

A STUDY OF SHORT TERM FUNCTIONAL OUTCOME IN ARTHROSCOPIC VERSUS MINI-OPEN ROTATOR CUFF REPAIR SURGERY

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Abstract

Background: Rotator cuff injuries of shoulder are common. With the advent of arthroscopic surgery, rotator cuff repair has evolved from an all-open technique to an all-arthroscopic technique. There still is a considerable controversy regarding which modality to choose. **Materials and Methods:** A comparative study of functional outcomes was conducted in 114 patients who underwent all arthroscopic (57) and mini open (57) repair in the Department of Orthopedics, Govt. Medical College Kottayam during the study period of 12 months. After receiving written informed consent from the patients, they underwent routine clinical evaluation by the principal investigator and diagnosis was confirmed radiologically. Procedures were done using standard techniques by the treating physician. Then the postoperative assessments were done at 6 months and 12 months post-surgery, when they presented to the outpatient department for followup by the principal investigator. The patients were assessed using Modified ASES score. Its a 100-point score that sum of pain (30 points), satisfaction (10 points), function (60 points). **Result:** The mean preoperative modified ASES Score 35.47 (SD 9.98) is improved to 64.56 (SD 10.51) and 75.42 (SD 13.7) at 6 month and 12 month respectively in mini-open repair group. Whereas in arthroscopic repair group, the preoperative score was 39.74 (SD 10.66) and post operatively it was 65.39 (SD 10.04) and 74.17 (SD 12.178) at 6 and 12 months. P value for this is obtained as 0.798 at 6 months and 0.756 at 12 months and there is no statistically significant difference in functional outcome of mini open and arthroscopic rotator cuff repair surgery at 6 months and 12 months in terms of modified ASES Score. **Conclusion:** In this study, the mini-open and arthroscopic repair has similar functional outcomes at the end of 6months and 12 months in terms of MODIFIED ASES SCORE.

INTRODUCTION

Rotator cuff tears are a common source of shoulder pain. The incidence of rotator cuff damage increases with age and is most frequently caused by degeneration of the tendon, rather than from sports or trauma. Rotator cuff tears are most common in people who are over the age of 40. The blood supply to the rotator cuff diminishes with age and transiently with certain motions and activities. The substance of the tendon itself degenerates over time. Because of the decrease in tendon blood supply, the body's ability to repair tendon damage is decreased with age; this can ultimately lead to a full-thickness tear of the rotator cuff. Rotator cuff tear may often happen as a result of wear and tear. An extrinsic factor that can cause damage to the rotator cuff is the presence of bones spurs underneath the

acromion. The spurs rub on the tendon when the arm is elevated; this is often referred to as impingement syndrome. Combining this with a diminished blood supply, the tendons have a limited ability to heal themselves. These factors are partly responsible for the age-related increase in rotator cuff disease and the higher frequency in the dominant arm. Most tears, however, are the result of overuse of these muscles and tendons over a period of years. People who are especially at risk for overuse are those who engage in repetitive overhead motions. These include participants in sports such as baseball, tennis, weight lifting and rowing.

Incidences are more commonly seen in females than Males. Pain when lifting the arm, pain when lowering the arm from a fully raised position, weakness when lifting or rotating the arm, crepitus or crackling sensation when moving the shoulder in certain positions are the common symptoms.

Diagnosis is based on the symptoms and physical examination. X-rays, and imaging studies, such as MRI or ultrasound, are also helpful. Physical examination includes looking for any tenderness or deformity including the Impingement sign. Range of motion of the shoulder is measured in several different directions and the strength of the arm is tested. We also check for instability or other problems with the shoulder joint. Plain X-rays of a shoulder with a rotator cuff tear are usually normal or show a small spur. For this reason, an MRI may be required to better visualize soft tissue structures such as the rotator cuff tendon. The MRI can tell how large the tear is, as well as its location within the tendon itself or where the tendon attaches to bone.

