

Arthroscopic Rotator Cuff Disease Management: Current Role of the Acromioplasty

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INTRODUCTION

Subacromial decompression has been advocated as an integral part of rotator cuff repair as well as an effective treatment with respect to pain relief and shoulder motion improvement^[1]. However, the efficacy of subacromial decompression, specifically acromioplasty, is still under debate even though it has been routinely performed during supraspinatus tendon repair^[2].

The frequency of anterior acromioplasty has dramatically raised over time^[3]. Increasing knowledge about shoulder pathogenesis, including better imaging, has facilitated patient treatment for a stable spectrum of rotator cuff pathology as has the application of endoscopic surgery^[4]. Among these diseases are included subacromial bursitis, rotator cuff tendinosis, and partial thickness and full-thickness rotator cuff tears.

Since the original description of Neer^[5] various technical modifications have been proposed for the anterior acromioplasty. Ellman *et al*^[6] described an arthroscopic technique to perform a resection of the anterior acromion undersurface, coracoacromial ligament release and bursal debridement. Others authors^[7] have indicated the need of avoiding resection or release of the coracoacromial ligament in order to avoid the potential complication consisting in the avulsion of the deltoid origin due to its weakening by the procedure.

Supporters and detractors of acromioplasty during rotator cuff procedures have based their surgical practice on different theoretic pathogenesis models. The rationale for acromioplasty is based on the extrinsic impingement theory of Neer, which describes irritation of the rotator cuff under the coracoacromial arch^[8]. According to this hypothesis the acromial morphology is the initiating factor leading to

ABSTRACT

Acromioplasty is a well-described surgical step used for a variety of rotator cuff pathologies. Although its incidence has increased greatly in last years, its role in rotator cuff surgery has been debated. In this review the recent evidence available at this respect is exposed. There is increasing number of published reports examining the role of acromioplasty in the treatment of rotator cuff disease. Evidence does not support the routine use of acromioplasty in the treatment of the impingement syndrome and rotator cuff repairs, on the basis of multiple well-designed studies suggesting acromioplasty providing no benefits in terms of pain relief, function or quality of life.

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dysfunction of the rotator cuff and eventual tearing. The influence of this theory on the practice of shoulder surgery has been profound^[9,12].

In contrast, bursectomy alone without acromioplasty may be considered adequate by those who subscribe to the intrinsic theory^[13], since symptoms are felt to be caused by degenerative tendinopathy and subsequent inflammation of the bursa with observed changes in the acromion felt to be secondary. Due to this intratendinous degeneration or tendinosis an eccentric tensile overload would occur at a rate greater than the ability of the cuff to repair itself. Therefore acromioplasty would fail to address the aforementioned primary problem of intratendinous degeneration. Additional investigations showed that the development of the acromial bony spur is a secondary degenerative change, implying that the majority of rotator cuff tears are initiated not by impingement but by an intrinsic degenerative tendinopathy^[13,14].

The objective of this review article is to summarize and review the current evidence in relation to the role of acromioplasty both for subacromial impingement syndrome and during arthroscopic repair of rotator cuff tears.

IMPIGEMENT SYNDROME

In subacromial impingement there is a disruption of the normal sliding mechanism, while lifting the arm, by compression of the tissues between the coracoacromial arch and the greater humeral tuberosity.

Rotator cuff disease with subacromial impingement has been described in 3 stages^[14]: stage 1, acute inflammation and either tendonitis or bursitis; stage 2, chronic inflammation with or without degeneration; and stage 3, rupture of the cuff.

Ketola *et al*^[15] reported a randomised controlled trial with the examination of the effectiveness and cost-effectiveness of arthroscopic acromioplasty in the treatment of stage II shoulder impingement syndrome. A total of 140 patients were randomly divided into two treatment groups: supervised exercise programme ($n=70$, exercise group) and arthroscopic acromioplasty followed by a similar exercise programme ($n=70$, combined treatment group). The main outcome measure was self-reported pain on a visual analogue scale of 0 to 10 at 24 months, measured on the 134 patients (66 in the exercise group and 68 in the combined treatment group) for whom endpoint data were available. An intention-to-treat analysis disclosed an improvement in both groups but without statistically significant difference in outcome between the groups ($p=0.65$). The combined treatment was considerably more costly. Arthroscopic acromioplasty provided no clinically important effects over a structured and supervised exercise programme alone in terms of subjective outcome or cost-effectiveness when measured at 24 months. Authors concluded that structured exercise treatment should be the basis for treatment of shoulder impingement syndrome, with operative treatment offered judiciously until its true merit is proven.

