

Original Research Article

Outcome of mini open anterolateral rotator cuff repair by suture anchor

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ABSTRACT

Background: Rotator cuff tears are a prevalent cause of shoulder pain and dysfunction, necessitating effective surgical interventions to restore function and alleviate symptoms. The mini open anterolateral rotator cuff repair technique using suture anchors has emerged as a promising approach, combining the advantages of arthroscopic and open surgery. This study aimed to evaluate the outcomes of mini open anterolateral rotator cuff repair with suture anchors, focusing on pain relief, range of motion, functional outcomes, complications, and radiographic assessments.

Methods: A retrospective analysis was conducted on 30 patients who underwent mini open anterolateral rotator cuff repair. Patient demographics, surgical details, postoperative outcomes, complications, and radiographic findings were evaluated.

Results: The average pain score significantly decreased from 7.8 (SD=1.2) preoperatively to 2.3 (SD=0.8) postoperatively ($p<0.001$). Range of motion improved with an average increase from 60 to 150 degrees of abduction and from 50 to 140 degrees of flexion ($p<0.001$). Functional outcomes, assessed by the American Shoulder and Elbow Surgeons (ASES) score, increased from 45 to 85 points ($p<0.001$). Complications, including joint stiffness, pain, and re-tears, were effectively managed. Radiographic assessments demonstrated satisfactory healing and alignment in the majority of patients.

Conclusions: Mini open anterolateral rotator cuff repair with suture anchors is an effective and safe surgical approach for managing rotator cuff injuries, leading to improved clinical outcomes and favorable radiographic findings. Further research is warranted to validate these findings and optimize treatment strategies.

Keywords: Rotator cuff tear, Mini open repair, Anterolateral approach, Suture anchors, Clinical outcomes

INTRODUCTION

Shoulder pain and dysfunction resulting from rotator cuff tears represent a significant clinical challenge, affecting individuals across various age groups and impacting their quality of life and functional abilities. Rotator cuff tears are one of the most common causes of shoulder pain, with a prevalence that increases with age, affecting up to 50% of individuals over the age of 60.¹ As the understanding of shoulder anatomy, biomechanics, and pathology has evolved, so too have the surgical techniques employed to address rotator cuff tears.

The rotator cuff is a group of four muscles and their tendons that stabilize the shoulder joint and facilitate its movements. These muscles include the supraspinatus, infraspinatus, teres minor, and subscapularis, collectively forming a cuff around the humeral head. The rotator cuff plays a crucial role in maintaining the dynamic stability of the shoulder joint, particularly during overhead and rotational movements.²

Rotator cuff tears can occur as a result of acute trauma, chronic overuse, or degenerative changes associated with aging. Common risk factors for rotator cuff tears include repetitive overhead activities (e.g., sports, manual labor),

trauma (e.g., falls, direct impact), anatomical variations, and age-related degeneration of tendon tissue.³ The clinical presentation of rotator cuff tears varies depending on the size, location, and chronicity of the tear but often includes shoulder pain, weakness, limited range of motion, and functional impairment.⁴

The diagnosis of rotator cuff tears typically involves a combination of clinical evaluation, imaging studies (e.g., MRI, ultrasound), and sometimes diagnostic arthroscopy. Management strategies for rotator cuff tears range from conservative measures such as physical therapy, analgesics, and corticosteroid injections to surgical intervention for cases refractory to non-operative treatment or those with significant functional limitations.⁵

Historically, open surgical approaches were the primary method for repairing rotator cuff tears, involving extensive soft tissue dissection and detachment of the deltoid muscle. While effective, these procedures were associated with significant postoperative pain, prolonged rehabilitation, and risk of deltoid dysfunction. The advent of arthroscopic techniques revolutionized rotator cuff surgery by offering less invasive approaches, improved visualization, and reduced surgical morbidity.⁶

Arthroscopic rotator cuff repair gained popularity due to its advantages, including smaller incisions, less soft tissue disruption, faster recovery, and potentially lower complication rates compared to open surgery. The procedure involves inserting an arthroscope into the shoulder joint through small incisions, allowing the surgeon to visualize the torn tendon and surrounding structures while repairing the tear using specialized instruments and suture anchors.⁷

However, despite the widespread adoption of arthroscopic techniques, certain challenges remain, particularly in cases of large or complex rotator cuff tears. Arthroscopic repair may be technically demanding, with limited access to the posterior and lateral aspects of the rotator cuff and potential difficulties in achieving adequate tendon-to-bone healing. These challenges have led to the development of alternative surgical approaches aimed at optimizing outcomes and addressing the limitations of arthroscopic repair.

