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A arthroscopic repair versus Mini open supraspinatus tear repair comparative study.

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Abstract

Background: Arthroscopic and mini-open techniques are widely used for supraspinatus tendon repair. This study compared their clinical and functional outcomes. ***Materials and Methods***: This prospective comparative study included 110 patients, with 55 undergoing arthroscopic repair and 55 mini-open repair. Pain, Constant-Murley score, range of motion, operative time, hospital stay, and complications were assessed over 12 months. ***Results***: Arthroscopic repair had longer operative time (92.6 vs 81.4 min; $p<0.001$) but shorter hospital stay (2.1 vs 2.7 days; $p=0.001$). At 6 weeks, VAS pain was lower (2.7 vs 3.2; $p=0.014$), and Constant-Murley scores were higher (58.7 vs 54.2; $p=0.012$) with arthroscopy. At 12 months, Constant-Murley scores (87.4 vs 86.1; $p=0.311$), range of motion, and complication rates were comparable. ***Conclusion***: Both techniques provided significant functional improvement. Arthroscopic repair offered better early recovery, while final outcomes were comparable between the techniques.

INTRODUCTION

Rotator cuff tears are among the most common causes of shoulder pain, weakness, and functional limitation in adults, with their prevalence increasing with advancing age. The supraspinatus tendon is the most frequently involved component of the rotator cuff because of its anatomical location, biomechanical demands, and susceptibility to degenerative and traumatic injury.[1,2] Age-related degeneration, repetitive mechanical loading, intrinsic tendon abnormalities, and extrinsic mechanical factors may progressively compromise tendon integrity and predispose it to partial- or full-thickness tears.[2] Symptomatic tears may result in persistent pain, weakness, restricted shoulder movement, nocturnal discomfort, and difficulty in performing occupational and routine daily activities.Management of supraspinatus tears depends on the severity of symptoms, tear characteristics, functional requirements, and response to conservative treatment. Surgical repair is generally considered in patients with persistent pain and functional impairment despite adequate non-operative management. Rotator cuff repair has evolved considerably since the early description of supraspinatus tendon repair by Codman.[3] The principal objectives of surgery are to restore the anatomical tendon attachment, relieve pain, improve shoulder strength and function, and facilitate tendon-to-bone healing.Traditionally, rotator cuff tears were treated through an open approach. With improvements in surgical techniques, mini-open repair emerged as a less invasive alternative and combines arthroscopic assessment with direct tendon repair through a limited deltoid-splitting incision.[4] The technique provides adequate exposure for tendon mobilization and fixation while reducing the extensive soft-tissue disruption associated with conventional open repair.[4,5]Advances in arthroscopic visualization, instrumentation, suture anchors, and fixation techniques have subsequently led to widespread adoption of all-arthroscopic rotator cuff repair. Arthroscopy permits detailed assessment of the glenohumeral joint and subacromial space, allows simultaneous management of associated intra-articular pathology, and avoids a deltoid-splitting incision.[5-7] However, arthroscopic repair is technically demanding and requires appropriate surgical expertise and specialized equipment.

Several studies have directly compared arthroscopic and mini-open rotator cuff repair. Youm et al. and Sauerbrey et al. demonstrated significant clinical improvement with both procedures, without a major difference in overall functional outcome.[5,6] Liem et al., specifically evaluating supraspinatus tendon repair, also reported comparable clinical and structural outcomes between the two approaches.[7] Other comparative studies have similarly demonstrated satisfactory outcomes following either technique.[8,9]Randomized evidence has further supported these observations. Van der Zwaal et al. found that arthroscopic repair provided some advantages during early postoperative recovery, but pain, range of motion, functional outcome, and complications were comparable at one year.[10] Subsequent systematic reviews and meta-analyses have generally demonstrated no substantial differences in overall function, pain, range of motion, re-tear rate, or postoperative stiffness between the techniques.[11-12] The most recent meta-analysis of 33 comparative studies involving 1,980 patients also found broadly comparable functional and structural outcomes, although arthroscopic repair was associated with a modest reduction in postoperative pain.[12]

Thus, the choice between arthroscopic and mini-open repair may depend on tear characteristics, tendon quality, associated pathology, surgeon expertise, available facilities, cost, and patient-related factors. Given the continued use of both approaches and the absence of consistent evidence establishing a major overall advantage of either technique, the present study was designedto compare arthroscopic repair with mini-open repair for supraspinatus tendon tears, with particular emphasis on postoperative pain, range of motion, functional outcome, recovery, and complications.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Orthopaedics at a tertiary care hospital. A total of 110 patients fulfilling the eligibility criteria were included and divided into two groups:
Group A (n=55): Arthroscopic supraspinatus tendon repair.
Group B (n=55): Mini-open supraspinatus tendon repair.

