

Functional Outcomes Following Arthroscopic Repair of Rotator Cuff Tears in Adults

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Received: 25-05-2026 / Revised: 23-06-2026 / Accepted: 26-07-2026

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Conflict of interest: Nil

Abstract:

Background: Rotator cuff tears are a common cause of shoulder pain and functional disability in adults. Arthroscopic repair aims to restore tendon integrity, relieve pain, and improve shoulder function. This study evaluated functional outcomes following arthroscopic rotator cuff repair in adults.

Methods: This prospective observational study included 120 adult patients with symptomatic rotator cuff tears undergoing arthroscopic repair. Patients were evaluated preoperatively and followed for 12 months. Outcomes were assessed using the Visual Analogue Scale (VAS), Constant–Murley Score, American Shoulder and Elbow Surgeons (ASES) score, shoulder range of motion, repair integrity, patient satisfaction, and postoperative complications.

Results: The mean VAS score decreased significantly from 7.2 ± 1.1 preoperatively to 1.6 ± 0.8 at 12 months ($p < 0.001$). The Constant–Murley Score improved from 47.8 ± 9.4 to 87.2 ± 7.3 , while the ASES score increased from 44.6 ± 10.2 to 89.1 ± 7.2 (both $p < 0.001$). Forward flexion improved from 112.4° to 163.8° , and abduction increased from 105.6° to 158.4° ($p < 0.001$). Excellent or good outcomes were achieved in 82.5% of patients, and 90.0% were satisfied with treatment. Repair integrity was maintained in 86.7%, while re-tear occurred in 13.3% and revision surgery was required in 2.5%.

Conclusion: Arthroscopic rotator cuff repair provided significant pain relief and functional improvement with high patient satisfaction. Favorable outcomes were achieved in the majority of adults, although larger tears, older age, prolonged symptoms, and re-tear were associated with less favorable recovery.

Keywords: Rotator Cuff Tear; Arthroscopic Repair; Functional Outcome; Constant–Murley Score; ASES Score; shoulder; Re-tear.

DOI: 10.25258/ijpqa.17.8.16

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Introduction

Rotator cuff tears are a common cause of shoulder pain, weakness, restricted movement, and functional disability in adults. The condition may develop as a result of age-related tendon degeneration, repetitive mechanical stress, or acute trauma. Persistent symptomatic tears can considerably affect activities of daily living, occupational performance, and quality of life. Arthroscopic rotator cuff repair has become an established surgical option for patients with symptomatic repairable tears that fail to respond adequately to conservative treatment. [1]

The primary objective of arthroscopic repair is to restore tendon continuity at its anatomical footprint, improve shoulder biomechanics, relieve pain, and facilitate recovery of strength and function. Improvements in arthroscopic

instrumentation, suture anchors, fixation constructs, and surgical techniques have contributed to favorable clinical outcomes. Repair integrity, however, may vary according to tear size, tendon quality, muscle degeneration, patient age, and other clinical characteristics. [2,3] Several patient- and tear-related factors may influence recovery following arthroscopic repair. Age, duration of symptoms, tear size, fatty infiltration, tendon retraction, preoperative functional status, and associated comorbidities have been investigated as potential predictors of postoperative outcome. [4,5] Consequently, assessment of functional recovery should incorporate both objective clinical findings and validated patient-reported outcome measures.

Recovery following rotator cuff repair is progressive and may continue for several months

after surgery. Clinically meaningful improvements in pain and shoulder function generally occur during postoperative rehabilitation, although the time required to achieve satisfactory outcomes varies among patients. [6] Long-term evidence also indicates that arthroscopic repair can provide sustained functional improvement with relatively low revision rates in appropriately selected patients. [7]

Therefore, the present study was undertaken to evaluate functional outcomes following arthroscopic repair of rotator cuff tears in adults, with particular emphasis on pain relief, shoulder function, range of motion, patient satisfaction, and postoperative complications.

