(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

Arthroscopic versus open repair for rotator cuff tears: comparison of functional scores and complication rates

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ABSTRACT :

Background: Rotator cuff tears are a common cause of shoulder pain and functional limitation. Surgical repair is indicated when symptoms persist despite conservative management. Arthroscopic repair has gained popularity due to minimal soft tissue disruption, while open repair remains widely practiced, particularly in complex tears. Comparative evidence regarding functional recovery and complication profiles in routine tertiary care practice continues to evolve. **Aim:** To compare arthroscopic versus open rotator cuff repair in terms of postoperative functional outcomes and complication rates in patients treated at a tertiary care hospital. **Materials and Methods:** A comparative observational study was conducted on 54 patients with clinically and radiologically confirmed rotator cuff tears who underwent surgical repair. Patients were allocated into two groups: arthroscopic repair (n = 27) and open repair (n = 27). Preoperative evaluation included clinical assessment and imaging, with baseline functional scores recorded. Functional outcomes were assessed using the Constant–Murley score and UCLA shoulder score, and pain was assessed using the Visual Analog Scale (VAS). Postoperative complications including infection, stiffness, re-tear, deltoid dysfunction, and overall complication rate were documented. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequencies and percentages. Group comparisons were performed using appropriate statistical tests, with $p < 0.05$ considered statistically significant. **Results:** Baseline demographic and preoperative parameters were comparable between groups (mean age: 52.41 ± 8.36 vs 54.18 ± 7.92 years; p = 0.38). Preoperative Constant–Murley (41.85 ± 6.92 vs 42.33 ± 7.14; p = 0.81), UCLA (14.96 ± 2.84 vs 15.22 ± 2.67; p = 0.72), and VAS pain scores (7.11 ± 0.89 vs 7.26 ± 0.94; p = 0.54) showed no significant difference. Postoperatively, the arthroscopic group achieved significantly better outcomes with higher Constant–Murley (82.74 ± 6.11 vs 76.92 ± 7.03; p = 0.002) and UCLA scores (31.48 ± 2.26 vs 28.63 ± 2.91; p = 0.001), and lower VAS pain scores (1.48 ± 0.64 vs 2.22 ± 0.71; p = 0.001). Overall complication rate was significantly lower after arthroscopic repair (14.81% vs 33.33%; p = 0.04). **Conclusion:** Arthroscopic rotator cuff repair resulted in superior functional recovery and greater pain reduction compared to open repair, with a significantly lower overall complication rate. Arthroscopic repair may be preferred in appropriately selected patients in a tertiary care setting.

Keywords: Rotator cuff tear; Arthroscopic repair; Open repair; Constant–Murley score; Complications

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This article may be cited as: Kumar R. Arthroscopic versus open repair for rotator cuff tears: comparison of functional scores and complication rates. J Adv Med Dent Scie Res 2014;2(4):328-333.

INTRODUCTION

Rotator cuff tears are among the most frequent causes of shoulder pain and functional limitation in adults, particularly in middle-aged and elderly populations. The burden of disease is amplified by age-related tendon degeneration, occupational overhead activity, and traumatic events, often leading to progressive pain, weakness, sleep disturbance, and restriction of daily activities. Population-based data demonstrate that a substantial proportion of individuals may harbor full-thickness tears even in the absence of symptoms, while symptomatic tears become increasingly common with advancing age, highlighting the clinical challenge of correlating imaging findings with functional impairment and treatment need.[1] Management of rotator cuff tears spans nonoperative measures—such as activity modification, analgesics, anti-inflammatory medication, physiotherapy, and selective injectionsto operative intervention when pain and disability persist despite conservative care. Contemporary guidance has emphasized tailoring treatment according to symptom severity, tear pattern, tissue quality, patient expectations, and functional demands, while acknowledging that the evidence base continues to evolve. At the same time, there remains ongoing debate regarding routine adjunct procedures, optimal rehabilitation progression, and the practical thresholds for recommending repair, especially in full-thickness tears and active individuals.[2] Surgical repair aims to restore tendon continuity, improve shoulder biomechanics, reduce pain, and enhance function. Historically, open repair was considered the standard technique, offering direct visualization and robust fixation options but requiring greater soft-tissue dissection with potential deltoid morbidity and postoperative pain. The development of mini-open approaches attempted to reduce deltoid trauma while maintaining secure repair, and the subsequent expansion of arthroscopic techniques has enabled comprehensive intra-articular and subacromial assessment, treatment of concomitant pathology, and repair through smaller portals. These evolving

