

# Arthroscopic repair of massive rotator cuff tears an effective and safe treatment option.

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## ABSTRACT

**Purpose:** The aim of the study is to evaluate the functional outcomes and the safety of arthroscopic repair in patients with rotator cuff massive tear at mid-term follow-up.

**Materials and Methods:** During a period of 4 years, 74 patients with average age of 65.5 years were treated with arthroscopic rotator cuff repair by the same surgeon in our department for massive rotator cuff tears. The mean time of follow up was 42 months. Functional outcomes were evaluated preoperatively and postoperatively with the Visual Analog Scale (VAS) for Pain, the active range of motion, the American Shoulder and Elbow Surgeons (ASES) Score and the Constant Score.

**Results:** The mean range of motion and the mean VAS for pain improved significantly from preoperatively to postoperatively. The mean ASES score improved from 50,4 preoperatively to 95 postoperatively and the mean Constant score improved from 40,7 to 77,4.

**Conclusions:** Patients with massive rotator cuff tears improved significantly the functional outcomes after arthroscopic repair as evaluated with ASES and Constant score, VAS and the mean Range of Motion. The majority of patients state that they are very satisfied with this treatment option. The arthroscopic repair is an effective and safe procedure to manage massive rotator cuff tears.

**Keywords:** Rotator cuff; massive rotator cuff tear; shoulder arthroscopy

### Introduction

The treatment of massive rotator cuff tear poses a significant challenge for all orthopedic shoulder surgeons, because they are often complicated by structural failure and poor outcomes. The failure rate varies from 20 to 94% and usually occurs at the tendon-bone interface [1].

According to DeOrio and Cofield, the definition of massive rotator cuff tear is tear that is >5 cm in size in

either the anterior-posterior or medial-lateral dimension. Definitions by other authors suggest that the tear must involve two tendons in order to be classified as massive [2, 3]. More recently Davidson and Burkhart proposed a system that connects rotator cuff tear patterns to treatment and prognosis [4]. Many surgical procedures have been described for treating these lesions and they have been classified in open, mini open and all arthroscopic operations. The arthroscopic re-

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pair includes complete repair, partial repair, medialized repair, muscle tendon transfer, superior capsule reconstruction, patch augmentation, in-space balloon implantation and finally with a reverse shoulder arthroplasty [5-9].

The chronicity of tear plays a significant role to the options of the treatment and the outcome of the rotator cuff tears. In fact, the acute tears have a good quality of rotator cuff tissue, there is no fatty infiltration or atrophy and are minimally retracted and mobile. The patients tend to be younger than those with chronic atraumatic massive tears and they have been combined with better surgical outcomes [10].

Patients with acute on chronic tears compose two groups, the first group consists of those that have a pre-existing symptomatic rotor cuff tearing which has an acute extension after an injury and the second group does not have any history of a significant shoulder symptom but a massive tearing of the rotator cuff [11].

Large chronic atraumatic tears are often present with no history of a significant injury and are frequently associated with pain, weakness because of the muscle atrophy and fatty infiltration. Usually they are older and less active people. Because of the chronicity, the poor tissue quality or the severe retraction of the tendon are height technically demanding, even with advance arthroscopic techniques and these can differentiate the surgical treatment [11].

The purpose of this study was to perform a retrospective review evaluating patients with a symptomatic massive rotator cuff tear treated arthroscopically. Furthermore, this study intends to assess the arthroscopic repair as an effective and safe treatment option to manage these types of tears.

### Materials and Methods

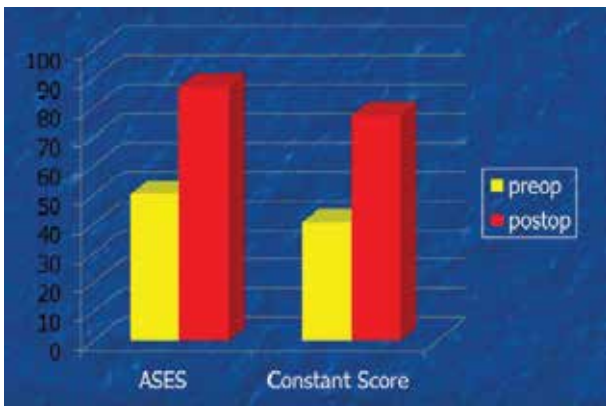
This was a retrospective review of patients treated from January 2009 through December 2014. The patients of this study had a symptomatic massive rotator cuff tear and had no signs of glenohumeral degenerative changes to preoperative x-rays and during the diagnostic arthroscopy at the time of surgery. The primary preoperative goal was to attempt a complete rotator cuff repair if possible or a low-tension medialized repair and if that was not attainable a partial

rotator cuff repair. All patients were placed in a shoulder immobilizer postoperative and physical therapy focusing on scapular strengthening exercises, pendulum exercises and active elbow, wrist and hand motion for the first six weeks. The patients started active assisted motion at weeks 6 to 10, active motion at weeks 10-16 and then continued with rotator cuff and deltoid strengthening exercises.