Materials and Methods

Study Design and Participants: This prospective observational study included 120 adult patients with symptomatic rotator cuff tears who underwent arthroscopic rotator cuff repair. Patients fulfilling the eligibility criteria were enrolled consecutively during the study period and followed for 12 months after surgery.

Inclusion Criteria: Patients aged 18 years or older with symptomatic partial- or full-thickness rotator cuff tears confirmed by magnetic resonance imaging (MRI), persistent pain or functional limitation despite adequate conservative treatment, and a repairable tear identified preoperatively were included.

Exclusion Criteria: Patients with irreparable massive rotator cuff tears, advanced glenohumeral osteoarthritis, inflammatory arthropathy, active shoulder infection, previous major surgery on the affected shoulder, associated fractures, significant neurological disorders affecting shoulder function, or inability to complete postoperative rehabilitation and follow-up were excluded.

Preoperative Assessment: A detailed clinical history was obtained regarding age, sex, occupation, dominant arm, affected side, mechanism of injury, duration of symptoms, previous treatment, and associated medical conditions.

Clinical examination included assessment of shoulder tenderness, active and passive range of motion, muscle strength, and appropriate rotator cuff provocative tests. Preoperative MRI was performed to assess the involved tendon, tear thickness and size, tendon retraction, muscle atrophy, fatty degeneration, and associated shoulder abnormalities.

Pain severity was assessed using the Visual Analogue Scale (VAS). Functional assessment was performed using the Constant–Murley Score and

American Shoulder and Elbow Surgeons (ASES) score.

Surgical Technique: All patients underwent arthroscopic rotator cuff repair under appropriate anesthesia. Diagnostic arthroscopy was initially performed to evaluate the glenohumeral joint, rotator cuff, long head of the biceps tendon, and associated intra-articular pathology.

The torn tendon was mobilized, and the greater tuberosity footprint was prepared to obtain a suitable healing surface. The tendon was repaired anatomically using suture anchors with a single-row or double-row technique, depending on tear configuration, tendon mobility, and surgeon preference. Associated procedures such as bursectomy, acromioplasty, or biceps tenotomy/tenodesis were performed when clinically indicated.

Postoperative Rehabilitation: Following surgery, the affected arm was immobilized in a sling. Passive shoulder mobilization was initiated according to tear size and repair stability. Active-assisted and active range-of-motion exercises were introduced gradually, followed by progressive rotator cuff and scapular strengthening.

Heavy lifting and strenuous overhead activity were restricted during the initial healing period. Rehabilitation progression was individualized according to clinical recovery and repair characteristics.

Follow-up and Outcome Assessment: Patients were evaluated preoperatively and at 6 weeks, 3 months, 6 months, and 12 months postoperatively.

The primary outcome was improvement in functional status measured using the Constant–Murley Score at 12 months.

Secondary outcome measures included:

- ASES score
- VAS pain score
- Shoulder range of motion
- Muscle strength
- Patient satisfaction
- Return to routine activities
- Postoperative complications
- Re-tear or requirement for revision surgery

Shoulder range of motion was assessed by measuring forward flexion, abduction, and external rotation using a standardized clinical technique.

Assessment of Repair Integrity: Ultrasonography and/or MRI was performed during follow-up when clinically indicated or according to the study protocol to assess tendon integrity. Repairs were classified as intact or re-torn. The relationship between structural integrity and postoperative functional outcomes was also evaluated.

Statistical Analysis: Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Preoperative and postoperative continuous variables were compared using the paired Student's t-test. Repeated-measures analysis of variance (ANOVA) was used to evaluate changes in functional scores across multiple follow-up intervals. The Chi-square test or Fisher's exact test was used for categorical variables. Potential factors associated with final functional outcome, including age, tear size, duration of

symptoms, and repair integrity, were assessed using appropriate univariate analysis, followed by multivariable regression where applicable. A p-value <0.05 was considered statistically significant.

Results

A total of 120 adult patients who underwent arthroscopic repair of rotator cuff tears were included in the study and evaluated over a 12-month follow-up period. Significant improvement was observed in pain, functional scores, and shoulder range of motion following surgery.

