluxation of the humeral head. Tear propagation will occur, particularly if the remaining tendon is of poor quality, with the increasing force that is required to move the arm.⁷

Rotator Cuff Debridement

The simplest surgical option to manage a massive, irreparable rotator cuff tear is a debridement. Classically, this has been reserved for the elderly low demand patient with good glenohumeral mobility but persistent pain despite conservative measures. It is well recognized that pain generators in the setting of rotator cuff disease include the biceps, subacromial bursitis, and joint synovitis. Debridement of the joint may include biceps tenotomy or tenodesis, subacromial bursectomy with limited acromioplasty, and joint debridement.

Especially in the absence of the rotator cuff, the coracoacromial arch is an important structure in the containment of the humeral head. The acromion itself also provides containment for a high-riding humerus in the setting of a massive rotator cuff. Therefore, it is important that debridement not eliminate these structures, as this yields unsatisfactory results. For this reason, some are advocating a reversed arthroscopic subacromial decompression (RASD) to help with pain management without eliminating the vital structures including the CA ligament and the acromion. Verhelst et al⁹ found the RASD with biceps tenotomy and respect for the coracoacromial arch to be a minimally invasive procedure for irreparable cuff tears in the elderly, with reliably good results in the midterm.

Favorable outcomes have been reported for rotator cuff debridement in the setting of massive tears. Both Rockwood et al¹⁰ and Gartsman et al¹¹ found a high satisfaction rate, decrease in pain, and improvement in range of motion, although strength was noted to be decreased postoperatively in the former study. Liem et al¹² treated 31 patients with no signs of pseudoparalysis and an acromiohumeral distance >5 mm with arthroscopic rotator cuff debridement and biceps tenotomy and found a significant improvement in the ASES score from 24-69.8 points and significant pain relief. Boileau et al¹³ treated 72 patients with massive rotator cuff tears with isolated arthroscopic biceps tenotomy or tenodesis, in which 78% of patients were satisfied with their result, and the authors concluded that this surgical treatment option can effectively treat severe pain or dysfunction caused by an irreparable rotator cuff tear associated with a biceps lesion.

Recent studies on debridement as treatment for irreparable rotator cuff tears are limited, likely due to the emergence of new treatment options. However, it is important to remember

that this may be a viable option for a patient with higher risk for a larger surgery and pain as a primary complaint in the setting of preserved arm elevation.

Partial Rotator Cuff Repair

The main concept of a partial rotator cuff repair is to restore the force couple of the shoulder, allowing stabilization of the humeral head during arm elevation to restore the deltoid force couple. A complete anatomical repair of massive rotator cuff tears is not always surgically possible as a result of poor tissue quality, tendon loss, severe retraction, or increased tension of the repair.¹⁴ In these situations, restoration of the anterior and posterior force couples may restore humeral head stability allowing for improved deltoid function.

Overall, most studies demonstrate that either complete or partial arthroscopic repair of a massive RCT is associated with an improvement in functional outcomes.³ Kim et al¹⁵ evaluated 27 patients who underwent partial rotator cuff repair, with patients showing improvement in all subsets of the UCLA shoulder score. In the simple linear correlation analysis between the residual defect size in the repaired cuff and muscle strength (active forward elevation), there was an inverse correlation. Further, both the Constant and UCLA shoulder scores showed an inverse correlation with the defect size and showed an inverse correlation with stage of fatty infiltration. Wellmann et al¹⁶ not only evaluated the outcomes using the Constant score following partial RC repair but also evaluated the acromiohumeral distance. Similar to other studies, pain and activity improved but patients did not have postoperative improvement in strength. Additionally, there was a nonstatistical difference in decrease in the acromiohumeral distance following surgery.

Cuff et al¹⁷ evaluated the midterm outcomes using partial rotator cuff repair and biceps tenotomy for the treatment of massive irreparable rotator cuff tears in patients with retained overhead motion. At a minimum of 5 years post-op, 75% of patients were subjectively satisfied with the surgery, and only 29% had failed based on objective data, noting an ASES score of <70, a loss of active elevation >90°, or revision to RSA considered as failures. The authors suggest that this is a low-risk option that may yield acceptable results at midterm follow-up. They do note, however, that it is difficult to discern whether their success was due to the partial RC repair or the biceps tenotomy.

Berth et al¹⁸ compared early and midterm results of arthroscopic partial repair and arthroscopic debridement in patients with massive RCT with stage 3 or 4 fatty degeneration. In general, the authors showed that both surgical treatment options in combination with tenotomy or tenodesis of the biceps led to significant decrease in pain and improvement of shoulder function, although the partial repair provided patients with a greater improvement in shoulder function.

Multiple studies have compared the results of complete vs partial repair. Godeneche et al¹⁹ compared partial to complete rotator cuff repairs, noting that patients have improvement in the outcomes with either repair, but that a complete repair

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