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All-Arthroscopic Versus Mini-Open Single-Row Repair of Full-Thickness Rotator Cuff Tears: A Prospective Comparative Study

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Abstract

Background: Evidence directly comparing all-arthroscopic and mini-open repair while holding the repair configuration constant is limited. This study compared functional outcomes, pain, shoulder range of motion, and postoperative complications following all-arthroscopic and mini-open single-row repair of full-thickness rotator cuff tears.

Methods: This prospective comparative study was conducted at a tertiary care teaching hospital in India between August 2022 and August 2024. Twenty-four patients with symptomatic full-thickness rotator cuff tears underwent single-row suture-anchor repair, 12 by an all-arthroscopic technique (Group A) and 12 by a mini-open technique (Group B). Shoulder range of motion, the University of California, Los Angeles (UCLA) Shoulder Rating Scale, the American Shoulder and Elbow Surgeons (ASES) score, and the Visual Analogue Scale (VAS) for pain were assessed preoperatively and at 1, 2, and 4 weeks and 3 and 6 months postoperatively. Postoperative complications were recorded throughout follow-up.

Results: Both groups improved progressively in shoulder function and pain after repair. At 6 months, Group A showed greater recovery of forward flexion, abduction, internal rotation, and external rotation, together with higher UCLA and ASES scores and lower VAS pain scores, than Group B ($p < 0.05$ for all comparisons). Two wound-related complications (one superficial and one deep dehiscence) occurred in Group B; none occurred in Group A ($p = 0.336$).

Conclusion: All-arthroscopic single-row repair was associated with faster early functional recovery, greater short-term restoration of shoulder motion, and lower postoperative pain than mini-open repair, with no wound complications. Both techniques nonetheless produced clinically meaningful improvement. Given the small sample size, non-randomized allocation, and 6-month follow-up, these findings should be regarded as hypothesis-generating pending confirmation in larger, randomized trials with longer follow-up and imaging-based assessment of tendon healing.

Keywords: Rotator cuff tear; Full-thickness rotator cuff tear; All-arthroscopic repair; Mini-open repair; Single-row repair; Shoulder function; Range of motion; Postoperative pain.

Introduction

Rotator cuff tears are a common cause of shoulder pain, weakness, and functional limitation, and full-thickness tears frequently produce persistent symptoms and disability when they fail to respond to non-operative treatment [1]. Surgical repair is therefore indicated for symptomatic patients who remain functionally limited despite adequate conservative management. Several repair strategies are available, including mini-open and all-arthroscopic approaches [2]. The mini-open technique combines arthroscopic assessment of the joint with a limited open exposure of the torn tendon, whereas all-arthroscopic repair permits complete evaluation and treatment of both the glenohumeral and subacromial spaces through portal access alone [3]. Although the arthroscopic approach reduces surgical exposure and facilitates concurrent treatment of intra-articular pathology, whether these theoretical advantages translate into superior clinical outcomes compared with mini-open repair remains a matter of ongoing debate [4].

Prior comparative studies have generally shown improvement in pain, range of motion, and shoulder function with both techniques, without consistently establishing the superiority of either approach. Severud et al. [1] and Verma et al. [4] reported comparable clinical outcomes between all-arthroscopic and mini-open repair, and Sauerbrey et al. [3] similarly found significant improvement with both techniques but no clear between-group difference. Subsequent systematic reviews and meta-analyses have largely corroborated these findings, reporting broadly comparable functional outcomes and range of motion between approaches, although selected patient-reported outcomes and postoperative pain have occasionally differed [6–9]. More recent evidence continues to indicate that both techniques yield satisfactory clinical outcomes, with no consistent overall advantage for either approach [10, 11].

Differences between the two techniques may be most apparent in the early postoperative period. The reduced soft-tissue disruption of all-arthroscopic repair could plausibly facilitate earlier recovery of shoulder movement and reduce postoperative discomfort, whereas mini-open repair remains an established technique with reliably satisfactory outcomes. Some studies have reported better early functional recovery or patient-reported outcomes after arthroscopic repair, while others have found no meaningful between-technique difference [10 -13]. The relative clinical benefit of the surgical approach therefore remains uncertain, particularly when the repair configuration itself is held constant between groups - a methodological control that much of the existing comparative literature does not apply, since many prior series have combined different fixation constructs (single-row, double-row, or transosseous-equivalent) within and across treatment arms, potentially confounding the comparison of surgical approach with that of repair configuration.

Evidence that directly compares all-arthroscopic and mini-open repair using an identical single-row fixation technique in both arms is relatively scarce compared with the broader literature on differing repair configurations. This represents the principal knowledge gap addressed by the present study: by fixing the repair construct (single-row suture-anchor fixation) as a constant across both surgical arms, and by performing the mini-open repair through a deltoid-split without detachment, the comparison can be attributed more confidently to the surgical approach itself rather than to differences in fixation biomechanics. This design feature, together with structured serial follow-up at six time points over six months, constitutes the novel contribution of this study relative to earlier comparative series, most of which report outcomes at only one or two follow-up intervals and do not standardize the repair construct across arms.

The aim of this study was to compare the clinical and functional outcomes of all-arthroscopic and mini-open single-row repair of full-thickness rotator cuff tears. Shoulder range of motion, the UCLA Shoulder Rating Scale, the ASES score, postoperative pain, and complications were assessed over a six-month follow-up period.

Materials and Methods

Study Design and Setting

This prospective comparative study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital in India between August 2022 and August 2024, comparing the functional outcomes of single-row rotator cuff repair performed by all-arthroscopic and mini-open techniques.