Table 1: Demographic and Clinical Characteristics of Patients

Variable	Number (n=120)	Percentage (%)
Age group (years)		
<40	12	10.0
40–49	27	22.5
50–59	45	37.5
≥ 60	36	30.0
Mean age (years)	54.6 ± 9.8	—
Sex		
Male	71	59.2
Female	49	40.8
Dominant shoulder involved	78	65.0
History of trauma	49	40.8
Type of tear		
Partial-thickness tear	32	26.7
Full-thickness tear	88	73.3
Tear size*		
Small (<1 cm)	24	20.0
Medium (1–3 cm)	54	45.0
Large (3–5 cm)	32	26.7
Massive (>5 cm)	10	8.3
Mean duration of symptoms (months)	10.8 ± 5.6	—

*Based on the greatest tear dimension.

The mean age of the patients was 54.6 ± 9.8 years, with the majority belonging to the 50–59-year age group. Males constituted 59.2% of the study population, and the dominant shoulder was involved in 65.0%. Full-thickness tears were more common than partial-thickness tears, while medium-sized tears represented the most frequent tear category.

Table 2: Changes in Pain and Functional Outcome Scores Following Arthroscopic Repair

Outcome	Preoperative	3 Months	6 Months	12 Months	p-value*
VAS pain score	7.2 ± 1.1	4.3 ± 1.2	2.6 ± 1.0	1.6 ± 0.8	<0.001
Constant–Murley Score	47.8 ± 9.4	65.7 ± 8.8	78.6 ± 8.1	87.2 ± 7.3	<0.001
ASES score	44.6 ± 10.2	64.8 ± 9.5	79.3 ± 8.4	89.1 ± 7.2	<0.001

*Repeated-measures comparison across follow-up periods.

There was a progressive and statistically significant reduction in pain following arthroscopic repair.

The mean VAS score decreased from 7.2 preoperatively to 1.6 at 12 months ($p < 0.001$). Similarly, the mean Constant–Murley Score

improved from 47.8 to 87.2, while the ASES score increased from 44.6 to 89.1 (both $p < 0.001$).

The greatest functional improvement occurred during the first 6 months, with further improvement observed up to 12 months.

Table 3: Improvement in Shoulder Range of Motion

Range of Motion	Preoperative	6 Months	12 Months	p-value*
Forward flexion (degrees)	112.4 ± 19.6	148.7 ± 16.3	163.8 ± 12.5	<0.001
Abduction (degrees)	105.6 ± 21.2	142.5 ± 17.8	158.4 ± 14.2	<0.001
External rotation (degrees)	42.8 ± 10.4	55.6 ± 9.3	63.7 ± 8.1	<0.001

*Repeated-measures comparison.

Shoulder range of motion improved significantly following arthroscopic repair. Mean forward flexion increased from 112.4° preoperatively to 163.8° at 12 months, while abduction improved from 105.6° to 158.4°. External rotation increased from 42.8° to 63.7°. Improvements in all three movements were statistically significant ($p < 0.001$).

Table 4: Final Functional Outcome, Repair Integrity, and Complications

Outcome	Number (n=120)	Percentage (%)
Overall functional outcome		
Excellent	54	45.0
Good	45	37.5
Fair	15	12.5
Poor	6	5.0
Excellent/good outcome	99	82.5
Repair integrity at follow-up		
Intact repair	104	86.7
Re-tear	16	13.3
Patient satisfaction		
Satisfied/very satisfied	108	90.0
Not satisfied	12	10.0
Postoperative stiffness	7	5.8
Superficial infection	2	1.7
Persistent pain	6	5.0
Revision surgery	3	2.5

At final follow-up, 82.5% of patients achieved an excellent or good functional outcome, while 90.0% were satisfied or very satisfied with the surgical result. Repair integrity was maintained in 86.7% of patients, while re-tear was identified in 13.3%. Postoperative stiffness occurred in 5.8%, and revision surgery was required in 2.5% of patients.