Treatment include Conservative treatments — such as rest, ice and physical therapy – sometimes are all that's needed to recover from a rotator cuff injury. If your injury is severe, you might need surgery. Physical therapy is usually one of the first treatments suggested. Exercises tailored to the specific location of your rotator cuff injury can help restore flexibility and strength to your shoulder. Physical therapy is also an important part of the recovery process after rotator cuff surgery. A steroid injection into the shoulder joint might be helpful, especially if the pain is interfering with sleep, daily activities or physical therapy. While such shots often provide temporarily relief, they also can weaken the tendon and reduce the success of future shoulder surgery. Many different types of surgeries are available for rotator cuff injuries, including: Arthroscopic tendon repair- In this procedure, surgeons insert a tiny camera (arthroscope) and tools through small incisions to reattach the torn tendon to the bone. Open tendon repair- In some situations, an open tendon repair may be a better option. In these types of surgeries, your surgeon works through a larger incision to reattach the damaged tendon to the bone. Tendon transfer- If the torn tendon is too damaged to be reattached to the arm bone, surgeons may decide to use a nearby tendon as a replacement. Shoulder replacement- Massive rotator cuff injuries may require shoulder replacement surgery. To improve the artificial joint's stability, an innovative procedure (reverse shoulder arthroplasty) installs the ball part of the artificial joint onto the shoulder blade and the socket part onto the arm bone.

Mini-open repairs were the earlier widely used technique for rotator cuff repair. All-arthroscopic rotator cuff repair has increased in popularity over the past several years, paralleling improvements in arthroscopic instrumentation and technique. There still is a considerable controversy regarding which modality to choose, with surgeon preference and comfort being one of the determining factor. There is still uncertainty regarding the superiority of one over the other in terms of clinical outcome.

Objective

1. To assess the short-term functional outcome of arthroscopic versus mini-open rotator cuff repair.

MATERIALS AND METHODS

A comparative study of functional outcome was conducted in all patients who underwent arthroscopic and mini open repair satisfying the inclusion criteria, presented to Department of Orthopaedics, Govt. Medical College Kottayam during the study period. After receiving written informed consent, patients who presented at casualty and outpatient department underwent routine clinical evaluation and diagnosis was confirmed radiologically. Then these patients were admitted in the corresponding units. The selection of patients whether to undergo mini open or arthroscopic rotator cuff repair was done by the treating physician himself. Procedures were done using standard techniques by the treating physician. The assessment of the patients was done at 6 and 12 months after surgery when they presented for followup in the outpatient department. At this point, details regarding surgery were collected retrospectively by the principal investigator. The patients were assessed using Modified ASES score. Its a 100-point score that sum of pain (30 points), satisfaction (10 points), function (60 points). Patients were asked to rate their pain at rest, during activities of daily living, strenuous activity using a 10-point visual analog pain scale with 10 representing no pain and 0 severe pain. The pain score was the sum of three results. Patients were asked to rate overall satisfaction with their current level of shoulder function from 0 (not satisfied) to 10 (completely satisfied). Patients rated their function based on the ability to perform activities with the involved shoulder (0 to 4 points for each function). Activities included the ability to tuck in a shirt tail, dressing, wash the back of opposite shoulder, comb hair, use the arm at shoulder level, carry objects with arm to the side, use the hand overhead, do overhead sporting activities, perform household activities, do the usual work etc. The function score of each patient was determined by totalling these numeric responses.

Sample Size

According to study done by L.A. Fink barne1 et al, mean ASES scores and standard deviation of mini-open repair was 91.0 and 10.5 and that of arthroscopic was 82.7 and 19.8.

Using this data sample size is calculated by the formula:

$$N = Z_{1-\alpha/2} + Z_{1-\beta} \sqrt{\sigma_1^2 + \sigma_2^2 / (\mu_1 - \mu_2)^2}$$

$$N = 1.96 + 0.84 \sqrt{10.5^2 + 19.8^2}$$

= 57 patients in each group

Total Sample Size : 114

Z = mean deviate

Z_α = 1.96 (value of Z at 5% α error)

Z_β = 0.84 (value of Z at 20% β error)

SD₁ = standard deviation of group 1 is 10.5

SD₂ = standard deviation of group 2 is 19.8

Study Tool

- Pretested Semi structured proforma.

- Standard clinical examination
- Modified ASES score

Ethical consideration

The study was conducted after obtaining due ethical clearance from the Ethical Committee of Government Medical College, Kottayam and Department of Orthopaedics, Informed written consent was obtained from cases in the study.

Data Management and Statistical Analysis

All the data collected were coded and entered in Microsoft Excel sheet which was re-checked and analysed using SPSS statistical software version 22. Quantitative variables were summarised using mean and standard deviation (SD). Categorical variables were represented using frequency and percentage. Normality of distribution was checked using Shapiro-Wilk test. Pearson Chi-square test was used for comparing categorical variables between groups. Mann Whitney test was used to test statistical significance of difference between means of variables among two independent groups. A p value of <0.05 was considered statistically significant.