Study Population and Eligibility Criteria

Patients presenting with rotator cuff tears were screened for eligibility. Patients aged 18–80 years with mild-to-moderate, post-traumatic or degenerative full-thickness rotator cuff tears and less than 3 cm of tendon retraction were considered eligible. Patients scheduled for either all-arthroscopic or mini-open rotator cuff repair and who provided written informed consent were enrolled consecutively until the target sample size was reached.

The surgical technique was determined according to the treating surgeon's clinical judgment and the patient's preference after discussion of the two surgical approaches, rather than by random allocation. Thus, patients were assigned to either the all-arthroscopic or mini-open repair group based on the preoperative treatment decision. The same eligibility criteria were applied to both groups. Patients were excluded if they were younger than 18 or older than 80 years, had associated fractures of the humerus, clavicle, or scapula, arthritic shoulder disease, or a neurological deficit.

A total of 24 patients were included, with 12 patients undergoing all-arthroscopic single-row rotator cuff repair (Group A) and 12 undergoing mini-open single-row rotator cuff repair (Group B). The sample size was calculated for comparison of two independent means, based on an expected between-group difference in pain score of 1.45 and a standard deviation of 1.2, with a significance level of 5% and 90% statistical power, using estimates derived from a previous comparative study [9].

Preoperative Assessment

All patients underwent detailed clinical assessment before surgery. Demographic and clinical variables age, sex, affected side, duration and mechanism of symptoms, occupation, and relevant clinical findings were recorded. Physical examination included shoulder range of motion, rotator cuff strength, impingement signs, and functional limitation.

Standard radiographs of the affected shoulder were obtained, followed by magnetic resonance imaging (MRI) to confirm the tear and assess tendon involvement, tear size, retraction, and associated pathology (Fig. 1). Baseline functional status was assessed using the UCLA Shoulder Rating Scale and the ASES score.

Surgical Technique

All patients underwent single-row suture-anchor repair, with the repair configuration held constant between groups; the principal difference between arms was the surgical approach. In the all-arthroscopic group, diagnostic glenohumeral arthroscopy was performed through standard posterior and anterior portals to assess the joint and identify associated intra-articular pathology. The arthroscope was then introduced into the subacromial space, and bursectomy was performed to improve visualization; acromioplasty was performed when indicated. The rotator cuff footprint on the greater tuberosity was prepared by soft-tissue removal and bony surface preparation with a shaver and burr. Suture anchors were placed along the lateral margin of the footprint, sutures were passed through the tendon approximately 5–10 mm medial to the tear edge, and the tendon was secured to the anatomical footprint using arthroscopic knot-tying.

In the mini-open group, diagnostic arthroscopy was performed first, followed by subacromial decompression when required. A small anterolateral incision was made and the deltoid fibres were split longitudinally without detachment from the acromion (Fig. 2). The torn rotator cuff was identified, mobilized, and debrided, the greater tuberosity footprint was prepared, and single-row suture-anchor fixation was performed to restore the tendon to its anatomical footprint. The deltoid split was repaired and the wound closed in layers.

Postoperative Rehabilitation and Follow-up

An identical postoperative rehabilitation protocol was used in both groups. The operated limb was immobilized in an arm sling for six weeks. Pendulum exercises were initiated immediately postoperatively, followed by passive range-of-motion exercises after two weeks. Active-assisted exercises commenced at six weeks, and progressive strengthening exercises were introduced at 10–12 weeks under physiotherapy supervision. Patients were evaluated at 1, 2, and 4 weeks and 3 and 6 months after surgery, with clinical examination and functional assessment performed at each visit.

Outcome Assessment

Shoulder range of motion, including forward flexion, abduction, internal rotation, and external rotation, was measured using a goniometer. Functional outcomes were assessed using the University of California, Los Angeles (UCLA) Shoulder Rating Scale and the American Shoulder and Elbow Surgeons (ASES) score. Pain intensity was assessed using the visual analogue scale (VAS). Postoperative complications, including wound-related complications and other adverse events, were recorded throughout the follow-up period.

All clinical assessments were performed by the designated clinical assessor. The assessor was not blinded to the surgical technique received by the patient. Therefore, the possibility of observer-related measurement bias, particularly for subjective outcomes such as VAS and functional scores, cannot be excluded.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Baseline characteristics were compared between the all-arthroscopic and mini-open groups using independent-samples t-tests for continuous variables and the chi-square test or Fisher's exact test for categorical variables, as appropriate.

For longitudinal outcomes, including pain, range of motion, UCLA Shoulder Rating Scale, and ASES scores, a linear mixed-effects model was used to account for repeated measurements within the same patient and to evaluate changes over time between the two treatment groups. Treatment group, time, and the group × time interaction were included as fixed effects, with patient included as a random effect. The group × time interaction was used to assess whether the pattern of postoperative recovery differed between the all-arthroscopic and mini-open groups. Where significant

overall or interaction effects were identified, post hoc pairwise comparisons were performed with appropriate adjustment for multiple comparisons. A two-sided p value <0.05 was considered statistically significant.

Results

Baseline Characteristics

A total of 24 patients with full-thickness rotator cuff tears were included: 12 underwent all-arthroscopic single-row repair (Group A) and 12 underwent mini-open single-row repair (Group B). Mean age was 43.0 ± 19.4 years in Group A and 58.8 ± 15.6 years in Group B, a difference that did not reach statistical significance ($p = 0.300$) but that is clinically appreciable and is addressed further in the Limitations. Male patients predominated in both groups (58.3% of Group A and 66.7% of Group B), with no significant between-group difference in sex distribution ($p = 0.673$).

