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Evaluation of Functional outcome of Arthroscopically Assisted Mini-Open Rotator Cuff Repair.

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Abstract
Arthroscopically assisted mini-open repair technique is the gold standard for rotator cuff repair. A prospective study was conducted between January 2020 to December 2021 in the Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University with one year follow up. A total of 16 patients between 20 to 60 years of age, who had tear in the rotator cuff tendon was treated by arthroscopic assisted mini open rotator cuff repair by the same surgeon. Shoulder function assessments were made with University of California at Los Angeles (UCLA) rating scale and Short Form Health Survey questionnaire (SF-36). Mean age of the 16 patients included was 39.69 ± 11.36 years. Most common mode of injury in our patient population was domestic fall, reported by 50% of the patients. A roadside accident was reported by five patients and sports injury by three. Partial thickness tear was observed in 25% of the patients and rest had a full thickness tear. We found the UCLA score reduced significantly from 15.00 ± 2.92 preoperatively to 28.81 ± 3.19 at the end of 6 months. SF36 scores showed a significant improvement in all the subscales as well and has excellent outcome in 10 patients (62.5%), 4 good, 2 fair which is due to stiffness and none as poor. Arthroscopic mini-open rotator cuff repair results in excellent functional outcome.

Keywords: *Mini-open, arthroscopic repair, rotator cuff, shoulder.*

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I. Introduction

Rotator cuff pathology is one of the most common conditions affecting the shoulder. It is a painful condition that occurs due to different causes. Severe or chronic impingement of the rotator cuff tendons on the under-surface of the coracoacromial arch is often a significant factor [1]. Conservative management is the first line of treatment for patients with rotator cuff tears. But surgery is indicated when conservative management fails

or in cases of a large to massive tears. Traditional treatment of full thickness tears of the rotator cuff was open surgical repair [2-4]. Outcome of open repair has ranged from 70% to 95% [5-15]. Although the effectiveness of open rotator cuff repair is well established, it is also associated with significant pain and morbidity. A significant limitation to rehabilitation after open repair is pain associated with reattachment of the deltoid to the acromion. Eventually mini-open repairs were developed because they had the potential advantage of less deltoid morbidity and demonstrated clinical outcomes that have been like those of open repairs. Arthroscopic assistance provides added benefit by improving joint visualization, confirm diagnosis and arthroscopic acromioplasty. This study was conducted to assess the functional outcome of mini-open rotator cuff repair of shoulder joint.

II. Methodology

A prospective study was conducted between January 2020 to December 2021 in Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University by the same surgeon with one year followup. A total of 16 patients between 20 to 60 years of age, was selected according to inclusion and exclusion criteria as a study sample who had tear in the rotator cuff tendon diagnosed by history, clinical examination, X-ray & confirmed by MRI &treated by arthroscopic assisted mini open rotator cuff tear repair . The sample size was calculated based on previous studies by Vaidyar J *et al*. [16]. With the power of study being 90% and alpha error at 5%, sample proportion 0.25 and with confidence interval 95%.

Shoulder function assessments were made with University of California at Los Angeles (UCLA) rating scale and Short Form Health Survey questionnaire (SF-36). Data was entered and analyzed 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 significant at the 5% critical level.

Inclusion criteria:

a. Age 20 to 60 years

b. Degenerative, traumatic and sports injury patient diagnosed radiologically and clinically with rotator cuff tear of shoulder joint.

Exclusion criteria:

a) Fracture of bone around shoulder joint
b) Age > 60 years
c) Massive tear
d) Frozen Shoulder
e) Infections
f) Calcific tendinitis
g) Osteoarthritis Of shoulder joint.

Radiological analysis

By doing plain X ray of shoulder joint we can see the normal anatomy of the shoulder joint, as well as Fracture around the shoulder joint, anatomy of acromion process, critical shoulder angle, any bony spur, calcification & osteoarthritis. [Fig. 01].