Seventy-four patients with massive rotator cuff tears were subjected to an arthroscopic repair by the same senior surgeon in our department and were available for follow up. The subjects of the study were 48 men and 26 women and the average age was 65,5 years (range 45-82). The average follow-up was 42 months (range 22-78). According to the type of tear, the patients were classified to acute traumatic tears 20 out of 74 (27%) patients, acute on chronic tears 35 patients (47,3%) and chronic tears 19 patients (25,7%). According to repair type, complete repair was achieved to 43 out of 74 patients (58,1%), 16 out of 74 (21,6%) patients were treated with medialized repair and 15 out of 74 (20,3%) patients with partial repair.

All patients had preoperative evaluation through clinical examination radiography and magnetic resonance imaging. All patients were assessed with the Visual Analog Scale (VAS) for pain, the active range of motion, the American Shoulder and Elbow Surgeons (ASES) score and the Constant score. This data was recorded at the preoperative examination and at 1, 3, 6,9,12 months postoperatively and then every 6 months at subsequent follow up visits.

Continuous variables are presented as means (SD) or medians (95% confidence intervals, interquartile ranges) when normality, as assessed by the Kolmogorov-Smirnov criterion, holds or not respectively. Categorical variables are expressed as absolute and relative frequencies (%). Differences between pre-operative and post-operative continuous variables were compared by paired sample t tests and Wilcoxon paired rank test (for normally distributed differences between pre-postoperative, respectively). All reported p values were based on two-sided tests and compared to a significance level of 5%. Data analysis was performed with SPSS software (Version 15.0, SPSS Inc., Chicago, Illinois).



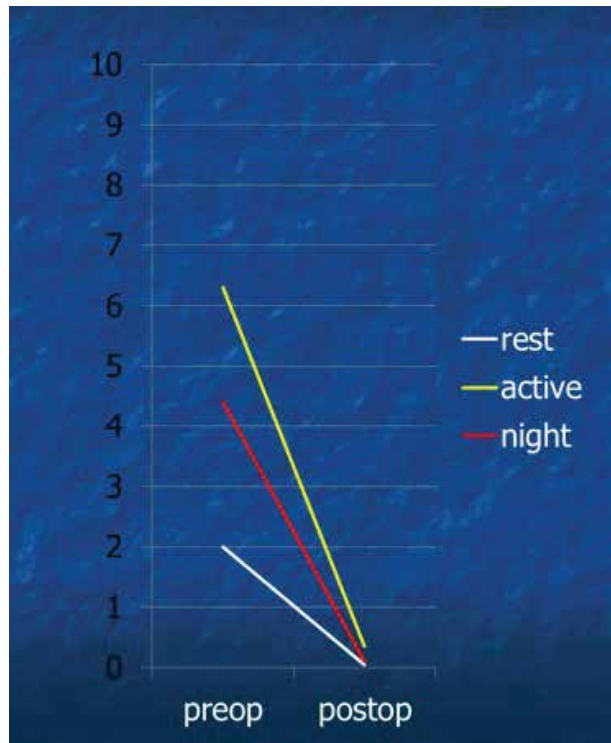
**Fig. 1:** The ASES & Constant scores preoperatively (yellow) compared to postoperatively (red)

## Results

The patients' evaluation was recorded preoperatively and at final follow up with the American Shoulder and Elbow Surgeons (ASES) score and the Constant score and are included in **Figure 1**. At final follow-up, patients maintained statistically significant improvement in their average preoperative to postoperative ASES scores from 50.4 to 95 [P < .001] and significant improvement in their Constant scores from 40.7 to 77.4 [P < .001].

They also demonstrated and maintained a decrease in average VAS pain scores at rest from 2.0 to 0.05 [P < .001], in average VAS pain score in activity from 6.3 to 0.35 [P < .001] and in average VAS pain score at night from 4.4 to 0.1 [P < .001]. The patients' outcomes, according to VAS scores, are depicted in **Figure 2**.

