

A Institutional Based Observational Study to Investigate the Clinical and Cost Outcomes of Arthroscopic and Open Procedures in Patients with Degenerative Full-Thickness Rotator Cuff Tears

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Abstract

Background: Rotator cuff tears have long been recognized as a cause of pain and disability. Over the past decades the treatment of rotator cuff tears has evolved from an open procedure to a mini-open procedure to an all-arthroscopic one. However, there is no consensus on whether one technique offers superior outcomes. The aim of this study to investigate the clinical and cost outcomes of arthroscopic and open procedures in patients with degenerative full-thickness rotator cuff tears. **Materials & methods:** This was a prospective study conducted in the department of Orthopaedics Patna Medical College & Hospital, Bihar, India from January 2018 to January 2021 with cases followed up for a minimum of 3 years. This study included 40 patients of either sex with non-massive full thickness tears of rotator cuff. The outcome of quality of life is measured through The American Shoulder and Elbow Surgeons Shoulder Score (ASES) after 3 years of follow-up by questionnaires. **Results:** The average age of the patient for rotator cuff tear is 56.5 year in mini open repair and 57.2 years in arthroscopic repair groups, which was statistical non-significant ($P > 0.05$). The preoperative and postoperative modified ASES scores were not significantly different between groups ($P > 0.05$ and $P > 0.05$, respectively). In addition, the individual scores for pain, satisfaction, and function showed significant improvement for both groups. **Conclusion:** This study confirms that short-term results for arthroscopic and mini-open rotator cuff repair are similar and supports continued use of arthroscopic repair techniques.

Keywords: ASES Score, Rotator Cuff Tears, Repair, Mini-Plates, Arthroscopy.

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Introduction

Rotator cuff tears have long been recognized as a cause of pain and disability. Rotator cuff tears are more prevalent in older adults, those involved in heavy labor, males as well as individuals with previous history of injury[1].

Over the past decades the treatment of rotator cuff tears has evolved from an open procedure to a mini-open procedure to an all-arthroscopic one. Studies have demonstrated that surgical interventions including mini-open or arthroscopic repairs to offer satisfactory outcomes[2,3]. The mini-open has been considered the gold standard technique, costs significantly less, and proved to attain good to excellent outcomes in 90% of patients[4,5]. On the other hand, factors such as lower postoperative pain, quicker recovery time, and superior cosmetic results have steered surgeons' preferences to choosing an arthroscopic technique based on the to emerging evidence[6,7]. However, there is no consensus on whether one technique offers superior outcomes.

The decision to treat a patient operatively should be made after first thoroughly weighing the respective benefits against the risks of treating nonoperatively versus operative repair. Nonoperative treatment include exercises, steroid injections, and avoidance of repetitive motion.

The benefits of nonoperative treatment include financial savings and the avoidance of the risks associated with undergoing an operation (i.e., infection, pain, etc.). Unfortunately, the risks associated with taking this route may undermine any operative efforts down the line.

Surgery may also be undertaken to repair the tear using either an arthroscopic or open (including "mini-open") technique. Recent studies have shown that the number of rotator cuff procedures is increasing, in part due to a preference for minimally invasive techniques[8,9].

However, there are not enough research about the relative costs and health-related quality of life outcomes of arthroscopic and open procedures to help justify the choice of surgery. The aim of this study to investigate the clinical and cost outcomes of arthroscopic and open procedures in patients with degenerative full-thickness rotator cuff tears.

Materials & methods

This was a prospective study conducted in the department of Orthopaedics Patna Medical College & Hospital, Bihar, India from January 2018 to January 2021 with cases followed up for a minimum of 3 years. This study included 40 patients of either sex with non-massive full thickness tears of rotator cuff.

Inclusion Criteria

- Patients aged more than 50 years who have suffer from a rotator cuff tear.
- Have a full thickness rotator cuff tear
- Rotator cuff tear diagnosed using MRI or ultrasound scan
- Patient able to consent

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Exclusion Criteria

- Previous surgery on the affected shoulder
- Dual shoulder pathology
- Rheumatoid arthritis/systemic disease
- Significant osteoarthritis problems
- Significant neck problems
- Unable to undergo an MRI scan for any reason

Surgical Methods

Surgery is carried out in a beach-chair position. Using deltoid splitting we expose the shoulder joint. At present we use Neer's acromioplasty only when a type II or a type III acromion is present. After releasing and mobilizing RC muscles and preparing the bone for re-attachment, we reduce the size of tear with end-to-end suture and re-attach the RC tendons to the humerus. We close the incision in two layers. The arm is then immobilized in a brace for 4 to 6 weeks and a long-term (6 months) rehabilitation is recommended. During the period of study, we first employed intraosseous sutures, then Mitek RC anchors and finally Spiralok anchors (Mitek). After the initial "single-row" technique using simple sutures we adopted a "double-row" technique with mattress sutures and, subsequently, the modified Mason-Allen technique combining mattress and simple vertical sutures. The

double-row technique allowed us to extend the area of contact for re-attachment and increased the strength of fixation.

