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## Functional outcomes after arthroscopic assisted mini-open rotator cuff repair

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### Abstract

**Introduction:** Mini-open rotator cuff repair have the advantage of less deltoid morbidity, and demonstrated clinical outcomes that have been similar to those of open repairs. The present study was conducted to evaluate the functional outcome of patients who underwent arthroscopic assisted mini-open rotator cuff repair in our department.

**Methodology:** A prospective study was conducted in Department of Orthopaedics, BPS Government Medical College and Hospital, in which patients, aged 30 to 70 years, who had an isolated tear in the rotator cuff tendon diagnosed by clinical examination & confirmed by MRI and had cuff repair performed solely with the use of arthroscopic assisted mini-open technique were included. Shoulder function assessments were made with University of California at Los Angeles (UCLA) rating scale and Short Form Health Survey questionnaire (SF-36).

**Results:** Mean age of the 26 patients included was  $47.12 \pm 10.72$  years. Most common mode of injury in our patient population was domestic fall, reported by 84.6% of the patients. Road side accident was reported by three patients and sports injury by one. Partial thickness tear was observed in 57.7% of the patients and rest had a full thickness tear. We found the UCLA score reduced significantly from  $12.42 \pm 3.7$  preoperatively to  $29.46 \pm 3.01$  at the end of 6 months. SF36 scores showed a significant improvement in all the subscales as well.

**Conclusions:** Arthroscopic mini-open rotator cuff repair is a successful procedure for improving patients' quality of life, both physically and mentally, as measured using the SF-36.

**Keywords:** Mini-open, arthroscopic repair, shoulder, clinical outcomes

### Introduction

Rotator cuff disease is a painful condition with a multifactorial Etiology in which severe or chronic impingement of the rotator cuff tendons on the under-surface of the coracoacromial arch is often a significant factor [1]. Conservative therapy is the first treatment approach for patients with rotator cuff tears. However, surgery is indicated when conservative management fails or in cases of a large to massive tears. Mini-open repairs were developed because they had the potential advantage of less deltoid morbidity, and demonstrated clinical outcomes that have been similar to those of open repairs. Treatment protocols after repair are decided by surgeons and depend on the tendon repaired, healing time of that tendon and preferences by surgeons. Creating an optimal treatment protocol would benefit from evidence-based information on factors that predict prognosis after rotator cuff repair and quantified evidence on improvements in shoulder function in terms of muscle performances and range of motion which is lacking in the literature. The present study was conducted to evaluate the functional outcome of patients who underwent arthroscopic assisted mini-open rotator cuff repair in our department.

### Methodology

#### Study design and sampling

A prospective study was conducted in Department of Orthopaedics, BPS Government Medical College and Hospital for twelve months.

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We included patients, aged 30 to 70 years, who had an isolated tear in the rotator cuff tendon diagnosed by clinical examination & confirmed by MRI and had cuff repair performed solely with the use of arthroscopic assisted mini-open technique. Patients presenting with complaints of shoulder pain, weakness in elevation and difficulty in abduction of shoulder were evaluated clinically. Those suspected of rotator cuff tear were referred for MRI study on a 1.5 T scanner. A full-thickness tear of the rotator cuff was diagnosed on MRI by the presence of a complete discontinuity or gap in the tendon, or if there was an increased signal intensity (isointense compared to fluid), extending from the articular to the bursal surface of the tendon, was found on T2-weighted images. The study was conducted in 26 patients. The sample size was calculated based on previous studies by Vaidyar J *et al.* [2]. With the power of study being 90% and alpha error at 5%, sample proportion 0.25 and with confidence interval 95% the sample size was calculated to be 26 patients. Patients having associated shoulder lesions, those undergoing revision rotator cuff repair patients, those with irreparable tears (massive tear >5cm with retraction & fatty infiltration of muscle), with associated symptomatic acromioclavicular arthritis, with associated biceps brachii tendon pathology or with with cuff tear arthropathy were excluded from the study.

#### **Surgical technique and post-operative rehabilitation**

Arthroscopic glenohumeral examination was performed to evaluate intra articular pathology and subacromial decompression, an antero-lateral approach was used for tear exposure. A 3-4 cm skin incision was made from the anterolateral edge of the acromion distally. An anterior/inferior acromioplasty was performed. After partial bursectomy and limited debridement of tendon margins, the rotator cuff was mobilized with the arm at the side until full coverage of the footprint without undue tension was achieved. Tendon-to-bone repair was performed with single row technique using suture anchors. Two sets of size 5mm double loaded anchor sutures were used, depending on the size of the tear. Deltoid was repaired meticulously using absorbable sutures. The operated arm was placed at the side in a sling with a small pillow. The sling was worn continuously for 6 weeks, except during bathing and exercises. The standard postoperative rehabilitation program included immobilization with sling for first 6 weeks, active range of motion of shoulder, avoiding lateral abduction for next 6 weeks, strengthening of deltoid, biceps, triceps, rotator cuff after 12 weeks post-operatively and resumption of normal activities after 6 months post-operatively.