surgical strategies have shifted the focus from merely achieving repair to optimizing patient-centered outcomes and minimizing morbidity.[3] Despite technical progress, the central question persists: does arthroscopic repair provide measurable clinical advantages over open (or mini-open) repair, particularly in functional recovery and complications? Earlier comparative evidence has been mixed. Meta-analytic evaluations of the available clinical trials up to the mid-2000s suggested broadly similar functional outcomes and complication profiles between arthroscopic and mini-open repairs, implying that the surgeon's ability to achieve a durable repair and deliver standardized rehabilitation may be more influential than incision size alone.[4] However, as arthroscopic instrumentation, suture-anchor constructs, and footprint restoration strategies have improved, many tertiary centers have increasingly favored arthroscopic repair, expecting reduced early pain, faster recovery, and fewer approach-related complications.Systematic reviews focusing specifically on arthroscopic versus open/mini-open repair have generally reported comparable medium-term functional scores and re-tear outcomes across techniques, though some studies indicate potential early pain benefits for arthroscopy. This is clinically relevant because early pain control can influence rehabilitation compliance, shoulder mobility, and patient satisfaction, which in turn may affect final functional scores. However, heterogeneity in tear size, chronicity, tendon quality, repair configuration, and rehabilitation protocols across published studies continues to limit definitive conclusions, reinforcing the need for well-characterized cohort comparisons within real-world hospital practice.[5] Complication profiles also remain an essential part of the comparison. Open approaches may carry higher risks related to soft-tissue disruption—such as deltoid dysfunction, wound problems, stiffness, and longer pain persistence—whereas arthroscopy introduces its own risks related to technical complexity, operative time, and learning curve. Nonetheless, randomized comparisons in small-to-medium tears have shown that arthroscopic repair can reduce immediate postoperative pain at least in the first days after surgery in some settings, while other early outcomes (range of motion, stiffness, and complications) may remain similar when rehabilitation is standardized. These nuances matter particularly in tertiary care systems where early discharge, rapid rehabilitation engagement, and complication avoidance are critical outcome targets.[6]

MATERIALS AND METHODS

This comparative observational study was conducted at a tertiary care hospital and included patients diagnosed with rotator cuff tears who underwent either arthroscopic repair or open repair. The study was designed to evaluate and compare functional outcomes and complication rates between the two surgical techniques under standardized perioperative and postoperative care protocols.A total of 54 patients with clinically and radiologically confirmed rotator cuff tears were enrolled in the study. Patients were divided into two groups based on the surgical technique performed: arthroscopic rotator cuff repair and open rotator cuff repair. The choice of surgical approach was determined by surgeon preference, tear characteristics, and patient-related factors.

Inclusion and Exclusion Criteria

Patients aged 18 years and above with full-thickness or high-grade partial-thickness rotator cuff tears were included. Only patients who underwent primary repair and completed postoperative follow-up assessments were considered. Exclusion criteria included revision rotator cuff surgery, associated fractures around the shoulder, advanced glenohumeral arthritis, inflammatory arthropathies, neurological disorders affecting shoulder function, and incomplete clinical records.

Methodology

All patients underwent detailed clinical evaluation, including history taking and physical examination focusing on pain, range of motion, muscle strength, and functional limitation. Radiological assessment included plain radiographs of the shoulder and magnetic resonance imaging to confirm the diagnosis, assess tear size, tendon retraction, muscle atrophy, and fatty infiltration. Baseline functional scores were recorded preoperatively for all patients.

Surgical Technique: Arthroscopic repair was performed using standard portal placement with the patient in beach-chair or lateral decubitus position. Tear configuration was assessed intraoperatively, and tendon repair was carried out using suture anchors with single-row or double-row techniques as appropriate. Open repair was performed through a deltoid-splitting or deltoid-detaching approach, allowing direct visualization of the tear and repair using transosseous sutures or suture anchors. All procedures were performed by experienced orthopedic surgeons following standard surgical protocols.

Postoperative Rehabilitation: All patients followed a standardized postoperative rehabilitation protocol. The operated shoulder was immobilized in an arm sling, followed by gradual progression from passive range-of-motion exercises to active-assisted and active exercises. Strengthening exercises were initiated once adequate healing was achieved. Rehabilitation protocols were comparable between both groups to minimize bias in functional outcomes.

Outcome Measures: Functional outcomes were assessed using validated shoulder scoring systems, including the Constant–Murley score and the University of California, Los Angeles (UCLA)

shoulder score. Pain levels, range of motion, and strength were evaluated during follow-up visits. Complications such as surgical site infection, shoulder stiffness, re-tear, deltoid dysfunction, neurovascular injury, and need for revision surgery were documented and compared between the two groups.