The outcome of quality of life is measured through The American Shoulder and Elbow Surgeons Shoulder Score (ASES) after 3 years of follow-up by questionnaires.

The cost of surgery is measured by the material used for surgery (Implant, Suture Material) as ours is a charitable trust hospital so there are no operative charges, medicine charges and hospital stay charges. So comparison of cost effectiveness is done by material used for repair of rotator cuff as it is the only chargeable. The final preference of surgery by cost effectiveness and quality of life of the patient after surgery is measured by questionnaires.

Results

There are total 40 patient's data collected by retrospectively. Among them 20 patient underwent mini open repair and 20 patient underwent arthroscopic repair of rotator cuff tear. There were, 40 % female patient and 60 % male patient in mini open repair, 45% female and 55 % male patients in arthroscopic repair. The average age of the patient for rotator cuff tear is 56.5 year in mini open repair and 57.2 years in arthroscopic repair groups, which was statistical non-significant ($P>0.05$) (Table. 1).

Table 1: Demographic distribution of patients in between groups

Demographic variables	Mini-open repair (N=20)	Arthroscopic repair (N=20)
Age (mean±sd) (yrs)	56.5±4.7	57.2±3.8
Gender		
Male	12 (60%)	11 (55%)
Female	8 (40%)	9 (45%)

All patients showed improvement in their modified ASES scores with surgery. The initial modified ASES score for patients in the arthroscopic group averaged 52, and this improved to an average final score of 91 ($P<0.05$). For patients in the mini-open group, the initial score averaged 45, improving to an average final score of 90 ($P<0.05$). The preoperative and postoperative modified ASES scores were not significantly different between groups ($P>0.05$ and $P>0.05$, respectively). In addition, the individual scores for pain, satisfaction, and function showed significant improvement for both groups (Table 2).

Table 2: Preoperative and Postoperative Modified ASES Scores (range) for Each Group

Modified ASES Scores (range)	Mini-open repair (N=20)		Arthroscopic repair (N=20)	
	Pre-op.	Post-op.	Pre-op.	Post-op.
Pain (30 points)	14 (1-23)	28 (18-30)	16 (4-25)	26 (18-30)
Satisfaction (10 points)	3 (0-10)	9 (5-10)	2 (0-10)	9 (5-10)
Function (60 points)	28 (10-45)	53 (24-60)	34 (14-45)	56 (24-60)
Total (100 points)	45 (10-49)	90 (50-100)	52 (10-53)	91 (50-100)

Discussion

Mini-open repair represented an attempt to combine the best features of arthroscopic and open repair. The ability to address intra-articular pathology and still repair the tendon with bone tunnels without taking down the deltoid origin has made mini open repair a popular technique. Short-term results of mini-open repair have been encouraging[10-12].

Gartsman et al. reported on a series of 73 patients who had undergone arthroscopic rotator cuff repair and were followed up for a minimum of 2 years. Patients improved their ASES scores from an average of 30.7 to 87.6. Based on Constant and Murley scores, 84% of patients had either a good or excellent result[13].

A similar results obtained by Andreas M Sauerbrey et al[14] retrospectively reviewed 54 patients who underwent either mini-open or arthroscopic rotator cuff repair. All patients showed significant improvement in their scores for pain, satisfaction, and function at the time of follow-up. The average preoperative and postoperative scores for the mini-open group were as follows: pain 17 and 27 (30 possible points), satisfaction 3 and 9 (10 possible points), function 32 and 53 (60 possible points), and total 52 and 89 (100 possible points) ($P<0.05$). For patients who underwent arthroscopic repair, average preoperative and postoperative scores were as follows: pain 12 and 26, satisfaction 2 and 9, function 28 and 51, and total, 42 and 86 ($P<0.05$). Improvement in scores within each group was significant, but

the difference in total scores between the 2 techniques was not statistically significant.

Servud and his colleagues compared 35 patients who had undergone mini-open repair with 29 patients with arthroscopic repair. At final follow-up, which averaged 44.6 months, there was no significant difference in function or range of motion. However, they reported that 4 of the 29 patients developed stiffness. Final outcome as measured by the ASES, UCLA, and SST scores were similar[15].

These results were similar to the results obtained with either open or mini-open repair and have provided a basis for the continued use of this technique[16,17].

Conclusion

This study confirms that short-term results for arthroscopic and mini-open rotator cuff repair are similar and supports continued use of arthroscopic repair techniques. There is a significant difference in patient's preference for surgery according to cost effectiveness, so cost effectiveness is really matters for the patients coming from a poor background in rural area.

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