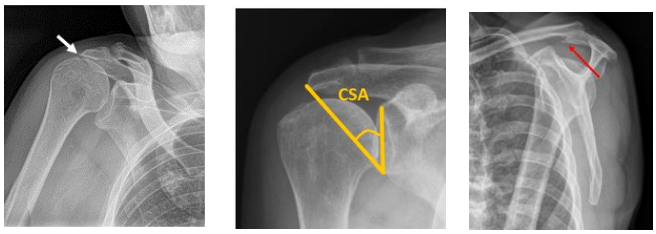


Fig 1: preoperative x-ray

MRI helps to diagnose rotator cuff tear, size & shape [Fig. 02]

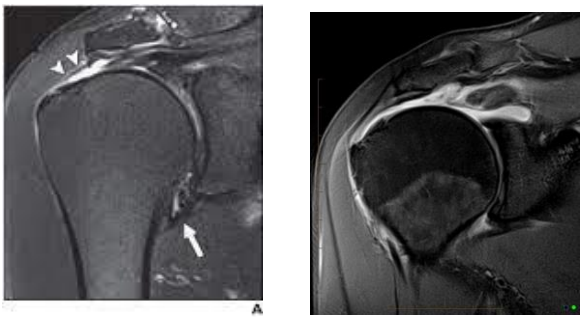
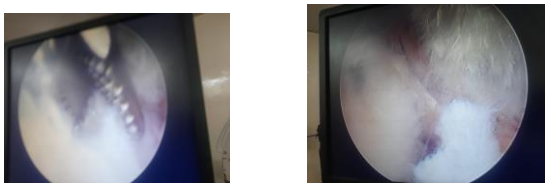


Fig 2: preoperative MRI showing Rotator cuff tear.

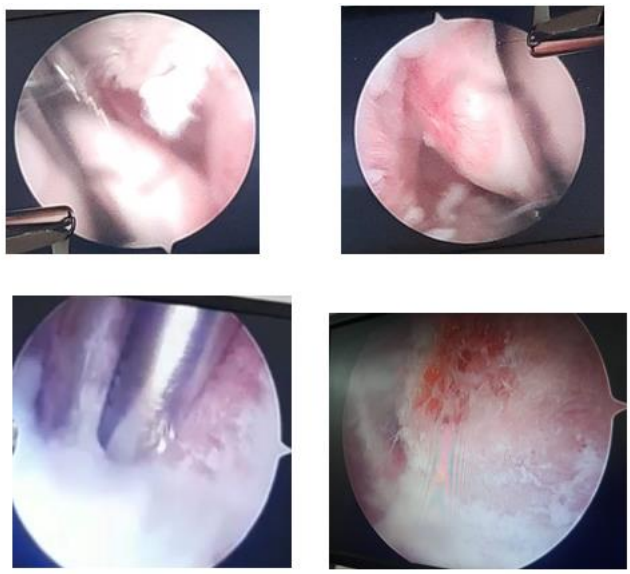
Diagnostic Arthroscopy(Final tools for diagnosis)



Operative techniques:
With all aseptic precaution under G/A, patient is placed in lateral decubitus position(Fig.1). Patient is rolled back approximately 20-30 degree. The arm is supported in 20-degree abduction and 15-degree forward flexion using 10 lbs traction.

(Fig .1)

Portals-
Posterior, Anterior, Anterio-Lateral and Lateral.
After complete evaluation of shoulder joint the arthroscope was placed in the subacromial space through posterior portal.
Lateral working portals were subsequently established. Bursectomy was performed using a shaver and to obtain a clear view of the cuff tear and the undersurface of the acromion. Rotator cuff assessment included evaluation of the extent of tear (partial versus complete), size of tear, and site of tear and free edge was mobilized arthroscopically.After soft tissue debridement, acromioplasty was performed anterolaterally using arthroscopy bur. (Fig.2



(Fig.2)

Then Mini Open approach through lateral portal is extended to create 4cm incision starting at the anterior border of the acromion. The middle and anterior fibers of the deltoid muscle were split by blunt dissection, Maximal visualization was established using a soft tissue retractor. (Fig.3)

(Fig.3)

Number 2 non-absorbable stay sutures were placed sequentially in the rotator cuff to mobilize the edge. (Fig.4)

. (Fig.4)

After minimal decortication of the attachment site on the greater tuberosity of the humerus, transosseous drill tunnels were made then anchor was placed. (Fig.5)

(Fig.5)