Henkus *et al*^[16] published a randomized controlled trial focusing on the treatment of impingement syndrome without rotator cuff tears. Fifty-seven patients were randomized either into arthroscopic bursectomy (26 patients) or bursectomy with acromioplasty groups (30 patients); one patient was lost to follow up. At a mean followup of 2.5 years (range, 1-5 years), both bursectomy and acromioplasty groups had good clinical outcomes, and there were no significant differences between the groups. Acromial morphology affected the outcome of both groups, but when stratified based on acromial morphology, the two groups again were no different in outcome.

Haahr and colleagues^[17] performed a randomized control

study with 1-year follow-up comparing exercise to subacromial arthroscopic decompression. They found no statistically significant difference in the mean change in Constant scores between groups at 3, 6, and 12 months or in the Project on Research and Intervention in Monotonous Work scores (aggregated pain and dysfunction score) at 12 months. However we consider that these findings need to be considered with caution because usually surgery is only indicated if conservative treatment fails. If surgery is used as primary treatment for impingement maybe a lot of these patients would have improved with physiotherapy.

ROTATOR CUFF REPAIR

Acromioplasty is commonly performed during arthroscopic rotator cuff repair, but its effect on outcomes is debated. Several studies have tried to determine the efficacy of subacromial decompression in the arthroscopic treatment of full-thickness rotator cuff tears. In order to assess the role of acromioplasty in the arthroscopic repair of small- to medium-sized rotator cuff tears Shin *et al*^[18] performed a prospective randomized trial of 120 patients who had small- to medium-sized rotator cuff tears and various types of acromions without spurs were included. Sixty patients received arthroscopic rotator cuff repair with acromioplasty (group I), and another sixty received the same procedure without acromioplasty (group II). The mean tear size was similar in the two groups. Clinical outcome at a mean of 35 months after surgery was significantly improved in both groups after arthroscopic rotator cuff repair. There were no significant differences with respect to pain and range of motion between the groups at the final follow-up. Functional outcomes also showed no significant differences between the 2 groups (American Shoulder and Elbow Surgeons score and University of California, Los Angeles score). Postoperative imaging showed that the retear rate was 17% in group I and 20% in group II. Authors considered that arthroscopic repair of small- to medium-sized rotator cuff tears provided pain relief and improved functional outcome with or without acromioplasty and that clinical outcomes were not significantly different, and acromioplasty may not be necessary in the operative treatment of patients with small- to medium-sized rotator cuff tears in the absence of acromial spurs.

McDonald *et al*^[19] performed a prospective randomized controlled trial to compare functional and quality-of-life index and rates of revision surgery in arthroscopic rotator cuff repair with and without acromioplasty. The primary outcome was the Western Ontario Rotator Cuff (WORC) index. Secondary outcome measures included the American Shoulder and Elbow Surgeons (ASES) shoulder assessment form and a count of revisions required in each group. Outcome measures were completed preoperatively and at three, six, twelve, eighteen, and twenty-four months after surgery. There were no differences in WORC or ASES scores between the groups that had arthroscopic cuff repair with or without acromioplasty at any time point. There were no differences in scores on the basis of acromion type, nor were any interaction effects identified between group and acromion type. Four participants (9%) in the group that had arthroscopic cuff repair alone, one with a Type-2 and three with a Type-3 acromion, required additional surgery by the twenty-four-month time point. The number of patients who required additional surgery was greater ($p=0.05$) in the group that had arthroscopic cuff repair alone than in the group that had arthroscopic cuff repair and acromioplasty. Authors concluded that there was no difference in functional and quality-of-life indices for patients who had rotator cuff repair with or without acromioplasty however a higher reoperation

rate was found in the group without acromioplasty.

In another randomized controlled trial, Abrams *et al*^[20] reported the clinical outcomes of patients undergoing arthroscopic repair of full-thickness rotator cuff tears with and without acromioplasty. Authors conclude that there were no significant differences in functional outcomes between nonacromioplasty and acromioplasty groups or between subjects with different acromial features at any time point. The results of this study demonstrated no difference in clinical results after rotator cuff repair with or without acromioplasty at 2 years postoperatively.