The affected side was comparable between groups ($p = 0.408$). A statistically significant difference was observed in the reported mechanism of injury ($p = 0.046$): road traffic accidents were the most frequent cause in Group A (41.7%), whereas degenerative pathology (41.7%) and joint weakness (33.3%) predominated in Group B. Subacromial impingement signs were present in 75.0% of Group A and 66.7% of Group B ($p = 0.653$), and MRC muscle strength grading was comparable between groups ($p = 0.895$).

Recovery of Shoulder Range of Motion

Both groups demonstrated progressive improvement in shoulder range of motion during the six-month follow-up (Tables 1 and 2; Fig. 4). Baseline forward flexion was comparable between groups (73.0 ± 7.7° vs. 68.2 ± 4.9°; $p = 0.081$) and increased progressively after surgery. The all-arthroscopic group demonstrated greater forward flexion during follow-up, reaching 139.9 ± 7.0° at six months compared with 110.1 ± 14.3° in the mini-open group ($p < 0.001$).

A similar pattern was observed for abduction. Baseline abduction was comparable between groups (65.2 ± 8.8° vs. 68.4 ± 7.4°; $p = 0.338$), followed by progressive improvement in both groups. At six months, mean abduction was 141.9 ± 7.1° in the all-arthroscopic group and 118.0 ± 6.4° in the mini-open group ($p < 0.001$).

Internal rotation also improved progressively following surgery. Baseline values were comparable between groups (50.6 ± 6.7° vs. 49.3 ± 5.6°; $p = 0.625$). At six months, internal rotation was 80.6 ± 4.4° in the all-arthroscopic group compared with 69.1 ± 3.4° in the mini-open group ($p < 0.001$).

External rotation showed no significant between-group difference at the first two postoperative assessments; however, a significant difference emerged at four weeks and persisted during subsequent follow-up. At six months, external

rotation reached 76.6 ± 3.9° in the all-arthroscopic group compared with 65.1 ± 4.5° in the mini-open group ($p < 0.001$).

Overall, all four assessed range-of-motion parameters demonstrated progressive postoperative improvement in both groups, with greater recovery observed in the all-arthroscopic group during follow-up. The longitudinal range-of-motion data are presented in Tables 1 and 2 and illustrated in Figure 4.

Functional Outcomes

Both groups showed progressive improvement in functional outcomes during follow-up (Table 3, Fig. 3a–b). Baseline UCLA scores were comparable (14.8 ± 5.9 in Group A vs. 16.1 ± 6.3 in Group B; $p = 0.596$), increasing progressively in both groups, with significantly higher scores in the all-arthroscopic group from the first postoperative week onward; at six months, mean UCLA score was 33.8 ± 1.2 in Group A versus 28.8 ± 2.6 in Group B ($p < 0.001$). ASES scores also increased progressively in both groups. The between-group difference was not significant at one week ($p = 0.581$) but became significant from two weeks onward; at six months, mean ASES score was 94.4 ± 3.6 in Group A versus 79.3 ± 3.3 in Group B ($p = 0.001$) (Table 3, Fig. 3b).

Postoperative Pain

Pain scores decreased progressively in both groups. Baseline VAS scores were comparable (9.2 ± 0.8 in Group A vs. 9.0 ± 0.6 in Group B; $p = 0.581$), with a significant between-group difference favouring the all-arthroscopic group from the first postoperative week onward. At six months, mean VAS score was 1.0 ± 0.0 in Group A versus 1.3 ± 0.5 in Group B ($p = 0.028$) (Table 3, Fig. 3c).

Postoperative Complications

No postoperative complications were recorded in the all-arthroscopic group. In the mini-open group, two wound-related complications were documented: superficial wound dehiscence in one patient (8.3%) and deep wound dehiscence in one patient (8.3%). Although both complications occurred in the mini-open group, the between-group difference in complication rate was not statistically significant ($p = 0.336$), most likely reflecting the limited statistical power afforded by the small sample.

Discussion

The present study demonstrated significant improvement in pain, shoulder range of motion, and functional outcomes after both all-arthroscopic and mini-open single-row repair of full-thickness rotator cuff tears. However, the all-arthroscopic group showed greater recovery of forward flexion, abduction, and internal and external rotation, together

with higher UCLA and ASES scores and lower postoperative pain, at six months. Although these findings favour the all-arthroscopic approach in the present cohort, they should be interpreted alongside the existing literature, which has generally reported satisfactory outcomes with both techniques without consistently establishing the superiority of either [14, 15].

The improvement in shoulder range of motion was among the more notable findings. At six months, forward flexion, abduction, internal rotation, and external rotation were all significantly greater in the all-arthroscopic group, a difference not attributable to baseline mobility, since the groups were broadly comparable before surgery. The greater postoperative recovery may relate to the less extensive soft-tissue exposure associated with arthroscopy: the mini-open technique requires a limited deltoid split, whereas the all-arthroscopic approach uses portal-based access and avoids direct disruption of the deltoid. Reduced soft-tissue trauma may cause less postoperative discomfort and guarding, permitting earlier progression of shoulder movement. Similar early advantages have been described in comparative studies, although differences between techniques tend to narrow with longer follow-up [13–16].