Ethics

IRB Clearance - yes.

RESULTS

The following data were obtained by studying the clinical outcome of mini open and arthroscopic rotator cuff repair surgeries done in the department of Orthopaedics, Govt medical college Kottayam during the study period. There were 57 study subjects in each group.



Figure 1: Preoperative clinical photograph of mini open repair



Figure 2: Postoperative clinical photograph of mini open repair



Figure 3: Pre operative clinical photograph of arthroscopic repair



Figure 4: Post operative clinical photograph of arthroscopic repair

Table 1: Distribution of Pain Score at 6 Months

	Arthroscopic		Mini Open		P value	
	Frequency	Percentage	Frequency	Percentage		
Pain score at rest at 6 months	3	0	0.0%	1	1.8%	0.04
	4	6	10.5%	10	17.5%	
	5	10	17.5%	17	29.8%	
	6	14	24.6%	17	29.8%	
	7	17	29.8%	8	14.0%	
	8	9	15.8%	4	7.0%	
	9	1	1.8%	0	0.0%	
Mean±SD	6.28±1.27		5.08±1.19			

Table 2: Distribution of Satisfaction Score at 12 Months

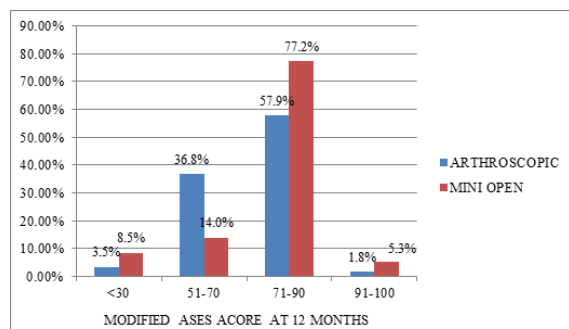
		Arthroscopy		Mini Open		P value
		Frequency	percentage	Frequency	Percentage	
Satisfaction score at 12 months	3	2	3.5%	2	3.5%	0.037
	4	3	5.3%	6	10.5%	
	5	8	14.0%	6	10.5%	
	6	14	24.6%	3	5.3%	
	7	17	29.8%	14	24.6%	
	8	12	21.1%	22	38.6%	
	9	1	1.8%	4	7.0%	
Mean ±SD		6.42±1.349		6.81±1.630		

Table 3: Distribution of Modified ASES Score at 12 Months

		ARTHROSCOPIC		MINI OPEN		P value
		Frequency	Percentage	Frequency	Percentage	
Modified ases score at 12 month	<30	2	3.5%	2	3.5%	0.756
	51-70	21	36.8%	8	14.0%	
	71-90	33	57.9%	44	77.2%	
	91-100	1	1.8%	3	5.3%	
Mean±SD		74.17±12.178		75.42±13.742		

Table 4: Mean Modified ASES Score At 12 Months

		Mini Open	Arthroscopy
Modified ASES score at 12 month	MEAN	75.42	74.17
	SD	13.742	12.178

**Graph 1: Bar Diagram Showing Modified ASES Score at 12 Months**

At 12 months post-surgery the mean modified ASES score for those who underwent arthroscopic surgery was 74.17 with a standard deviation of 12.178 and those who underwent mini open repair was 75.42 with a standard deviation of 13.742.

DISCUSSION

The arthroscopic and mini open rotator cuff repair offers good results in terms of post-operative function and activities of daily living. This study shows highest incidence of rotator cuff tear in the age group of 41-50 years. No statistical significance between age and post-operative results are seen. There is higher incidence of rotator cuff tear in males in our study. Some of the Indian studies showed the same results.

The rotator cuff injury occurred more in people with moderate level of activity. In our study 55 patients give history of trauma. Past history of trauma has shown no statistical significance in the functional outcome with both interventions. The major comorbidities include hypertension, diabetes,

coronary artery disease and dyslipidemia affects the functional outcome.

Majority of patients had injury to the dominant arm. There is no statistical significance for the personal habits like smoking, alcohol consumption with the post operative results. Majority of people who underwent surgery had medium or large rotator cuff tears. Majority of the participants underwent surgery within 1 year of symptom onset. The duration of symptoms before surgery did not affect the functional outcome in our study statistically.