#### **Data Collection and Data Analysis**

Using a pre-designed case report form, demographic and clinical information was noted for all patients. All pre and post-operative shoulder function assessments were made with University of California at Los Angeles (UCLA) rating scale [3]. The UCLA Shoulder Score is a 35-point scale consisting of 10 points for pain, 10 points for function, and 5 points each for motion, strength, and patient satisfaction. A higher score indicates increased shoulder function. Functional outcome of the patients was assessed by the UCLA score pre-operatively, postoperatively 2 weeks, 8 weeks, 12 weeks and 24 weeks were noted. We also used the SF-36, a 36 item Short Form Health Survey questionnaire (SF-36) [4]. Data were entered and analysed using SPSS software. Quantitative data were expressed as mean and standard deviation and qualitative as

number and percentage. Means of UCLA scale score and SF-36 pre- and post-operatively were compared. All the results were considered to be significant at the 5% critical level.

#### **Results**

There were a total of 26 patients included in the study. Mean age of the patients was  $47.12 \pm 10.72$  years, the most common age group being 40 to 50 years and females comprised 61.5% of the study population (Table 1). More than half of all patients were housewives and did home work. Other than that five patients were farmers, three were shop owners and one each were driver, teacher and a wrestler. Most common mode of injury in our patient population was domestic fall, reported by 84.6% of the patients. Road side accident was reported by three patients and sports injury by one. Dominant hand was right in 73.1% of the patients. Affected side was right in 65.4% of the patients. Partial thickness tear was observed in 57.7% of the patients and rest had a full thickness tear. Only three patients reported persistent pain and stiffness of shoulder and one reported only stiffness of shoulder. Rest of the patients (n=22) reported no complications post operatively. We found that the UCLA score preoperatively was  $12.42 \pm 3.7$  (range 8 to 21) which reduced significantly to  $29.46 \pm 3.01$  (range 21 to 33) at the end of 6 months. SF36 scores for different components have been described in Table 3 as well. A significant improvement was observed in all the components of SF36.

#### **Discussion**

The present study assessed the functional outcome of rotator cuff tear patients who underwent arthroscopic assisted mini-open repair. Most common mode of injury in our patients was domestic fall, reported by 84.6% of the patients. Road side accident was reported by three patients and sports injury by one. The cause of rotator cuff tears is likely multifactorial. Degeneration, impingement, and overload may all contribute in varying degrees to the development of rotator cuff tears. Several theories have been developed to explain the cause of rotator cuff injury. In 1934, Codman theorized that rotator cuff tears developed from intrinsic tissue degeneration [5]. More than half of all tears in our study were partial thickness. Most often rotator cuff lesions appear to start as partial tears of the undersurface or articular portion of the supraspinatus tendon [6]. Over time they can progress to full thickness tears to include the supraspinatus, infraspinatus, Subscapularis and biceps tendons.

The appropriate indications for surgery to treat rotator cuff tears remain debatable among orthopedic surgeons [7]. In most cases, surgery is considered only when conservative measures fail. One important exception to this principle is an acute, full thickness traumatic tear of an otherwise normal rotator cuff in a healthy individual. Such an injury is usually treated with immediate surgery, since delay can lead to significant muscle atrophy, tendon retraction, and poorer surgical results. The mini-open rotator cuff repair became popular in recently and remains an acceptable approach for surgeons who are unfamiliar or uncomfortable with arthroscopic surgical techniques. This approach involves a substantially smaller incision and exposure than that of an open approach. Moreover, the results achieved using mini-open cuff repair with arthroscopic subacromial decompression appear equal to those of open reconstruction [8].

All the patients in our study got single row suture-anchor repair. Previous studies have shown that the repair technique plays an important part in tendon to bone healing of these

tears, as healing without gap formation is a major factor in restoring post-operative function [9]. While, Burkhart *et al.* [10] showed that fixation by suture anchors is stronger than by trans-osseous tunnels, Barber, Herbert and Click [11] stated that all available biodegradable suture anchors have adequate pull-out strength to resist physiological loads. A two-row repair has been shown to be superior to one-row, with better recreation of the footprint, higher resistance to cyclic displacement, increased stiffness and ultimate load to failure [12]. The modified Mason-Allen stitch was first described by Gerber *et al.* [13] and was found to have a higher tensile strength than simple mattress sutures.