The available evidence is nonetheless not uniform. Ji et al. [12], in a meta-analysis of randomized controlled trials, found no significant differences between arthroscopic and mini-open repair in functional scores, pain, or range of motion. Sakha et al. [16] similarly reported equivalent clinical outcomes between the two techniques over the medium to long term. These findings suggest that the difference observed in the present study may reflect a faster early recovery trajectory rather than a definite difference in eventual shoulder function [16, 17]. The six-month follow-up in the present study also limits the ability to determine whether the observed advantage in range of motion would persist over a longer period.

Functional outcomes followed a similar pattern. Both groups showed substantial improvement in UCLA and ASES scores, indicating meaningful recovery after repair, but at six months the all-arthroscopic group achieved higher scores on both measures. This is consistent with some evidence favouring better patient-reported outcomes after arthroscopic repair: Sakha et al. [16] reported statistically significant differences favouring arthroscopic repair for selected patient-reported outcomes in their systematic review and meta-analysis, and Migliorini et al. [18] identified differences in some functional outcomes in their updated meta-analysis, although the overall evidence did not demonstrate consistent superiority of arthroscopy across all measures.

More recent comparative studies further illustrate the uncertainty surrounding this issue. Daga et al. [19] reported that both all-arthroscopic and mini-open repair produced favourable clinical outcomes, without a consistent difference in

patient-reported outcomes between techniques. Tosyali et al. [20] similarly found that both approaches produced clinical improvement, with no clear overall superiority when clinical and structural outcomes were considered together. Conversely, Jithesh et al. [21] reported favourable short-term outcomes with both procedures but observed better results in the mini-open group. These contrasting findings suggest that functional recovery is influenced by multiple factors — tear characteristics, patient selection, surgical technique, rehabilitation, and surgeon experience rather than by the operative approach alone.

Postoperative pain decreased progressively in both groups, with lower VAS scores in the all-arthroscopic group throughout follow-up. This difference may be explained by the smaller incisions and reduced soft-tissue disruption associated with arthroscopic repair, consistent with the rationale proposed for the approach and with recent comparative evidence: the most recent meta-analysis by Boutros et al. [22] found broadly comparable clinical and structural outcomes between arthroscopic and mini-open repair but identified a modest advantage for arthroscopy in postoperative pain. The lower pain scores observed here are therefore compatible with recent evidence, although the difference should not be interpreted as proof of a universal long-term pain advantage.

The complication profile also warrants consideration. No postoperative complications occurred in the all-arthroscopic group, whereas two patients in the mini-open group developed wound-related complications (superficial and deep dehiscence). Although these complications occurred exclusively in the mini-open group, the difference was not statistically significant. This is clinically plausible, since mini-open repair involves a larger incision and deltoid splitting compared with portal-based arthroscopic access; nevertheless, the very small number of events and the overall sample size of 24 patients substantially limit any conclusion regarding comparative complication rates. Recent comparative evidence has likewise shown that complication findings vary between studies and that the overall difference between techniques remains uncertain [18–22].

An important feature of the present study is that the repair configuration was held constant between groups: all patients underwent single-row suture-anchor repair, with the surgical approach as the principal variable. This provides a relatively focused comparison of all-arthroscopic and mini-open repair without introducing differences related to single-row versus double-row fixation, which is relevant because repair configuration, tear size, tendon quality, and postoperative rehabilitation can each independently influence functional recovery. The present findings therefore contribute specifically to the clinical comparison of the two approaches when an identical single-row repair strategy

is used — a comparison that, as outlined in the Introduction, is less well represented in the existing literature than comparisons across differing repair configurations.

The findings should nevertheless be interpreted in light of several limitations. The study included only 24 patients, 12 per group, limiting statistical power and generalizability, and outcomes were compared using repeated independent t-tests across six time points and several instruments without correction for multiple comparisons, which increases the risk of a Type I error and should be weighed when interpreting the many statistically significant between-group differences reported here. Allocation to treatment arm was not randomized, and the two groups differed significantly in reported mechanism of injury ($p = 0.046$) and showed a substantial, albeit not statistically significant, difference in mean age (43.0 vs. 58.8 years); either factor could independently influence functional recovery and cannot be excluded as a source of confounding. Whether outcome assessors were blinded to treatment allocation was not specified, which is a further potential source of bias in the ROM and VAS assessments. Follow-up was limited to six months, and postoperative imaging was not used to assess tendon integrity or retear rates. The study was conducted at a single centre. Larger, ideally randomized, studies with longer follow-up, blinded outcome assessment, and standardized imaging-based assessment of tendon healing are required to determine whether the functional differences observed here persist over time.

Overall, the present study suggests that both all-arthroscopic and mini-open single-row repair provide meaningful improvement in patients with full-thickness rotator cuff tears. In this cohort, all-arthroscopic repair was associated with greater recovery of shoulder motion, better UCLA and ASES scores, and lower postoperative pain at six months. These findings are consistent with some recent evidence but contrast with other comparative studies demonstrating broadly equivalent outcomes or, in some cases, more favourable results with mini-open repair [16–22]. The choice between techniques should therefore remain individualized, taking into account tear characteristics, surgeon expertise, rehabilitation requirements, available resources, and patient preference, rather than assuming universal superiority of either approach.

Strengths, Limitations, and Clinical Implications

A key strength of this study was the use of an identical single-row suture-anchor configuration and postoperative rehabilitation protocol in both groups, allowing the comparison to focus primarily on the surgical approach; multiple standardized follow-up assessments of function, pain, and range of motion over six months further strengthened the assessment. The principal limitations — small sample size, single-centre and non-randomized design, unspecified

blinding of outcome assessment, baseline imbalance in age and injury mechanism, absence of correction for multiple statistical comparisons, and lack of imaging-confirmed tendon healing — are detailed above and should be regarded collectively as constraining the strength, though not the clinical plausibility, of the conclusions. Both techniques produced meaningful clinical improvement, and until confirmed by adequately powered randomized trials, the choice of technique should be individualized according to tear characteristics, surgeon expertise, rehabilitation requirements, and patient factors rather than guided by these results alone.