In a systematic review^[21] authors included the evaluation of partial articular-sided rotator cuff tears treated with debridement. Tear grade and depth were not recorded. Mean follow-up was 23 months. Twenty-six patients (84%) had satisfactory outcomes (UCLA score greater than 28). Results were similar in patients who had a subacromial decompression compared to those without.

In a recent study, Lee *et al*^[22], concluded that arthroscopic tuberopecty with concomitant acromioplasty would be an option for diminishing pain and improving active forward elevation for irreparable massive rotator cuff tears. In particular, satisfactory results during the minimum follow-up period of 24 months can be achieved in the cases with good preservation of the preoperative and postoperative acromiohumeral interval and continuity in the inferior scapulohumeral line, regardless of preoperative mobility.

In relation to reoperation rates after rotator cuff repair of full thickness tears with and without acromioplasty, a systematic review that included three prospective randomized controlled trials^[23], revealed no significant differences between groups of the reoperation rate in the first 2 years after surgery. However, due to the strong trend found at this respect by MacDonald and colleagues^[19] in the number of patients who required reoperation in the non-acromioplasty group we consider that long-term follow-up studies are needed to determine whether differences exist in retear and reoperation rates between groups.

CONCLUSION

There is increasing number of published reports examining the role of acromioplasty in the treatment of rotator cuff disease (Table 1). Evidence does not support the routine use of acromioplasty in the treatment of rotator cuff disease, mainly in relation to tears management, on the basis of multiple well-designed studies suggesting acromioplasty providing no added benefits in terms of pain relief, better function or improving quality of life.

CONFLICT OF INTERESTS

There are no conflicts of interest with regard to the present study.

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Table 1 Summary of the evidence evaluated.

Authors	Type of study and follow-up	Number of patients without acromioplasty/with acromioplasty	Diagnosis	Treatment	Post-treatment evaluation: without acromioplasty/with acromioplasty	p value	Main conclusions acromioplasty / non acromioplasty
Abrams <i>et al</i> 2014	Randomised controlled trial, 2 years	43 / 52	Full-thickness tear of the superior rotator cuff. Exclusion criteria included isolated subscapularis tear, partial tears, irreparable tears or partial repair.	Group 1: arthroscopic rotator cuff repair without acromioplasty. Single row 24, Double row 11, others: 8 Group 2: arthroscopic rotator cuff repair with acromioplasty. Single row 26, Double row 17, others: 9	Simple Shoulder Test (SST), mean and (sd) -10.5 (2.1)/10.5 (2.3) American Shoulder and Elbow Surgeons (ASES) score, mean and (sd) -91.5 (13.3)/89.0 (16.4) Constant score, mean and (sd) -75.0 (15.0)/78.7 (11.1) University of California-Los Angeles (UCLA) score mean and (sd) -17.2 (3.4)/17.4 (3.3)	>0.05	The results of this study demonstrate no difference in clinical outcomes after rotator cuff repair with or without acromioplasty at 2 years postoperatively.
Bollier <i>et al</i> 2012	Systematic review, (Snyder <i>et al.</i>), 23 months	13 / 18	Partial rotator cuff tears in patients with instability, biceps lesions, arthritis, or other specific lesions.	Group 1: arthroscopic debridement without acromioplasty, n=13 Group 2: arthroscopic debridement without acromioplasty, n=18	University of California-Los Angeles (UCLA) score mean and (sd) -31 (no data)/33 (no data)	No data	Results were similar in patients who had a subacromial decompression compared to those without.
Lee <i>et al</i> 2011	Case series, 24 months	6 / 26	Irreparable rotator cuff tears	Group 1: arthroscopic tuberopecty, n=6 Group 2: arthroscopic tuberopecty with concomitant acromioplasty, n=26	Constant score, mean and (sd) and University of California-Los Angeles (UCLA) score mean and (sd), improvement in both groups in relation to preoperative period	No data	Arthroscopic tuberopecty with concomitant acromioplasty would be an option for diminishing pain and improving active forward elevation for irreparable massive rotator cuff tears

Table 1. Summary of the evidence evaluated.