Statistical Analysis

Data were entered and analyzed using appropriate statistical software. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. Comparative analysis between arthroscopic and open repair groups was performed using appropriate statistical tests based on data distribution. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The demographic and preoperative characteristics of patients in both groups are summarized in Table 1. The mean age of patients in the arthroscopic repair group was 52.41 ± 8.36 years, while that of the open repair group was 54.18 ± 7.92 years, with no statistically significant difference between the groups (p = 0.38). Male patients constituted 59.26% of the arthroscopic group and 62.96% of the open repair group, whereas female patients accounted for 40.74% and 37.04% of the groups, respectively. This difference in gender distribution was not statistically significant (p = 0.78). Involvement of the dominant shoulder was observed in 66.67% of patients undergoing arthroscopic repair and 70.37% of those undergoing open repair, showing comparable distribution (p = 0.77). Full-thickness rotator cuff tears were present in 74.07% of patients in the arthroscopic group and 77.78% in the open repair group, while high-grade partial-thickness tears were seen in 25.93% and 22.22% of patients, respectively. The distribution of tear types did not differ significantly between the two groups (p = 0.75), indicating that both groups were comparable at baseline.

Preoperative functional assessment scores are shown in Table 2. The mean preoperative Constant–Murley score was 41.85 ± 6.92 in the arthroscopic repair group and 42.33 ± 7.14 in the open repair group, with no statistically significant difference (p = 0.81). Similarly, the mean UCLA shoulder score was 14.96 ± 2.84 in the arthroscopic group and 15.22 ± 2.67 in the open group (p = 0.72). Preoperative pain assessment using the Visual Analog Scale revealed mean scores of 7.11 ± 0.89 and 7.26 ± 0.94 in the arthroscopic and open repair groups, respectively, which were also statistically comparable (p = 0.54).

Postoperative functional outcomes are presented in Table 3. Patients who underwent arthroscopic repair demonstrated significantly better functional outcomes compared to those who underwent open repair. The mean postoperative Constant–Murley score was 82.74 ± 6.11 in the arthroscopic group compared to 76.92 ± 7.03 in the open repair group, and this difference was statistically significant (p = 0.002). The mean postoperative UCLA shoulder score was also higher in the arthroscopic group (31.48 ± 2.26) than in the open repair group (28.63 ± 2.91), with a statistically significant difference (p = 0.001). Postoperative pain, as measured by the Visual Analog Scale, was significantly lower in the arthroscopic group (1.48 ± 0.64) compared to the open repair group (2.22 ± 0.71) (p = 0.001).

The magnitude of improvement in functional scores from the preoperative to postoperative period is detailed in Table 4. The arthroscopic repair group showed a mean improvement of 40.89 ± 7.04 points in the Constant–Murley score, whereas the open repair group demonstrated a mean improvement of 34.59 ± 6.88 points; this difference was statistically significant (p = 0.003). Similarly, improvement in the UCLA shoulder score was significantly greater in the arthroscopic group (16.52 ± 3.01) compared to the open repair group (13.41 ± 2.84) (p = 0.002). Reduction in pain scores, as assessed by the Visual Analog Scale, was also more pronounced in the arthroscopic group, with a mean reduction of 5.63 ± 0.91 compared to 5.04 ± 1.02 in the open repair group, and this difference was statistically significant (p = 0.02).

Postoperative complications in both groups are summarized in Table 5. Surgical site infection was observed in 3.70% of patients in the arthroscopic repair group and 11.11% of patients in the open repair group; however, this difference was not statistically significant (p = 0.29). Shoulder stiffness occurred in 7.41% of patients following arthroscopic repair and 18.52% of patients following open repair (p = 0.22). Re-tear rates were low in both groups, occurring in 3.70% of arthroscopic repairs and 7.41% of open repairs (p = 0.55). Deltoid dysfunction was observed only in the open repair group, affecting 7.41% of patients, whereas no cases were reported in the arthroscopic group; this difference did not reach statistical significance (p = 0.15). Overall, the incidence of any postoperative complication was significantly lower in the arthroscopic repair group (14.81%) compared to the open repair group (33.33%), and this difference was statistically significant (p = 0.04).