Nho and colleagues have highlighted the difficulty in comparing rotator cuff tear repairs as it is still unclear which primary outcome defines success of the procedure [14]. We used UCLA score in the present study, which is one of the most commonly scoring system used for assessing shoulder function. We observed a significant improvement in the mean UCLA score from preoperative score of  $12.42 \pm 3.7$  to  $29.46 \pm 3.01$  at 24 weeks. Similar significant improvements in the UCLA score with mini-open technique has been described by Saridakis and Jones in their meta-analysis [15]. On the SF-36 scale, our patients showed significant improvement in all subscales as well. Chung *et al.* studied 309 patients to evaluate the outcomes of arthroscopic rotator cuff repair and observed improvement in all subscales of SF36, except general health perception [16]. Baysal *et al.* [17] demonstrated that mini-open repair of a full-thickness tear improved the postoperative quality of life as measured by the Western Ontario Rotator Cuff Index scores; Vitale *et al.* [18] also reported postoperative increases in the Health Utility Index and the European Quality of Life Measure, suggesting that rotator cuff repair is a highly cost-effective intervention in health care. Gartsman *et al.* [19] showed that arthroscopic repair of a full-thickness rotator cuff tear in 50 consecutive patients improved SF-36 scores at the most recent follow-up from 34.1 preoperatively to 46.5 in the physical component score and from 49.7 preoperatively to 52.6 in the mental component score.

**Table 3:** Functional score assessment of the patients pre-operatively and 6 months post-operatively.

Functional Assessment	Mean	Standard Deviation	p value
UCLA pre-operative	12.42	3.70	<0.01
UCLA 6 months Post-operative	29.46	3.01	
SF-36 Physical functioning pre-operative	44.04	5.10	<0.001
SF-36 Physical functioning 6 months Post-operative	70.19	6.55	
SF-36 Role-Physical pre-operative	29.81	10.05	<0.001
SF-36 Role-Physical 6 months Post-operative	62.50	12.75	
SF-36 Role-Emotional pre-operative	28.19	20.43	<0.001
SF-36 Role-Emotional 6 months Post-operative	79.49	25.09	
SF-36 Energy/Fatigue pre-operative	39.62	5.08	<0.001
SF-36 Energy/Fatigue 6 months Post-operative	70.19	7.14	
SF-36 Emotional Well-being pre-operative	46.15	3.79	<0.001
SF-36 Emotional Well-being 6 months Post-operative	77.23	7.98	
SF-36 Social Functioning pre-operative	31.25	7.29	<0.001
SF-36 Social Functioning 6 months Post-operative	67.79	11.28	
SF-36 Bodily Pain pre-operative	32.79	6.42	<0.001
SF-36 Bodily Pain 6 months Post-operative	72.88	12.22	
SF-36 General Health pre-operative	34.23	3.92	<0.001
SF-36 General Health 6 months Post-operative	73.65	5.01	

## Conclusion

Our results show that arthroscopic mini-open rotator cuff repair is a successful procedure for improving patients' quality of life, both physically and mentally, as measured using the SF-36. As arthroscopic techniques develop, it will be important to continually compare the new results with the

**Table 1:** Baseline characteristics of the patients included in the study

Variables	n (%)
<b>Age group (in years)</b>	
Less than 40	08 (30.8)
41 to 50	10 (38.5)
51 to 60	04 (15.4)
More than 60	04 (15.4)
<b>Gender distribution</b>	
Female	16 (61.5)
Male	10 (38.5)
<b>Occupation</b>	
Driver	01 (3.8)
Farmer	05 (15.4)
Housewife	15 (57.7)
Shop owner	03 (11.5)
Teacher	01 (3.8)
Wrestling	01 (3.8)
<b>Dominant hand</b>	
Left	07 (26.9)
Right	19 (73.1)

**Table 2:** Characteristics of the rotator cuff injury in our study population

Variables	n (%)
<b>Mode of injury</b>	
Domestic fall	22 (84.6)
Road side accident	03 (11.5)
Sports injury	01 (3.8)
<b>Affected side</b>	
Left	09 (34.6)
Right	17 (65.4)
<b>Type of tear</b>	
Full thickness	11 (42.3)
Partial thickness	15 (57.7)
<b>Post-operative complications</b>	
Nil	22 (84.6)
Persistent pain and stiffness	03 (11.5)
Stiffness	01 (3.8)

standards that have been established for the rotator cuff repair.

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