Patients with intact repairs demonstrated better functional outcomes at 12 months than those with re-tears. Larger tear size, older age, longer duration of symptoms, and re-tear were associated with comparatively lower final functional scores.

Discussion

The present study evaluated functional outcomes following arthroscopic rotator cuff repair in 120 adults and demonstrated significant improvement in pain, shoulder function, and range of motion during 12 months of follow-up. The mean Constant–Murley Score improved from 47.8 preoperatively to 87.2 at 12 months, while the ASES score increased from 44.6 to 89.1. Simultaneously, the mean VAS pain score decreased from 7.2 to 1.6, indicating substantial symptomatic and functional improvement following repair.

Repair integrity was maintained in 86.7% of patients, while re-tear occurred in 13.3%. Although

structural healing is an important objective of rotator cuff repair, its relationship with clinical outcome is complex. Russell et al. [8] reported that structural integrity following rotator cuff repair does not always correlate strongly with patient-reported function and pain. Similarly, Haque and Singh [9] found that patients may achieve meaningful clinical improvement despite structural failure, although intact repairs generally demonstrate advantages in strength and some functional parameters.

Age and tear characteristics are important factors influencing tendon healing. In the present study, older age and larger tear size were associated with comparatively poorer final functional outcomes. Park et al. [10] demonstrated that satisfactory clinical improvement can be achieved even in patients older than 75 years, although re-tear rates increase with larger tears. These observations suggest that advanced age alone should not necessarily exclude patients from arthroscopic repair when appropriate indications are present.

Tear morphology may also affect structural and functional recovery. Lee et al. [11] demonstrated that arthroscopic repair can provide satisfactory clinical outcomes across different tear configurations, although anatomical characteristics may influence repair integrity. Therefore,

preoperative evaluation of tear size, shape, tendon retraction, and muscle quality remains important for predicting postoperative recovery. The present study demonstrated significant improvement in shoulder range of motion, with forward flexion increasing from 112.4° to 163.8° and abduction from 105.6° to 158.4° at 12 months. Arthroscopic repair may provide considerable functional recovery even in patients with severe preoperative impairment. Denard et al. [12] reported substantial restoration of active elevation and functional improvement following arthroscopic repair of massive rotator cuff tears in appropriately selected patients.

Return to normal occupational and daily activities is another important measure of successful treatment. Ting et al. [13] reported that a large proportion of patients were able to return to work following primary arthroscopic rotator cuff repair, although occupational intensity and patient-related characteristics influenced the timing and likelihood of return.

In the present study, 82.5% of patients achieved excellent or good functional outcomes and 90.0% were satisfied or very satisfied with treatment. Favorable results have also been reported in older populations. Galasso et al. [14] demonstrated significant functional improvement and a high tendon integrity rate after arthroscopic rotator cuff repair in patients older than 65 years, supporting the effectiveness of repair across a broad adult age range.

Finally, the relationship between structural healing and functional recovery should be interpreted carefully. Paul et al. [15] evaluated functional outcomes in relation to postoperative structural integrity and highlighted the importance of considering both imaging and clinical parameters during follow-up. Thus, postoperative assessment should incorporate pain, function, and range of motion, strength, patient satisfaction, and repair integrity rather than relying on imaging findings alone.

Overall, the present findings demonstrate that arthroscopic rotator cuff repair provides substantial functional improvement and pain relief with a high rate of patient satisfaction. However, older age, larger tears, longer symptom duration, and structural re-tear may be associated with less favorable outcomes.

Conclusion

Arthroscopic repair of rotator cuff tears resulted in significant improvement in pain, functional scores, and shoulder range of motion at 12 months. The majority of patients achieved excellent or good outcomes, with high patient satisfaction and a relatively low re-tear and revision rate. Older age,

larger tear size, prolonged symptoms, and re-tear were associated with comparatively poorer functional recovery. Careful patient selection, appropriate surgical technique, and structured postoperative rehabilitation remain important for achieving optimal outcomes.

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