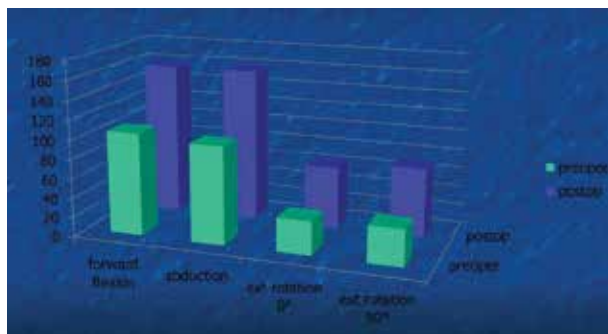
The patients had statistically significant change in their average preoperative to postoperative active range of motion during the study period as depicted in **Figure 3** and **Table 1**. Specifically, the mean increase of active forward flexion was 55.4° from 105.9° to 157.7° [P < .001], the mean increase of active abduction was 60.3° from 100.9° to 158.2° [P < .001]. The mean increase of active external rotation with upper limb at side was 30.8° from 35° to 63.5° [P < .001], the mean increase of active external rotation with upper limb at 90° abduction was 35.4° from 37.8° to 71.2° [P < .001]. Active internal rotation was evaluated as excellent (T6-T9) to 6.8% of patients preoperatively and



**Fig. 2:** The reduction in VAS pain score at rest, at night and during activity.

21.9% postoperatively, was satisfied (T10-L3) to 65.8% of patients preoperatively and 69.9% postoperatively and poor (L4- I5) to 27.4% of patients preoperatively and 8.2% postoperatively. 32 patients had positive external rotation lag test preoperatively and converted to negative to 20 out of 32 patients.

All patients except 6 (68 of 74 patients) were available to complete questionnaires to determine the level of satisfaction, the residual pain and the strength of the affected shoulder. The remaining 6 (8.1%) patients had progression to rotator cuff arthropathy and evaluated as dissatisfied, painful and with poor strength and elected for revision to reverse shoulder arthroplasty. Subjectively, 49 out of 74 (66.2%) patients were completely satisfied with their surgical result, 3 out of 74 (4.1%) were just satisfied and 16 of 64 (21.6%) were less satisfied. Patient reported pain was recorded during the questionnaire and 62 of 68 patients (83.8%) of patients had no pain, 6 of 68 patients (8.8%) feel pain sometimes or during certain activities. Finally, concerning the strength to the effected shoulder, 25 out



**Fig. 3:** The mean degrees of Range of Motion preoperatively (green) vs postoperatively (blue).

of 68 patients (33.8%) report that there is no strength reduction, 16 out of 68 (21.6%) patients reported that their shoulder is weaker compared to healthy side and 27 of 68 (36.5%) report great weakness to the affected shoulder.

### Discussion

The most important finding of this study is that the ASES score, Constant score and VAS score significantly improved after arthroscopic repair of massive rotator cuff tears. In addition to this, the arthroscopic repair of massive tears resulted in the great majority of our patients (70.3%) that they were subjectively completely satisfied or simply satisfied with their surgical procedure in more than 3 years postoperatively. 83.2% of patients reports no pain at final follow up. On the other hand, 36.5% report great weakness to the repaired shoulder compared to healthy side. Finally, 6 out of 74 patients (8.1%) have been considered as failures due to progression to rotator cuff arthropathy and revised to RSA.

The arthroscopic treatment of rotator cuff massive tears is a real challenge for a shoulder surgeon. An anatomical, water-tight complete repair is the main goal of an arthroscopic rotator cuff repair. However, a complete anatomic repair is often not possible when the cuff tear is massive and chronic, the tissues are severe retracted and have poor quality. In that case, a medialized repair or a partial repair has been reported as a treatment option with satisfactory results [12,13].

Our goal with this treatment option is to offer a min-

INTERNAL ROTATION	PREOP	POSTOP
EXCELLENT (T6-T9)	5 (6,8%)	16 (21,9%)
VERY GOOD (T10-L3)	48 (65,8%)	51 (79,9%)
POOR (L4-GLUT)	20 (27,4%)	6 (8,2%)


**Table 1:** The men degrees Internal Rotation preoperatively and at last follow up.

imal invasive procedure as arthroscopic repair, with low morbidity and low complication rate attempting to repair as much rotator cuff as possible in order to reduce pain and increase the shoulder function. Our total complication rate considered low, including 2 patients with post-op infection (both diabetic type I) treated successfully with arthroscopic debridement and antibiotics. Additionally, 3 patients underwent revision surgery and finally one of them develops rotator's cuff arthropathy two years postoperatively. A patient who presented Axillary nerve paresis postoperatively, restored spontaneously at 3 months. Finally, 6 rotators' cuff arthropathies in total were treated with reverse shoulder arthroplasty.

There are several limitations to this study. Firstly, it was a retrospective review with the inherent limitations. In addition, in this study there were not follow up imaging studies to assess the rate of healing to our patients.

Clinical relevance of this study is to demonstrate the outcomes of arthroscopic repair of massive rotator cuff tears in order to advise beforehand an orthopedic surgeon about the expectations of this treatment option.

### Conclusion

Patients with massive rotator cuff tears improved significantly the functional outcome after arthroscopic repair as evaluated with ASES and Constant score, VAS and the mean Range of Motion. The majority of the patients stated that they were very satisfied with this treatment option. The arthroscopic repair is an effective and safe procedure to manage massive rotator cuff tears. 

### Conflict of interest:

The authors declared no conflicts of interest.

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