The sutures were tied down after each was individually loaded and tensioned.Each knot was individually completed while tension was applied on each of the suture ends. (Fig.6)

((Fig.6)

Visualization of the apposition of the cuff edge into the bone repair site was confirmed, and range of motion was tested to assess for gapping. (Fig.7)

(Fig.7)

After all rotator cuff sutures were tied, the deltoid muscle split was repaired using No. 2 non-absorbable suture in a vertical mattress pattern, and the skin was closed with an subcuticular suture. The operated arm was placed at the side in a sling with a small pillow. (Fig.8)

(Fig.8)

Post-operative rehabilitation:
IMMEDIATE POSTOPERATIVE PERIOD (0-3weeks):

- Using a Sling with abduction pillow for 3 weeks, then as needed for comfort
- Begin pendulum exercises
- AROM wrist, hand and Elbow

4-6 weeks :

- Full passive forward flexion and full passive external rotation
- Gentle active exercise .
- Strengthening biceps and deltoids .
- No active motion for internal rotation were allowed for the 1st 6 weeks.

7-12 weeks :

- Wean from sling
- Active range of motion and internal rotation were began
- Resistance exercise were began
- 3 months to 6 months then continue the physiotherapy until full range of motion was reached.
- Patient try to return his previous daily activity
- After 6 months heavy manual works ,overhead activities and sports were allowed.

Pre-operative picture **Post-operative picture**

III. Results

There was a total of 16 patients included in the study. Mean age of the patients was 39.69 ± 11.36 years, the most common age group being 51 to 60 years and males comprised 75% of the study population (Table 1). 25% of all patients were housewives. Other than that, three patients each farmers & Carpenters and two each were painters, teachers & others. Most common mode of injury in our patient population was domestic fall, reported by 50% of the patients. A roadside accident was reported by five patients and sports injury by three. Dominant hand was right in 62.5% of the patients. The affected side was right in 62.5% of the patients. Partial thickness tear was observed in 25% of the patients, small 18.75%, medium 37.5% and the rest had a Large tear (Table 2). Only two patients reported pain and stiffness of shoulder and one reported infection of shoulder. The rest of the patients (n=13) reported no complications post operatively. We found that the UCLA score preoperatively was 15.00 ± 2.92 (range 10 to 22) which reduced significantly to 28.81 ± 3.19 (range 22 to 35) and has excellent functional outcome in 10 patients (62.5%), 4 patients (25%)good, 2 (12.5%) fair and none poor which is due to stiffness and infection 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.

Variables	**n (%)**
Age group (in years)	
20-30	01(6.25%)
31-40	01(6.25%)
41-50	06(37.5%)
51-60	08(50%)
Gender distribution	
Male	12(75%)
Female	04(25%)
Occupation	
Painter	02(12.5%)
House wife	04(25%)
Teacher	02(12.5%)
Carpenter	03(18.75%)
Farmer	03(18.75%)
|Others	02(12.5%)
Dominant hand	
Right	10(62.5%)
Left	06(37.5%)

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

Variables	**n%**
Mode of injury	
Road side injury	05(31.25%)
Domestic fall	08(50%)
Sports injury	03(18.75%)
Affected side	
Right	10(62.5%)
Left	06(37.5%)

Type of tear	
Partial thickness	04(25%)
Small	03(18.75%)
Medium	06(37.5%)
Large	03(18.75%)
Post-operative complications	
Nil	14(87.5%)
Pain & stiffness	02(12.5%)