Conclusion

Both all-arthroscopic and mini-open single-row rotator cuff repair produced significant improvement in shoulder pain, range of motion, and functional outcomes over six months of follow-up. In this cohort, patients undergoing all-arthroscopic repair showed greater recovery of shoulder motion, higher UCLA and ASES scores, and lower postoperative pain than those undergoing mini-open repair, with no wound complications compared with two in the mini-open group. These findings suggest a possible early functional advantage of the all-arthroscopic approach, but given the small, non-randomized sample and six-month follow-up, they should be regarded as preliminary. Larger, randomized studies with longer follow-up and imaging-based assessment of tendon healing are required to determine whether these differences are sustained and whether they translate into superior long-term structural and functional outcomes.

Declarations

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was conducted in accordance with ethical standards and was approved by the Institutional Ethics Committee (Approval No.: SRMIEC-ST0324-1025). Written informed consent was obtained from all the participants.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Written Consent for publication

All images included in this manuscript have been fully anonymised and de-identified in accordance with institutional ethical guidelines. No identifiable patient information is presented.

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Author contributions statement

Bhalodiya Milap Mahendrabhai - Study conception, data collection, manuscript drafting.

Priyank Oza - Literature review and manuscript editing.

Parth Mehta - Data collection and Patient follow-up.

S. Muthukumar Balaji - Data analysis and interpretation.

S. Devi Prasad - Study design, surgical supervision, critical revision, and correspondence.

Abbreviations

Abbreviation	Definition
ASES	American Shoulder and Elbow Surgeons
IEC	Institutional Ethics Committee
MRC	Medical Research Council
MRI	Magnetic Resonance Imaging
RTA	Road Traffic Accident
ROM	Range of Motion
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences

Abbreviation	Definition
UCLA	University of California, Los Angeles Shoulder Rating Scale
VAS	Visual Analogue Scale

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Figures legends

Figure 1. Preoperative magnetic resonance imaging (MRI) of the right shoulder demonstrating a full-thickness rotator cuff tear with medial tendon retraction.

Figure 2. Intraoperative photographs of mini-open rotator cuff repair showing exposure of the torn rotator cuff tendon, footprint preparation, and single-row suture-anchor fixation in a study participant.

Figure 3. Changes in clinical outcome measures during follow-up. (a) UCLA Shoulder Rating Scale, (b) ASES score, and (c) VAS score in the all-arthroscopic and mini-open groups from baseline to 6 months after surgery.

Figure 4. Recovery of shoulder range of motion following all-arthroscopic and mini-open rotator cuff repair. Mean values for forward flexion, abduction, internal rotation, and external rotation are shown at baseline and at 1 week, 2 weeks, 4 weeks, 3 months, and 6 months after surgery.