The mini open anterolateral approach to rotator cuff repair represents a hybrid technique that combines the advantages of arthroscopic and open surgical methods. This approach involves a small skin incision in the anterolateral aspect of the shoulder, providing direct access to the rotator cuff tendon while minimizing soft tissue disruption and preserving deltoid function. The use of suture anchors allows for secure fixation of the tendon to the greater tuberosity of the humerus, promoting tendon healing and restoration of shoulder function.⁸

The rationale behind the adoption of the mini open anterolateral approach with suture anchors lies in its

potential to address the shortcomings of both open and arthroscopic techniques. By combining arthroscopic visualization with open surgical access, this approach allows for thorough assessment of the rotator cuff tear, precise placement of suture anchors, and reliable tendon-to-bone repair while minimizing the risk of deltoid dysfunction and postoperative stiffness.⁹ Furthermore, the mini open anterolateral approach offers several potential advantages over traditional open surgery, including smaller incisions, reduced soft tissue dissection, shorter operative times, and potentially faster recovery. These factors contribute to improved patient satisfaction, earlier return to function, and overall better outcomes following rotator cuff repair.¹⁰

The primary objective of this research paper is to provide a comprehensive review of the outcome of mini open anterolateral rotator cuff repair using suture anchors. By synthesizing the existing literature on this topic, the paper aims to elucidate the surgical technique, clinical outcomes, complications, and factors influencing the success of this approach. Additionally, it seeks to identify gaps in knowledge, highlight areas for further research, and guide clinical decision-making regarding the management of rotator cuff tears.

The significance of this research paper lies in its potential to inform orthopedic surgeons, allied healthcare professionals, and patients about the efficacy and safety of the mini open anterolateral approach with suture anchors for rotator cuff repair. By critically evaluating the available evidence, identifying best practices, and discussing future directions, this paper aims to contribute to the ongoing refinement of surgical techniques and improve outcomes for individuals suffering from rotator cuff tears.

METHODS

Study design

A retrospective cohort study was conducted to assess the outcomes of mini open anterolateral rotator cuff repair by suture anchor. The study focused on evaluating the improvement in pain, range of motion, and overall shoulder function post-surgery.

Study setting

The research was carried out at Government Medical College Aurangabad, which serves as a major referral center for orthopedic conditions. The facility is equipped with advanced medical imaging technologies and a dedicated orthopedics department.

Study participants

Inclusion criteria

Participants included patients who underwent mini open anterolateral rotator cuff repair by suture anchor from 01

January 2023 to 31 December 2023. All participants were above 20 years of age and had been diagnosed with rotator cuff injuries.

Exclusion criteria

Exclusion criteria encompassed patients with incomplete medical records, those who did not complete the follow-up period, individuals with prior shoulder surgeries, and patients with associated injuries or conditions that could confound the outcomes, such as significant arthritis or neurological disorders.

Study sampling

Patients were selected based on their medical records which indicated a diagnosis of rotator cuff injury and subsequent treatment via the mini open anterolateral approach. Only patients who completed at least 12 months of follow-up post-surgery were included in the study.

Study sample size

A total of 30 patients were included in the study. This sample size was deemed sufficient to achieve statistical power, based on previous studies with similar surgical interventions and outcomes.

Study parameters

The primary parameters measured were postoperative pain levels, range of motion, and functional outcomes assessed through the American Shoulder and Elbow Surgeons (ASES) scoring system. Secondary parameters included patient demographics, preoperative condition, and any complications or additional interventions required postoperatively.

Study procedure

The mini open anterolateral rotator cuff repair involved a small anterolateral incision, careful protection of the axillary nerve, deltoid splitting, evaluation of the tear, freshening of the tear edges, repair using suture anchors, and subsequent deltoid repair.

Study data collection

Data were collected retrospectively from patient medical records which included demographic information, clinical findings, imaging studies (MRI and X-rays), operative reports, and follow-up clinical assessments. All data collection complied with the confidentiality and data protection guidelines set by the institution.

Study data analysis

Data were entered into a statistical software program for analysis. Descriptive statistics were used to summarize patient demographics and clinical characteristics.

Comparative analyses of preoperative and postoperative scores were conducted using paired t-tests. A p value of less than 0.05 was considered statistically significant.

Ethical considerations

The study received ethical clearance from the Institutional Ethics Committee. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. Since this was a retrospective study, informed consent was waived by the ethics committee; however, patient anonymity and data confidentiality were rigorously maintained throughout the study.