Table 1. Demographic and Preoperative Characteristics of the Study Population

Variable	Arthroscopic Repair (n = 27)	Open Repair (n = 27)	p-value
Mean age (years)	52.41 ± 8.36	54.18 ± 7.92	0.38
Male patients	16 (59.26%)	17 (62.96%)	0.78
Female patients	11 (40.74%)	10 (37.04%)	0.78
Dominant shoulder involved	18 (66.67%)	19 (70.37%)	0.77
Full-thickness tear	20 (74.07%)	21 (77.78%)	0.75
High-grade partial tear	7 (25.93%)	6 (22.22%)	0.75

Table 2. Comparison of Preoperative Functional Scores

Functional Score	Arthroscopic Repair (Mean ± SD)	Open Repair (Mean ± SD)	p-value
Constant–Murley score	41.85 ± 6.92	42.33 ± 7.14	0.81
UCLA shoulder score	14.96 ± 2.84	15.22 ± 2.67	0.72
Visual Analog Scale (pain)	7.11 ± 0.89	7.26 ± 0.94	0.54

Table 3. Comparison of Postoperative Functional Outcomes

Functional Score	Arthroscopic Repair (Mean ± SD)	Open Repair (Mean ± SD)	p-value
Constant–Murley score	82.74 ± 6.11	76.92 ± 7.03	**0.002**
UCLA shoulder score	31.48 ± 2.26	28.63 ± 2.91	**0.001**
Visual Analog Scale (pain)	1.48 ± 0.64	2.22 ± 0.71	**0.001**

Table 4. Improvement in Functional Scores from Preoperative to Postoperative Period

Parameter	Arthroscopic Repair	Open Repair	p-value
Mean improvement in Constant score	40.89 ± 7.04	34.59 ± 6.88	**0.003**
Mean improvement in UCLA score	16.52 ± 3.01	13.41 ± 2.84	**0.002**
Mean reduction in VAS pain score	5.63 ± 0.91	5.04 ± 1.02	**0.02**

Table 5. Comparison of Postoperative Complications

Complication	Arthroscopic Repair (n = 27)	Open Repair (n = 27)	p-value
Surgical site infection	1 (3.70%)	3 (11.11%)	0.29
Shoulder stiffness	2 (7.41%)	5 (18.52%)	0.22
Re-tear	1 (3.70%)	2 (7.41%)	0.55
Deltoid dysfunction	0 (0.00%)	2 (7.41%)	0.15
Any complication	4 (14.81%)	9 (33.33%)	**0.04**

DISCUSSION

The present study demonstrated that both treatment arms were well matched at baseline, minimizing selection bias in outcome comparison. Patients undergoing arthroscopic repair (mean age 52.41 ± 8.36 years; 59.26% male) and open repair (54.18 ± 7.92 years; 62.96% male) showed no significant differences in age, sex distribution, dominant side involvement (66.67% vs 70.37%), or tear type (full-thickness: 74.07% vs 77.78%), indicating a comparable starting point for functional recovery analysis. A similar baseline equivalence between arthroscopic and open cohorts has been reported by Ide et al (2005), where preoperative characteristics and scores did not significantly differ, supporting the validity of direct technique comparison.[7]

Preoperative functional disability and pain severity were comparable between groups in our series, with Constant–Murley scores of 41.85 ± 6.92 (arthroscopic) and 42.33 ± 7.14 (open), UCLA scores of 14.96 ± 2.84 and 15.22 ± 2.67, and high pain burden on VAS (7.11 ± 0.89 vs 7.26 ± 0.94). This mirrors the observation of comparable preoperative pain intensity between open and arthroscopic cohorts described by Buess et al (2005), where groups were similar preoperatively, allowing postoperative pain and function differences to be attributed more plausibly to surgical approach rather than baseline imbalance.[8]

In our study, postoperative function was significantly superior after arthroscopic repair, with Constant–Murley scores reaching 82.74 ± 6.11 versus 76.92 ± 7.03 ($p = 0.002$) and UCLA scores improving to 31.48 ± 2.26 versus 28.63 ± 2.91 ($p = 0.001$). These findings contrast with Osti et al (2009), who reported that final UCLA outcomes were not significantly different between arthroscopic and mini-open repairs in tears <3 cm (approximately 31 vs 32 at follow-up), suggesting that the magnitude of arthroscopic advantage in our cohort may reflect differences in tear patterns, rehabilitation response, or perioperative tissue morbidity between open and minimally invasive techniques.[9]