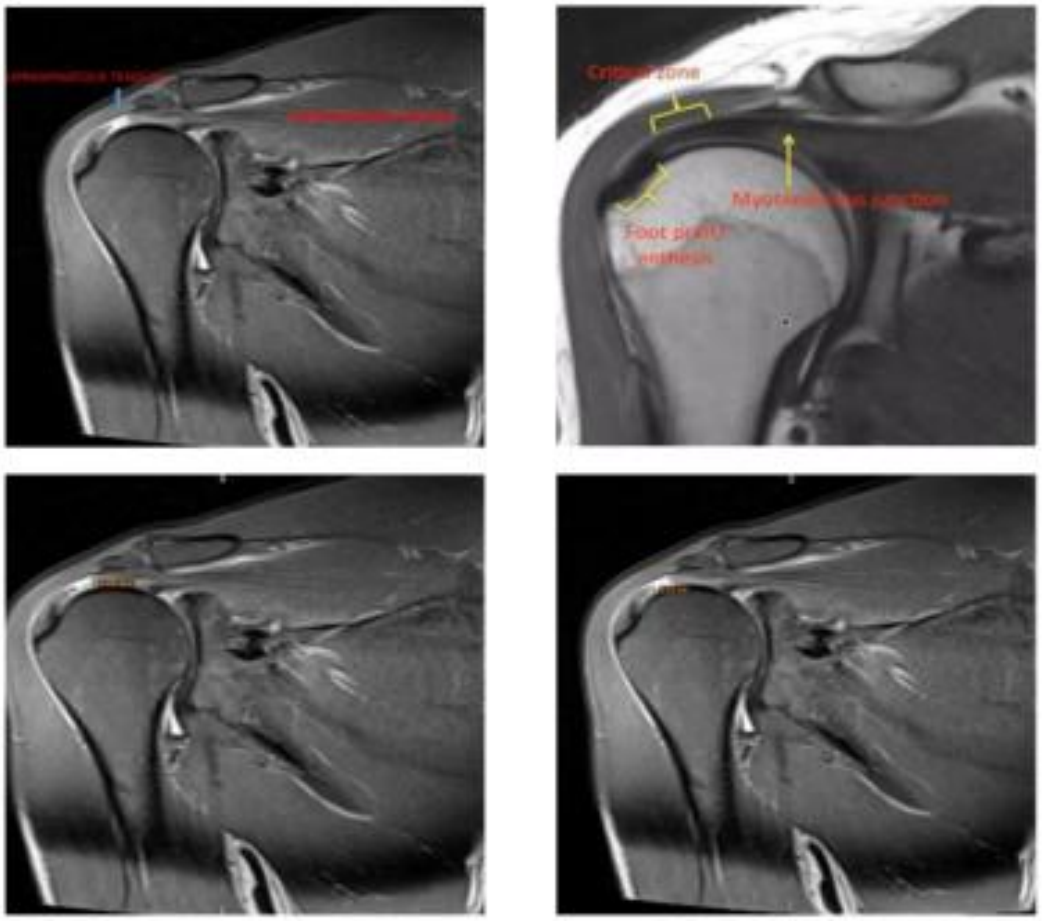


Fig. 1

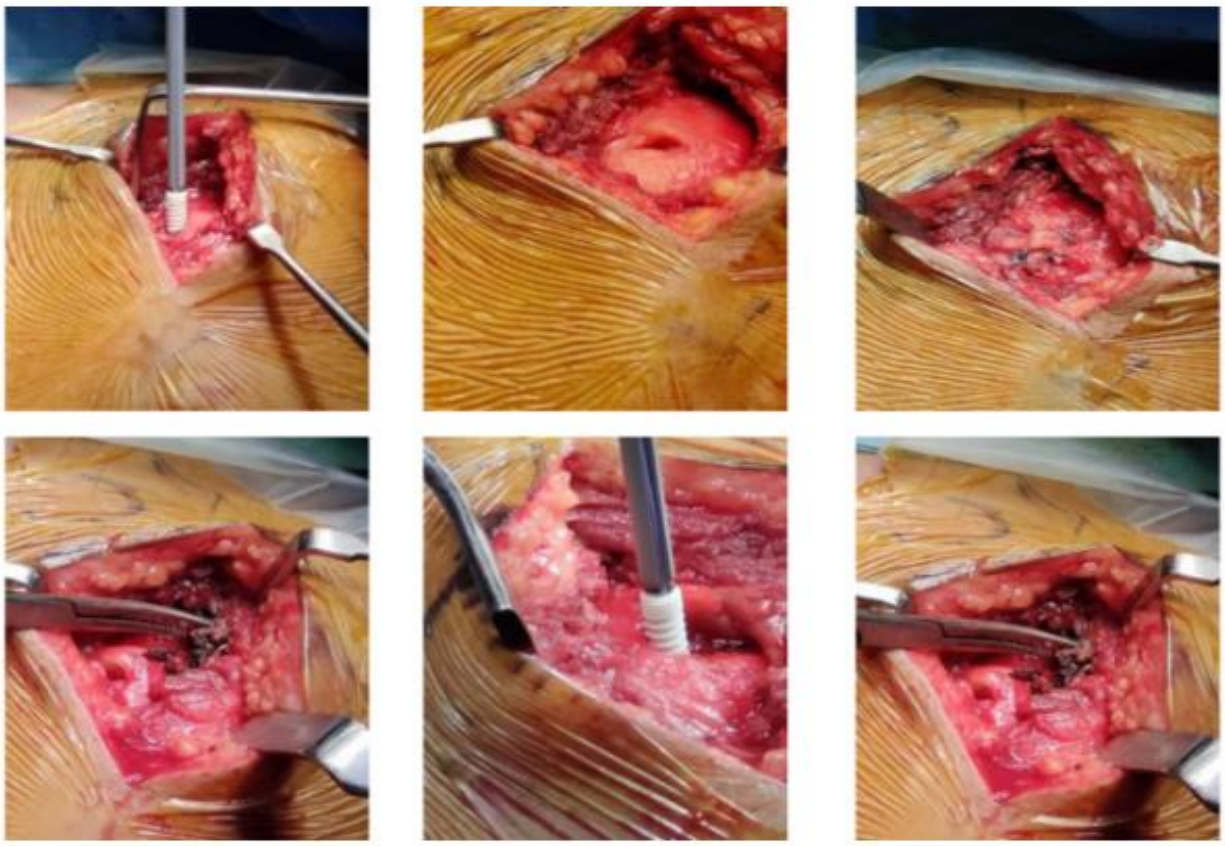


Fig. 2

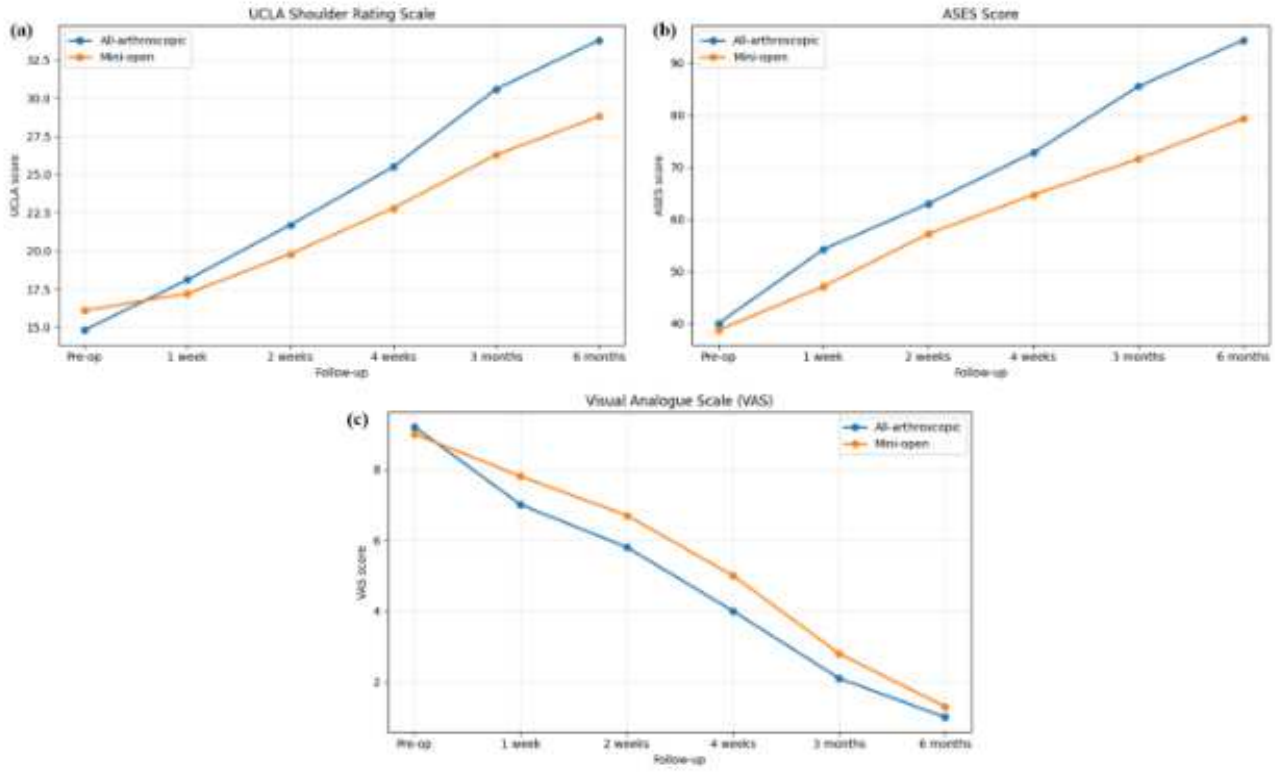

(a)
UCLA Shoulder Rating Scale
All-arthroscopic
Mini-open
UCLA score
Pre-op
1 week
2 weeks
4 weeks
3 months
6 months
Follow-up
(b)
ASES Score
All-arthroscopic
Mini-open
ASES score
Pre-op
1 week
2 weeks
4 weeks
3 months
6 months
Follow-up
(c)
Visual Analogue Scale (VAS)
All-arthroscopic
Mini-open
VAS score
Pre-op
1 week
2 weeks
4 weeks
3 months
6 months
Follow-up

Fig. 3

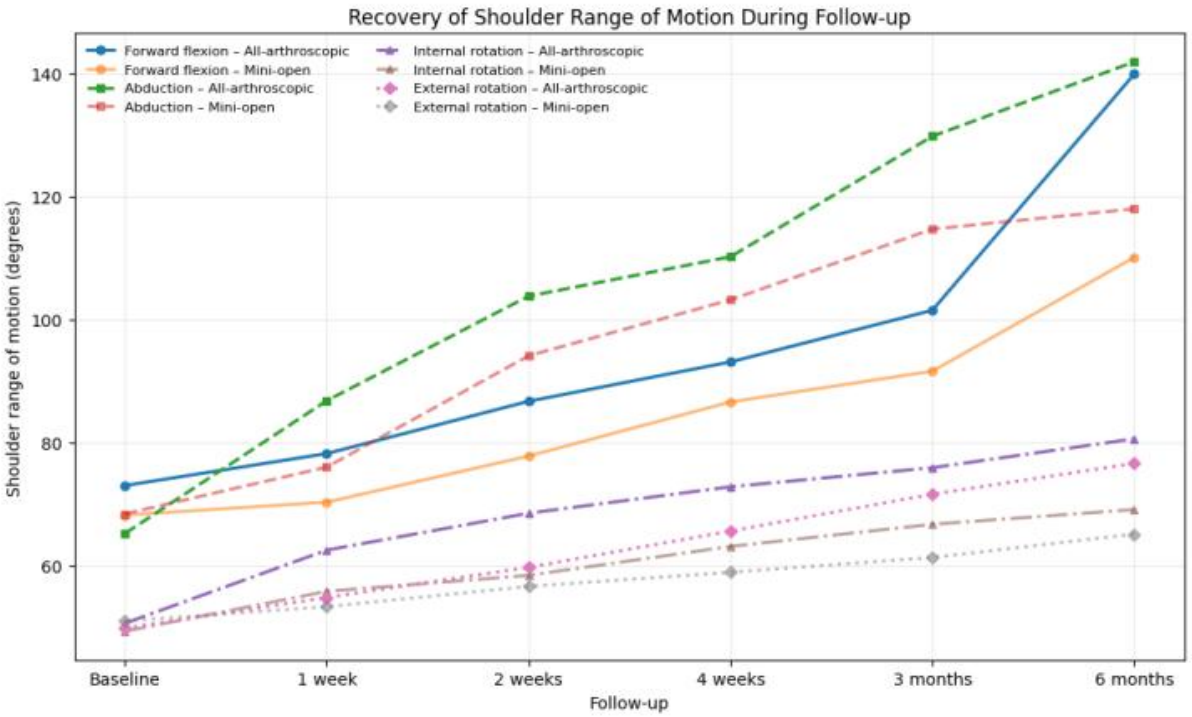

Recovery of Shoulder Range of Motion During Follow-up
Forward flexion – All-arthroscopic
Forward flexion – Mini-open
Abduction – All-arthroscopic
Abduction – Mini-open
Internal rotation – All-arthroscopic
Internal rotation – Mini-open
External rotation – All-arthroscopic
External rotation – Mini-open
Shoulder range of motion (degrees)
140
120
100
80
60
Baseline
1 week
2 weeks
4 weeks
3 months
6 months
Follow-up

Fig. 4

Tables

Table 1. Comparison of forward flexion and abduction between the all-arthroscopic repair group (Group A) and mini-open repair group (Group B) at baseline and during postoperative follow-up.