RESULTS

Patient demographics and baseline characteristics

The demographic and baseline characteristics of the 30 patients involved in the study highlight a slightly higher prevalence of rotator cuff injuries in males (60%) compared to females (40%), with the most common age group being 30-40 years. The majority of the cases were chronic in nature (67%), suggesting that patients often seek treatment after prolonged symptoms. The distribution of injury types showed a higher occurrence of full-thickness tears (60%), which underscores the severity of injuries treated by the mini open anterolateral repair technique. Trauma was the most frequent etiology (50%), followed by degenerative changes (33%) and repetitive strain (17%), indicating varied causes of rotator cuff injuries in the study population. This diverse mix of patient characteristics and injury types reflects the typical clinical scenario encountered in tertiary care settings and provides a relevant context for assessing the effectiveness of the surgical approach used in the study (Table 1).

Surgical details

The surgical details of the mini open anterolateral rotator cuff repair reveal a typical surgery duration of approximately 85 minutes, with individual cases ranging from 60 to 120 minutes, indicating a reasonably consistent surgical time across different cases. The majority of patients (73.33%) underwent general anesthesia, which may suggest a preference for this method due to its ability to provide a controlled environment for complex or lengthy repairs, although regional anesthesia was also utilized in a significant minority (26.67%). The distribution of tear sizes most frequently observed was medium (1-3 cm) in half of the cases, indicating that this surgical approach is commonly applied to moderately severe injuries. The predominance of repairs conducted on the supraspinatus muscle (50% of cases) underscores its vulnerability within the rotator cuff group. This data not only reflects typical clinical profile of patients undergoing this procedure but also highlights technical considerations and expertise required in managing such cases effectively.

Table 1: Patient demographics and baseline characteristics.

Characteristics	Total (n=30) (%)	Male (n=18) (%)	Female (n=12) (%)
Age (years)			
Mean±SD	35±7	36±6	33±8
Range	20-50	22-50	20-48
Injury duration (weeks)			
Acute (<6)	10 (33)	6 (33)	4 (33)
Chronic (>6)	20 (67)	12 (67)	8 (67)
Degree of tear			
Partial	12 (40)	7 (39)	5 (42)
Full thickness	18 (60)	11 (61)	7 (58)
Etiology			
Trauma	15 (50)	9 (50)	6 (50)
Degenerative	10 (33)	6 (33)	4 (33)
Repetitive strain	5 (17)	3 (17)	2 (17)

Table 2: Summary of surgical details.

Surgical details	No. of patients (%)
Duration of surgery (minutes)	
Average	85 (range: 60 to 120)
Shortest	60
Longest	120
Anesthetic technique	
General anesthesia	22 (73.33)
Regional anesthesia	8 (26.67)
Intraoperative findings	
Size of tear (cm)	
Small (<1)	5 (16.67)
Medium (1-3)	15 (50)
Large (3-5)	8 (26.67)
Massive (>5)	2 (6.67)
Location of tear	
Anterior cuff	10 (33.33)
Posterior cuff	5 (16.67)
Supraspinatus (most common)	15 (50)

Postoperative outcomes

Following the mini open anterolateral rotator cuff repair, significant improvements were observed in both pain relief and functional outcomes. The average pain score, as measured on the visual analog scale (VAS), showed a marked decrease from a preoperative mean of 7.8 (SD=1.2) to a postoperative mean of 2.3 (SD=0.8) at the 12-month follow-up. This reduction in pain was statistically significant, with a p value of <0.001, indicating a successful alleviation of pain through surgical intervention.

The range of motion (ROM) in the shoulder also saw considerable improvement. Preoperatively, the average ROM was limited to 60 degrees of abduction and 50 degrees of flexion. Postoperatively, patients exhibited an average of 150 degrees of abduction and 140 degrees of flexion. The increase in ROM was statistically significant

(p<0.001), demonstrating the effectiveness of the procedure in restoring shoulder mobility.

Functional outcomes assessed by the American Shoulder and Elbow Surgeons (ASES) score also improved significantly. The average preoperative ASES score was 45 points, which increased to 85 points at the 12-month postoperative evaluation. This improvement in functional scores reflects a substantial enhancement in the overall shoulder function and quality of life of the patients, with a statistically significant p value of <0.001.

These results suggest that the mini open anterolateral approach for rotator cuff repair is highly effective in improving pain, range of motion, and functional outcomes in patients with rotator cuff injuries. The statistical analysis underscores the reliability of these findings, supporting the procedure as a valuable treatment option for rotator cuff pathology.

Complications

During the follow-up period, complications were observed in a subset of patients. The most common complication was joint stiffness, occurring in 6 out of the 30 patients (20%). Stiffness was categorized based on severity: mild stiffness was noted in 3 patients (10%), moderate in 2 patients (6.7%), and severe in 1 patient (3.3%). These patients were managed with additional physiotherapy sessions focusing on mobility exercises, and all reported some improvement at the final follow-up.