Considering patients who underwent mini open repair, the mean preoperative modified ASES Score 35.47 with SD 9.98 is improved to 64.56 (SD 10.51) and 75.42(SD 13.7) at 6 month and 12 month respectively in those who underwent miniopen repair. Whereas in those who underwent arthroscopic repair the pre-operative modified ASES score was 39.74 (SD 10.66) and post operatively it was 65.39 (SD 10.04) and 74.17 (SD 12.17) at 6 and 12 months respectively. P value for this is obtained as 0.798 at 6 months and 0.756 at 12 months and there is no statistical significant difference in functional outcome of mini open and arthroscopic rotator cuff repair surgery at 6months and 12 months in terms of modified ASES Score. Mini-open repair and arthroscopic repair showed similar functional outcomes at the end of 6 months and 12 months.

Mini open repair has shown less pain score when compared to arthroscopic group at the end of 6 months which suggests that mini open repair has high post operative pain compared to arthroscopic surgery in our study. Similar results were obtained by assessing the pain score at rest, daily activity.

At the end of 12 months mini open repair has shown higher pain scores compared to the arthroscopic group which suggests that mini open repair has

brought significant reduction in pain. But these results does not show any statistical significance.

Satisfaction score shows statistical significance in case of mini open (mean 6.81 with SD 1.63) compared to the arthroscopic group(mean 6.42 with SD 1.349) at the end of 12 months whereas function score shows no statistically significant difference in both groups.^[1]

Jon J. P. Warner et al,^[2] made a comparative retrospective study regarding the results between arthroscopic and mini-open rotator cuff repair on the assumption that arthroscopic repair would produce similar results to mini-open repair but with less stiffness and faster recovery. Similar results were obtained in studies conducted by Thomas Youm, Nikhil N Verma, Cho CH.^[3-6]

The limitation of our study include a lesser period of follow up and also recurrent tears were not taken into account.

Even after the advent of arthroscopic techniques, mini-open rotator cuff repair still have significant role to play in the management of small, medium and massive rotator cuff tears. The arthroscopic repair technique is widely developing modality of surgery which has advantages of decreased postoperative pain, deltoid preservation, full visualization of joint during the surgery, better cosmesis.^[7] Miniopen repair technique is still used in case of large tears, failed arthroscopic surgeries, in centres with minimal arthroscopic equipments. Miniopen technique has advantages of faster approach, rapid access to the tendons, less expensive.

CONCLUSION

In this study, we can conclude that mini-open and arthroscopic repair has similar functional outcomes at the end of 6 months and 12 months in terms of MODIFIED ASES SCORE.

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REFERENCES

1. L. A. Fink Barnes, H. M. Kim, J-M. Caldwell, J. Buza, C. S. Ahmad, L. U. Bigliani, W. N. Levin. Bone Joint J, 2017; 99-B:245-9.
2. Jon J. P. Warner, M.D., Patrice Tétreault, M.D., Janne Lehtinen, M.D., Ph.D., and David Zurakowski, Ph.D. Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 21, No 3 (March), 2005: pp 328-332
3. Thomas Youm, MD, Doug H. Murray, MD, Erik N. Kubiak, MD, Andrew S. Rokito, MD, and Joseph D. Zuckerman, MD. NYJ Shoulder Elbow Surg 2005;14:455-459
4. Nikhil N. Verma, M.D., Warren Dunn, M.D., M.P.H., Ronald S. Adler, Ph.D., M.D. Frank A. Cordasco, M.D., Answorth Allen, M.D., John MacGillivray, M.D., Edward Craig, M.D., Russell F. Warren, M.D., and David W. Altchek, M.D. The Arthroscopy Association of North America 0749-8063/06/2206-5175
5. Norberg FB, Field LD, Savoie FH 3rd. Repair of the rotator cuff. Mini-open and arthroscopic repairs. Clin Sports Med. 2000 Jan;19(1):77-99.
6. Cho CH, Song KS, Jung GH, Lee YK, Shin HK. Early postoperative outcomes between arthroscopic and mini-open repair for rotator cuff tears. Orthopedics. 2012 Sep;35(9):e1347-52.
7. Thakor KN, Amin PC, Patel ZM, Dalal AN, Patel SN. Comparison of outcome between miniopen and arthroscopic rotator cuff repair. Indian J Orthop Surg 2021;7(1):67-72.