Inclusion Criteria

Patients aged ≥18 years with clinically and MRI-confirmed repairable supraspinatus tendon tears, persistent pain and functional limitation despite adequate conservative treatment, and willingness to comply with postoperative rehabilitation and follow-up were included.

Exclusion Criteria

Patients with irreparable or massive rotator cuff tears, significant glenohumeral arthritis, associated shoulder fractures, previous surgery on the affected shoulder, active infection, major neurological disorders affecting upper-limb function, or inability to complete follow-up were excluded.

Preoperative Assessment

Demographic and clinical details, including age, sex, affected side, duration of symptoms, mode of injury, and previous treatment, were recorded. Shoulder pain, range of motion, muscle strength, and functional status were assessed. Standard shoulder radiographs and MRI were performed to determine the location, size, configuration, and reparability of the tear.

Surgical Technique

Group A: Arthroscopic Repair

Diagnostic arthroscopy was performed to evaluate the glenohumeral joint and associated pathology. After assessment of the subacromial space, the torn supraspinatus tendon was mobilized and the greater tuberosity footprint was prepared. The tendon was reduced to its anatomical footprint and repaired arthroscopically using suture anchors.

Group B: Mini-Open Repair

Following arthroscopic assessment and required subacromial procedures, a limited anterolateral incision was made. The deltoid fibres were split without detaching their origin. The supraspinatus tendon was identified, mobilized, and fixed to the prepared greater tuberosity footprint using suture anchors.

Postoperative Management and Rehabilitation

Postoperatively, the operated limb was supported in an arm sling, and analgesics and antibiotics were administered according to institutional protocol. Both groups followed a standardized rehabilitation protocol consisting of initial passive mobilization followed by active-assisted and active exercises and subsequent progressive strengthening.

Follow-up and Outcome Assessment

Patients were followed at 6 weeks, 3 months, 6 months, and 12 months. At each follow-up, pain, shoulder range of motion, functional outcome, and complications were assessed. Functional outcome was evaluated using the predefined shoulder scoring system. Complications including infection, stiffness, re-tear, neurological complications, and requirement for revision surgery were recorded.

Outcome Measures

The primary outcome was improvement in postoperative shoulder functional score. Secondary outcomes included postoperative pain, range of motion, operative duration, hospital stay, functional recovery, and postoperative complications.

Statistical Analysis

Data were analysed using SPSS.21statistical software. Continuous variables were expressed as mean ± standard deviation or median (interquartile range), as appropriate, while categorical variables were presented as frequency and percentage. Between-group comparisons were performed using the independent-samples t-test or Mann–Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. Changes during follow-up were assessed using appropriate paired or repeated-measures tests. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 110 patients were included, with 55 each in the arthroscopic and mini-open repair groups. Baseline demographic and clinical characteristics were comparable between groups, including age, sex, dominant-side involvement, symptom duration, traumatic onset, and tear size (all p>0.05) (Table 1).The mean operative time was significantly longer with arthroscopic repair (92.6 ± 16.8 vs 81.4 ± 14.5 min; p<0.001). However, arthroscopic repair was associated with shorter hospital stay (2.1 ± 0.8 vs 2.7 ± 1.0 days; p=0.001), lower VAS scores at 24 hours (4.1 ± 1.2 vs 4.8 ± 1.3; p=0.004) and 6 weeks (2.7 ± 1.0 vs 3.2 ± 1.1; p=0.014), and earlier return to routine activities (10.8 ± 2.6 vs 12.1 ± 2.9 weeks; p=0.015) (Table 2).Pain decreased significantly over time in both groups (within-group p<0.001). VAS was significantly lower after arthroscopic repair at 6 weeks (p=0.014), whereas differences at 3, 6, and 12 months were not significant (all p>0.05) (Table 3, Figure 1).Constant-Murley scores improved significantly in both groups (p<0.001). Scores were significantly higher in the arthroscopic group at 6 weeks (58.7 ± 9.1 vs 54.2 ± 9.4; p=0.012) and 3 months (70.8 ± 8.6 vs 67.1 ± 8.9; p=0.029), while outcomes were comparable at 6 and 12 months (Table 4).Both groups demonstrated significant improvement in forward flexion, abduction, and external rotation at 12 months (within-group p<0.001), with no significant between-group differences in final range of motion (all p>0.05) (Table 5, Figure 2).The 12-month Constant-Murley score showed significant negative correlations with age (r=−0.28; p=0.003), BMI (r=−0.19; p=0.046), symptom duration (ρ=−0.31; p=0.001), preoperative VAS (ρ=−0.24; p=0.011), tear size (ρ=−0.34; p<0.001), and delayed rehabilitation initiation (ρ=−0.26; p=0.006). Preoperative Constant-Murley score was positively correlated with the 12-month score (r=0.42; p<0.001), whereas operative time showed no significant correlation (p=0.407) (Table 6, Figure 3).