Pain at the surgical site was another complication, reported by 4 patients (13.3%). This was managed effectively with pain medication and did not persist beyond the first postoperative month in any of the cases. Additionally, two cases of superficial infections were reported (6.7%). These were treated with oral antibiotics, and no patient required further surgical intervention for this issue.

A more serious complication was the re-tear of the rotator cuff, which occurred in 3 patients (10%). These re-tears

were identified on follow-up MRI scans and were evenly distributed among males and females. These patients were offered a choice of conservative management or revision surgery, with one opting for surgery. Overall, while complications were noted, they were managed effectively, and none led to long-term adverse outcomes as per the last follow-up evaluations.

MRI and radiographic analysis

Postoperative MRI and radiographic evaluations were conducted to assess the anatomical outcomes of the mini open anterolateral rotator cuff repair by suture anchor. These imaging studies were crucial for detecting structural integrity, healing process, and any occurrence of re-tears. A total of 30 patients underwent both preoperative and postoperative imaging.

The MRI findings revealed that 24 patients (80%) showed satisfactory healing with intact rotator cuffs at the final

follow-up. However, re-tears were identified in 6 patients (20%), which were equally distributed among males and females. These re-tears appeared predominantly in patients who were initially classified with large to massive cuff tears. Radiographs taken immediately post-surgery and at subsequent follow-ups showed adequate placement of suture anchors and alignment of the rotator cuff.

In terms of radiographic outcomes, the alignment of the humeral head relative to the glenoid cavity was maintained or improved in 28 patients (93.3%). Only 2 patients (6.7%) showed minor deviations in alignment, which did not significantly impact their range of motion or pain levels.

Overall, the MRI and radiographic analyses post-surgery demonstrated a high rate of structural integrity and alignment, which correlates positively with the clinical outcomes observed in terms of pain reduction and improved functionality.

Table 3: Postoperative outcomes.

Outcome measures	Preoperative mean (SD)	Postoperative mean (SD)	P value
VAS pain score	7.8 (1.2)	2.3 (0.8)	<0.001
Range of motion - abduction (degrees)	60 (15)	150 (10)	<0.001
Range of motion - flexion (degrees)	50 (20)	140 (15)	<0.001
ASES functional score	45 (10)	85 (5)	<0.001

Table 4: Summary of complications observed in the study.

Complication type	Number of patients	Percentage	Management strategy
Joint stiffness	6	20	Additional physiotherapy
Mild	3	10	
Moderate	2	6.7	
Severe	1	3.3	Pain medication
Pain at surgical site	4	13.3	
Superficial infections	2	6.7	Oral antibiotics
Rotator cuff re-tear	3	10	Conservative management, surgery

Table 5: Summary of MRI and radiographic findings.

Outcome	Number of patients	Percentage	Observations
Satisfactory healing (MRI)	24	80	Intact rotator cuffs at final follow-up
Re-tears (MRI)	6	20	Occurred in large to massive initial tears
Adequate suture anchor placement	30	100	Confirmed by immediate post-op radiographs
Correct alignment (radiograph)	28	93.3	Improved or maintained humeral head alignment
Alignment deviations	2	6.7	Minor, without significant clinical impact

DISCUSSION

The results of this study underscore the efficacy of the mini open anterolateral rotator cuff repair using suture anchors in treating rotator cuff injuries. The patient demographics

reveal a slightly higher prevalence of rotator cuff injuries in males (60%) compared to females (40%), with the most common age group being 30-40 years. This is consistent with previous studies that have documented a higher incidence of rotator cuff tears in males, likely due to

occupational and recreational activities that place greater stress on the shoulder. The majority of the cases were chronic (67%), indicating that many patients delay seeking treatment, possibly due to the gradual onset of symptoms or a preference for conservative management before opting for surgery. This trend highlights the importance of timely diagnosis and intervention to prevent further deterioration of shoulder function.

The study's surgical details reveal that the mini open anterolateral approach is associated with a reasonably consistent surgical duration, averaging 85 minutes, and that general anesthesia was predominantly used (73.33%). The preference for general anesthesia likely reflects the need for optimal muscle relaxation and control during the procedure, particularly for more complex tears. The distribution of tear sizes, with medium tears (1-3 cm) being the most common, suggests that this approach is particularly suited for moderately severe injuries. The frequent involvement of the supraspinatus muscle (50% of cases) underscores its vulnerability within the rotator cuff group, a finding that aligns with other studies emphasizing the supraspinatus as the most commonly affected muscle in rotator cuff injuries.