Follow-up	Forward Flexion Group A (Mean ± SD)	Forward Flexion Group B (Mean ± SD)	P value	Abduction Group A (Mean ± SD)	Abduction Group B (Mean ± SD)	P value
Baseline	73.0 ± 7.7	68.2 ± 4.9	0.081	65.2 ± 8.8	68.4 ± 7.4	0.338
1 Week	78.2 ± 6.1	70.3 ± 5.7	0.004*	86.8 ± 5.0	76.0 ± 3.8	<0.001*
2 Weeks	86.7 ± 6.1	77.8 ± 4.9	0.001*	103.8 ± 6.6	94.1 ± 6.2	0.001*
4 Weeks	93.1 ± 4.6	86.6 ± 2.4	0.001*	110.2 ± 6.1	103.2 ± 3.7	0.003*
3 Months	101.5 ± 8.2	91.6 ± 4.5	0.001*	129.8 ± 7.3	114.7 ± 6.0	<0.001*
6 Months	139.9 ± 7.0	110.1 ± 14.3	<0.001*	141.9 ± 7.1	118.0 ± 6.4	<0.001*

Data are presented as mean ± standard deviation (SD). P values were calculated using the independent-samples t-test. Statistical significance was set at $p < 0.05$ (*). UCLA, University of California, Los Angeles Shoulder Rating Scale; ASES, American Shoulder and Elbow Surgeons score; VAS, Visual Analogue Scale.

Table 2. Comparison of internal rotation and external rotation between the all-arthroscopic repair group (Group A) and mini-open repair group (Group B) at baseline and during postoperative follow-up.

Follow-up	Internal Rotation Group A (Mean ± SD)	Internal Rotation Group B (Mean ± SD)	P value	External Rotation Group A (Mean ± SD)	External Rotation Group B (Mean ± SD)	P value
Baseline	50.6 ± 6.7	49.3 ± 5.6	0.625	49.8 ± 6.3	51.0 ± 5.4	0.630
1 Week	62.5 ± 4.2	55.8 ± 5.6	0.003*	54.8 ± 4.9	53.3 ± 4.7	0.476
2 Weeks	68.5 ± 4.7	58.4 ± 4.7	<0.001*	59.7 ± 5.1	56.6 ± 4.8	0.142
4 Weeks	72.8 ± 4.4	63.1 ± 3.6	<0.001*	65.6 ± 5.0	58.9 ± 4.7	0.003*
3 Months	75.9 ± 4.6	66.7 ± 3.5	<0.001*	71.6 ± 3.2	61.3 ± 4.6	<0.001*
6 Months	80.6 ± 4.4	69.1 ± 3.4	<0.001*	76.6 ± 3.9	65.1 ± 4.5	<0.001*

Data are presented as mean ± standard deviation (SD). P values were calculated using the independent-samples t-test. Statistical significance was set at $p < 0.05$ (*). UCLA, University of California, Los Angeles Shoulder Rating Scale; ASES, American Shoulder and Elbow Surgeons score; VAS, Visual Analogue Scale.

Table 3. Comparison of functional outcome scores (UCLA and ASES) and pain scores (VAS) between the all-arthroscopic repair group (Group A) and mini-open repair group (Group B) at baseline and during postoperative follow-up.

Follow-up	UCLA A (Mean ± SD)	UCLA B (Mean ± SD)	P value	ASES A (Mean ± SD)	ASES B (Mean ± SD)	P value	VAS A (Mean ± SD)	VAS B (Mean ± SD)	P value
Baseline	14.8 ± 5.9	16.1 ± 6.3	0.596	–	–	–	9.2 ± 0.8	9.0 ± 0.6	0.581
1 Week	25.3 ± 2.8	20.7 ± 4.6	0.007*	54.0 ± 5.8	46.7 ± 5.1	0.581	5.8 ± 0.9	7.6 ± 0.9	<0.001*
2 Weeks	27.8 ± 3.2	24.6 ± 2.8	0.017*	62.3 ± 7.9	55.5 ± 6.0	0.023*	4.3 ± 0.8	5.7 ± 1.0	0.001*
4 Weeks	31.8 ± 1.5	25.8 ± 2.8	<0.001*	70.3 ± 8.4	63.8 ± 4.2	0.025*	2.9 ± 0.9	4.0 ± 0.7	0.004*
3 Months	33.7 ± 1.0	28.4 ± 2.4	<0.001*	77.9 ± 6.1	69.3 ± 5.3	0.001*	1.3 ± 0.5	2.2 ± 0.9	0.006*
6 Months	33.8 ± 1.2	28.8 ± 2.6	<0.001*	94.4 ± 3.6	79.3 ± 3.3	0.001*	1.0 ± 0.0	1.3 ± 0.5	0.028*

Data are presented as mean ± standard deviation (SD). P values were calculated using the independent-samples t-test. Statistical significance was set at $p < 0.05$ (*). UCLA, University of California, Los Angeles Shoulder Rating Scale; ASES, American Shoulder and Elbow Surgeons score; VAS, Visual Analogue Scale.