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

Functional Assessment	**Mean**	**Standard Deviation**	**p value**
UCLA pre-operative	15.00	2.92	<0.001
UCLA 6 months Post-operative	28.81	3.19	
SF-36 Physical functioning pre-operative	46.02	5.46	<0.001
SF-36 Physical functioning 6 months Post-operative	69.26	5.78	
SF-36 Role-Physical pre-operative	28.56	9.28	<0.001
SF-36 Role-Physical 6 months Post-operative	60.29	11.68	
SF-36 Role-Emotional pre-operative	27.46	18.98	<0.001
SF-36 Role-Emotional 6 months Post-operative	78.32	24.75	
SF-36 Energy/Fatigue pre-operative	37.44	4.69	<0.001
SF-36 Energy/Fatigue 6 months Post-operative	68.29	6.84	
SF-36 Emotional Well-being pre-operative	45.24	3.15	<0.001
SF-36 Emotional Well-being 6 months Post-operative	76.58	7.12	
SF-36 Social Functioning pre-operative	30.65	6.82	<0.001
SF-36 Social Functioning 6 months Post-operative	66,59	10.61	
SF-36 Bodily Pain pre-operative	70.45	10.26	<0.001
SF-36 Bodily Pain 6 months Post-operative	32.43	2.39	
SF-36 General Health pre-operative	33.16	2.76	<0.001
SF-36 General Health 6 months Post-operative	72.37	4.73	
Functional Outcome (UCLA)	**No**	**Percentage**	
Excellent	10	62.5%	
Good	4	25%	
Fair	2	12.5%	
Poor	Nil	0%	
Maximum score is 35: 34 to 35, excellent; 29 to 33, good; 21 to 27, fair; 0 to 20, poor.			

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

IV. Discussion

The study assessed the functional outcome of rotator cuff tear patients who underwent arthroscopic assisted mini-open repair. We found the mean age (and standard deviation) at the time of surgery 39.69 ± 11.36 years and Vikas Sharma et al. [5] in his study in 2018 found the mean age (and standard deviation) at the time of surgery was 41.90±13.98 years.; which is comparable to our study. We found 75% male and he also found majority male patient 85%; which is also comparable. We found 62.5% right sided and 37.5% left sided tear and in his study,60% of the patients had rotator cuff tear on right side and 40% of the patients had left sided tear, which is also comparable.

Most common mode of injury in our patients was domestic fall, reported by 50% of the patients. A roadside accident was reported by five patients and sports injury by three. 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 [25]. 25% 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 [26]. Over time they can progress to full thickness tears to include the supraspinatus, infraspinatus, Subscapularis, and biceps tendons.

We found 87.5 % rated as excellent or good, 2 patients (12.5%) fair and none as poor and in year 2002, a study by Theodore J. et al. [6] shows (93%) were rated as excellent or good, 3 patients (7%) were rated as fair, and none was rated as poor; which is comparable. All patients showed improvement in pain and function after surgery and all the patients were satisfied with the procedure.

We used UCLA score in the present study, which is one of the most commonly scoring systems used for assessing shoulder function. We observed a significant improvement in the mean UCLA score from preoperative

score of 15.00 ± 2.92 to 28.81 ± 3.19 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 [11].

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 [12]. Baysal *et al*. [13] 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*. [14] 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*. [15] 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.

Limitation

This study was conducted in a single hospital. So the study population was not representative of the whole community of the country. The sample was taken purposively. Follow up period was also short in comparison to other studies.

V. Conclusion:

We can conclude that arthroscopy enhances the evaluation of the entire rotator cuff and associated intraarticular pathology. It is an excellent alternative to standard open technique. By using small incision precisely located over the tear site, repair can be possible of most tears with excellent functional results and patient satisfaction.