The postoperative outcomes of this study are particularly compelling, with significant improvements observed in pain relief, range of motion, and functional outcomes. The reduction in VAS pain scores from a preoperative mean of 7.8 to a postoperative mean of 2.3 is in line with the findings of previous research, such as Lafosse et al, which also reported substantial pain relief following rotator cuff repair using suture anchors.⁹ The improvements in range of motion, with abduction increasing from 60 to 150 degrees and flexion from 50 to 140 degrees, are particularly noteworthy. These gains suggest that the mini open approach effectively restores shoulder mobility, which is crucial for patients' return to daily activities and work. The increase in ASES functional scores from 45 to 85 points further supports the effectiveness of this technique in enhancing overall shoulder function and quality of life.

However, the study also identified several complications, although these were generally manageable and did not result in long-term adverse outcomes. Joint stiffness was the most common complication, affecting 20% of patients. This is a known issue in rotator cuff repairs, as documented by Yeraniosian et al, and emphasizes the importance of postoperative rehabilitation in maintaining shoulder mobility.⁶ The occurrence of re-tears in 10% of patients, primarily those with larger initial tears, highlights the challenges associated with repairing more severe injuries. These re-tears were managed with either conservative treatment or revision surgery, underscoring the need for careful patient selection and counseling regarding the potential for re-injury.

MRI and radiographic analyses provided further validation of the clinical outcomes, with 80% of patients

demonstrating satisfactory healing and intact rotator cuffs at the final follow-up. This high rate of healing aligns with the results of Gartsman et al and supports the structural integrity achieved by the mini open approach.⁸ The radiographic assessments confirmed adequate suture anchor placement and proper alignment of the rotator cuff in 93.3% of patients, further correlating with the positive functional outcomes observed. The minor alignment deviations in 6.7% of patients did not have a significant impact on clinical outcomes, suggesting that the mini open approach is generally reliable in maintaining or improving shoulder alignment.

When comparing these results with those of purely arthroscopic techniques, the mini open approach appears to offer certain advantages, particularly in terms of range of motion and functional recovery. While arthroscopic methods are lauded for their minimally invasive nature, the mini open approach allows for better visualization and access to the rotator cuff, potentially leading to superior outcomes in cases involving larger or more complex tears. This is consistent with the findings of Burkhart, who advocated for the use of suture anchors in a hybrid approach to optimize tendon-to-bone healing.⁷

The findings of this study have important implications for the surgical management of rotator cuff injuries. The mini open anterolateral approach using suture anchors has proven to be an effective technique, offering significant improvements in pain relief, range of motion, and functional outcomes with manageable complication rates. This suggests that the approach could be recommended as a preferred option, particularly for patients with moderately severe tears, where traditional arthroscopic techniques may not provide sufficient access for optimal repair.

Limitations

However, the study also has several limitations. The relatively small sample size of 30 patients and the retrospective nature of the study may limit the generalizability of the findings. The lack of a control group or comparison with other surgical techniques restricts the ability to draw definitive conclusions about the superiority of the mini open approach. Furthermore, the follow-up period, while adequate for initial outcome assessment, may not fully capture the long-term durability of the repair, particularly regarding the potential for re-tears over time.

Based on these limitations, future research should focus on larger, prospective studies that include a control group for comparison. Long-term follow-up is essential to assess the durability of the repair and to identify any late-onset complications. Additionally, research exploring patient-reported outcomes and quality of life measures post-surgery could provide a more comprehensive understanding of the benefits and potential drawbacks of this technique. Finally, investigating the cost-effectiveness of the mini open approach compared to other methods

could inform clinical decision-making and resource allocation in healthcare settings. By addressing these areas, future studies can build on the current findings and further refine the surgical approach to enhance patient outcomes.

CONCLUSION

In conclusion, the findings of this study underscore the effectiveness and safety of the mini open anterolateral rotator cuff repair technique using suture anchors in managing rotator cuff injuries. Through comprehensive analysis of patient demographics, surgical details, postoperative outcomes, complications, and radiographic assessments, it is evident that this surgical approach leads to significant improvements in pain relief, range of motion, and functional outcomes. Despite the occurrence of complications such as joint stiffness, pain, and re-tears, these were managed effectively without long-term adverse effects. The high rate of structural integrity and alignment observed on postoperative MRI and radiographic evaluations further support the durability and efficacy of this technique. Overall, the study highlights the importance of a multidisciplinary approach, meticulous surgical technique, and diligent postoperative care in achieving favorable outcomes for patients with rotator cuff injuries. Further research and long-term follow-up are warranted to validate these findings and optimize treatment strategies for this common and debilitating condition.

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