Postoperative pain reduction was marked in both groups but remained significantly better after arthroscopic repair in our series (VAS 1.48 ± 0.64 vs 2.22 ± 0.71; $p = 0.001$), consistent with the concept that less soft-tissue disruption contributes to earlier

pain relief. Van der Zwaal et al (2013) similarly found that although overall 1-year outcomes did not differ significantly between all-arthroscopic and mini-open techniques, the arthroscopic group experienced significantly earlier improvement at short-term follow-up (notably 6 weeks) in pain-related measures and functional recovery, aligning with our observation of superior pain status in the arthroscopic arm at final assessment.[10]

When analyzing the magnitude of recovery, arthroscopic repair in our cohort produced greater mean improvement in Constant score (40.89 ± 7.04 vs 34.59 ± 6.88; p = 0.003) and UCLA score (16.52 ± 3.01 vs 13.41 ± 2.84; p = 0.002), along with a greater reduction in pain (VAS decrease 5.63 ± 0.91 vs 5.04 ± 1.02; p = 0.02). Sauerbrey et al (2005) also demonstrated substantial within-group improvements for both arthroscopic and mini-open repairs using a modified ASES framework (arthroscopic total approximately 42 to 86; mini-open 52 to 89), but without a significant difference in total score between techniques—suggesting that while both approaches reliably improve outcomes, our data indicate that arthroscopy may yield a larger functional and pain delta within comparable baseline severity.[11]

Youm et al (2005) reported good-to-excellent UCLA outcomes in 96.40% overall (95.20% arthroscopic vs 97.60% mini-open) and near-equivalent ASES scores (91.1 vs 90.2), concluding comparable satisfaction and clinical performance at ≥2 years. In contrast, our cohort showed a clear between-group separation in postoperative UCLA (31.48 vs 28.63) and pain (1.48 vs 2.22), implying that in certain clinical settings—such as tertiary care practice with standardized protocols—arthroscopy may translate into measurably better functional endpoints even when both techniques succeed clinically.[12]

Regarding complications, our study observed lower overall complication burden in arthroscopy (any complication 14.81%) than open repair (33.33%), with stiffness more frequent after open repair (18.52% vs 7.41%). These findings are directionally supported by Severud et al (2003), who found comparable final functional outcomes between all-arthroscopic and mini-open repairs but reported fibrous ankylosis in 14% of the mini-open group and none in the arthroscopic group, suggesting that increased surgical exposure and deltoid handling in open/mini-open approaches may predispose to postoperative shoulder stiffness and capsular problems.[13]

Structural integrity and re-tear patterns are important when interpreting functional superiority. In our cohort, clinically recorded re-tear rates were low (3.70% arthroscopic vs 7.41% open), though imaging-based healing was not emphasized in the presented results. Bishop et al (2006) highlighted that while clinical outcomes may be similar, repair integrity can diverge by technique and tear size: intact repairs were 69% in open versus 53% in arthroscopic overall, with small tears showing similar integrity (74% open vs 84% arthroscopic) but large tears demonstrating substantially lower integrity after arthroscopy (24% arthroscopic vs 62% open; p < 0.036). This underscores that the functional advantage seen in our arthroscopic group should be interpreted alongside tear size distribution and reinforces the value of imaging follow-up when comparing techniques.[14]

Finally, our observed profile of fewer overall complications with arthroscopy (14.81% vs 33.33%) and lower deltoid morbidity (0.00% vs 7.41% deltoid dysfunction in open repair) supports the rationale for minimally invasive repair in reducing approach-related soft-tissue injury. Verma et al (2006) reported comparable clinical outcomes between all-arthroscopic and mini-open repairs and similar rates of recurrent defects on ultrasound (24% vs 27%), noting that larger initial tears carried higher risk of persistent defects; importantly, they also observed that defect persistence did not necessarily correlate with worse pain or patient-reported outcome scores. In the context of our results—showing better pain and function with arthroscopy despite low clinically recorded re-tears—this supports the interpretation that arthroscopic repair may optimize patient-centered outcomes even when structural integrity differences exist across studies, while open repair may still remain relevant for selected large tears where healing integrity is prioritized.[15]

CONCLUSION

Arthroscopic rotator cuff repair produced significantly better postoperative functional outcomes than open repair, with higher Constant–Murley (82.74 ± 6.11 vs 76.92 ± 7.03) and UCLA scores (31.48 ± 2.26 vs 28.63 ± 2.91), along with lower pain scores (VAS 1.48 ± 0.64 vs 2.22 ± 0.71). The arthroscopic group also demonstrated greater overall improvement in functional scores and pain reduction from baseline. Although individual complications were not significantly different, the overall complication rate was significantly lower after arthroscopic repair (14.81% vs 33.33%). These findings support arthroscopic repair as a preferable technique in appropriately selected patients at a tertiary care hospital setting.

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