References

[1]. Gray H, Standring S. Gray's anatomy: the anatomical basis of clinical practice. Churchill Livingstone, 2008.
[2]. Gerber C, Fuchs B, Hodler J: The results of repair of massive tears of the rotator cuff. *J Bone Joint Surg Am* 2000, 82(4):505-515.
[3]. Gazielly DF, Gleyze P, Montagnon C: Functional and anatomical results after rotator cuff repair. *Clin Orthop Relat Res* 1994,304:43-53.
[4]. Adamson GF, Tibone JE: Ten year assessment of primary rotatorcuff repairs. *J Shoulder Elbow Surg* 1993, 2:57-63.
[5]. Vikas Sharma, Shailesh V. Udapudi, Somnath T, Sameer Haveri,Mahantesh Y. Patil Assessment of functional outcome of mini-open rotator cuff repair: a hospital based prospective study International Journal of Research in Orthopaedics 2018Mar;4(2):285-290
[6]. Theodore J. Shinners M.D., Peter G. Noordsij M.D., John F. Orwin M.D.Arthroscopically assisted mini-open rotator cuff repair. Arthroscopy: The Journal of Arthroscopic & Related Surgery 2002;18(1):21-26
[7]. Barber FA, Herbert MA, Click JN. Internal fixation strength of suture anchors: update. Arthroscopy. 1997; 13(3):355-62.
[8]. Milano G, Grasso A, Zarelli D. Comparison between single-row and double- row rotator cuff repairs: a biomechanical study. Knee Surgery Sports Traumatology Arthroscopy. 2008; 16(1):75-80.
[9]. Gerber C, Schneeberger AG, Beck M, Schlegel U. Mechanical strength of repairs of the rotator cuff. The Journal of bone and joint surgery British. 1994; 76(3):371-80.
[10]. Nho SJ, Shindle MK, Sherman SL, Freedman KB, Lyman S, MacGillivray JD. Systematic review of arthroscopic rotator cuff repair and mini-open rotator cuff repair. JBJS. 2007; 89:127-36.
[11]. Saridakis P, Jones G. Outcomes of single-row and double-row arthroscopic rotator cuff repair: a systematic review. JBJS. 2010; 92(3):732-42.
[12]. Chung SW, Park JS, Kim SH, Shin SH, Oh JH. Quality of life after arthroscopic rotator cuff repair: evaluation using SF-36 and an analysis of affecting clinical factors. The American journal of sports medicine. 2012; 40(3):631-9.
[13]. Baysal D, Balyk R, Otto D, Luciak-Corea C, Beaupre L. Functional outcome and health-related quality of life after surgical repair of full-thickness rotator cuff tear using a mini-open technique. Am J Sports Med. 2005; 33(9):1346-1355.
[14]. Vitale MA, Vitale MG, Zivin JG, Braman JP, Bigliani LU, Flatow EL. Rotator cuff repair: an analysis of utility scores and cost-effective- ness. J Shoulder Elbow Surg. 2007; 16(2):181-187.
[15]. Gartsman GM, Brinker MR, Khan M. Early effectiveness of arthroscopic repair for full-thickness tears of the rotator cuff: an outcome analysis. J Bone Joint Surg Am. 1998; 80(1):33-40.
[16]. Vaidyar J, Kassim S, Shibli S, Safwan U. Functional Outcome of Shoulder Following Mini-open Repair for Rotator cuff Injuries. Int. J Cur Res Rev 2015; 7(7):40-4
[17]. Altchek DW, Warren RF, Wickiewicz TL, et al: Arthroscopic acromioplasty: Technique and results. J Bone Joint Surg 72A: 1198–1207, 1990
[18]. Brown AR, Weiss R, Greenberg C, et al: Interscalene block for shoulder arthroscopy: Comparison with general anesthesia. Arthroscopy 9: 295–300, 1993
[19]. Skyhar MJ, Altchek DW, Warren RF, et al: Shoulder arthroscopy with the patient in the beach-chair position. Arthroscopy 4: 256–259, 1988
[20]. Snyder SJ: Evaluation and treatment of the rotator cuff. Orthop Clin North Am 24: 173–192, 1993
[21]. Paulos LE, Kody MH: Arthroscopically enhanced "miniapproach" to rotator cuff repair. Am J Sports Med 22: 19–25, 1994
[22]. Burkhart SS, Johnson TL, Wirth MA, et al: Cyclic loading of transosseous rotator cuff repairs. Tension overload as possible cause of failure. Arthroscopy 13: 172–176, 1997
[23]. Bartolozzi A, Andreychik D, Ahmad S: Determinants of outcome in the treatment of rotator cuff disease. Clin Orthop 308: 90–97, 1994
[24]. Berg EE, Ciullo JV, Oglesby JW: Failure of arthroscopic decompression by subacromial heterotopic ossification causing recurrent impingement. Arthroscopy 10: 158–161, 1994
[25]. McFarland EG. Examination of the shoulder. In: The Complete Guide, Kim TK, Park HB, Rassi GE *et al*. (Eds), Thieme Medical Publishers, New York 2006. 142.
[26]. Oh LS, Wolf BR, Hall MP *et al*. Indications for rotator cuff repair: a systematic review. Clin Orthop Relat Res. 2007; 455:52.