Authors	Type of study and follow-up	Number of patients without acromioplasty / with acromioplasty	Diagnosis	Treatment	Post-treatment evaluation: without acromioplasty/with acromioplasty	p value	Main conclusions acromioplasty / non acromioplasty
Ketola <i>et al</i> 2009	Randomised controlled trial, 2 years	70 / 70	Impingement syndrome, not relieved by conservative treatment (pharmacotherapy and physiotherapy)	Group 1: supervised exercise programme (n=70) Group 2: arthroscopic acromioplasty followed by a similar exercise programme (n= 70)	- Mean self-reported pain (range): VAS 0 to 10 -6.5 (1.0 to 10)/6.4 (2.0 to 10) - Mean working ability (range): VAS 0 to 10 -5.9 (0 to 9.0)/5.7 (0 to 9.0) - Mean Shoulder Disability Questionnaire (0-100) -82.5 (0 to 100)/78.0 (0 to 100)	0.65	Arthroscopic acromioplasty provides no clinically important effects over a structured and supervised exercise programme alone that should be the basis for treatment of shoulder impingement syndrome No differences were found between the two treatments. The type of acromion and severity of symptoms had a greater influence on the clinical outcome than the type of treatment. Authors believe that primary subacromial impingement syndrome is largely an intrinsic degenerative condition rather than an extrinsic mechanical disorder.
Henkus <i>et al</i> 2009	Randomised controlled trial, 2.5 years	26 / 30	Impingement syndrome not relieved by conservative treatment (three lidocaine and hydrocortisone injections into the subacromial space at four-week intervals, combined with NSAIDs and a period of exercise therapy of at least six weeks.	Group 1: debridement of the subacromial bursa (bursectomy alone) n= 26 Group 2: debridement of the subacromial bursa, followed by an arthroscopic acromioplasty n=30	- Constant score mean improvement (sd) 13.9 (17.9)/18.5 (17.5) - Simple shoulder test mean improvement 2.9 (2.6)/3.0 (3.1) - Visual analogue scale mean improvement 2.6 (2.8)/2.8 (3.1)	0.34 0.59 >0.88	
Haahr <i>et al</i> 2006	Randomised controlled trial, 6 years	43 / 41	Impingement syndrome. Symptoms despite conservative treatment, and fulfilment of diagnostic criteria: the presence of shoulder pain, painful arch, a positive Hawkins sign, and a positive impingement sign (relief of pain on injection of a local anaesthetic in the subacromial space).	Group 1: supervised exercise programme (n=43) Group 2: arthroscopic acromioplasty (n = 41)	- PRIM score mean and range 25.8 (24.1-27.5)/25.8 (23.9-28.8), - Self-evaluated working capability (scale 0-10), mean and range 5.0 (3.9-6.1)/5.3 (4.3-6.3) - Self-reported work status: working (scale 0-10) mean and (sd). 21 (53)/20 (51)	> 0.05	Results of surgical decompression were equal to those of conservative treatment, and the surgery group had more income transferrals during the first year of follow-up.
Shin <i>et al</i> 2012	Randomised controlled trial, 35 months.	60/60	Full rotator cuff tears. If the tear size measured was less than 1 cm at its longest dimension was defined as a small-sized rotator cuff tear. If the tear size was between 1 and 3 cm, we classified it as a medium-sized rotator cuff tear. Full-thickness rotator cuff tears by clinical and imaging criteria, including either ultrasound or magnetic resonance imaging. All patients had persistent pain and functional disability for at least six months and had six months of conservative treatment without success.	Group 1: arthroscopic rotator cuff repair without acromioplasty. Single row 20, Double row 40 Group 2: arthroscopic rotator cuff repair with acromioplasty. Single row 23, Double row 37	Pain score on VAS, mean and (sd) -1.1 (0.9)/1.3 (1.4) ASES score, mean and (sd) - 90.7 (13.1)/87.5 (12.0) Constant score, mean and (sd) - 85.0 (11.3)/83.3 (13.0) UCLA score, mean and (sd) - 33.4 (3.3)/32.3 (3.5)	> 0.05	Clinical outcomes were not significantly different, and acromioplasty may not be necessary in the operative treatment of patients with small- to medium-sized rotator cuff tears in the absence of acromial spurs.
McDonald <i>et al</i> 2011	Randomised controlled trial, 34 months	42 / 40		Group 1: arthroscopic rotator cuff repair without acromioplasty. All single row configuration. Group 2: arthroscopic rotator cuff repair with acromioplasty. All single row configuration.	WORC-Western Ontario Rotator Cuff index, mean and (sd) - 80.7 (21.3)/87.5 (15.3) ASES = American Shoulder and Elbow Surgeons scoring system, mean and (sd) - 85.6 (19.1)/90.5 (13.4)	0.135 0.230	There was no difference in functional and quality-of-life indices for patients who had rotator cuff repair with or without acromioplasty

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