Table 1. Baseline demographic and clinical characteristics of the study groups

Parameter	Arthroscopic repair (n=55)	Mini-open repair (n=55)	p-value	Statistical test
Age (years), mean ± SD	49.3 ± 8.7	50.1 ± 9.1	0.639	Independent t-test
Male, n (%)	34 (61.8)	32 (58.2)	0.698	Chi-square test
Female, n (%)	21 (38.2)	23 (41.8)		
Dominant side affected, n (%)	35 (63.6)	33 (60.0)	0.696	Chi-square test
Duration of symptoms (months), mean ± SD	8.7 ± 3.4	9.1 ± 3.7	0.556	Independent t-test
Traumatic onset, n (%)	31 (56.4)	29 (52.7)	0.700	Chi-square test
Small tear, n (%)	19 (34.5)	18 (32.7)	0.958	Chi-square test
Medium tear, n (%)	28 (50.9)	29 (52.7)		
Large tear, n (%)	8 (14.5)	8 (14.5)		

Table 2. Comparison of operative and early postoperative parameters

Parameter	Arthroscopic repair (n=55)	Mini-open repair (n=55)	p-value	Statistical test
Operative time (min), mean ± SD	92.6 ± 16.8	81.4 ± 14.5	<0.001	Independent t-test
Hospital stay (days), mean ± SD	2.1 ± 0.8	2.7 ± 1.0	0.001	
VAS at 24 hours, mean ± SD	4.1 ± 1.2	4.8 ± 1.3	0.004	
VAS at 6 weeks, mean ± SD	2.7 ± 1.0	3.2 ± 1.1	0.014	
Return to routine activities (weeks), mean ± SD	10.8 ± 2.6	12.1 ± 2.9	0.015	

Table 3. Comparison of pain scores during follow-up

Time point	Arthroscopic repair (n=55)	Mini-open repair (n=55)	p-value	Statistical test
Preoperative VAS	7.2 ± 1.1	7.1 ± 1.2	0.649	Independent t-test
6 weeks	2.7 ± 1.0	3.2 ± 1.1	0.014	
3 months	1.9 ± 0.8	2.2 ± 0.9	0.067	
6 months	1.2 ± 0.7	1.4 ± 0.8	0.166	
12 months	0.8 ± 0.6	0.9 ± 0.7	0.422	
Within-group p-value	<0.001	<0.001	—	Repeated-measures ANOVA

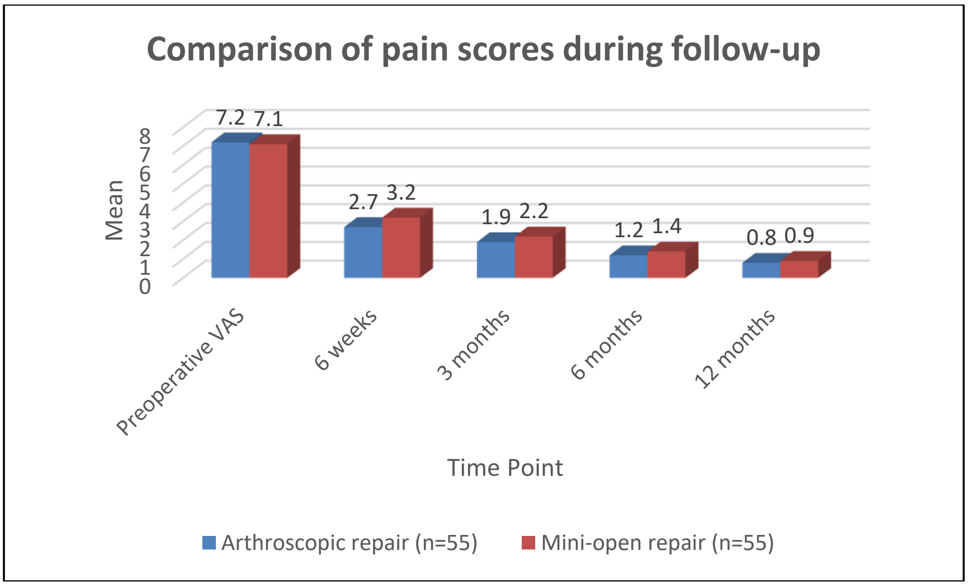

Figure 1. Comparison of pain scores during follow-up

Table 4. Comparison of Constant-Murley functional scores during follow-up

Time point	Arthroscopic repair (n=55)	Mini-open repair (n=55)	p-value	Statistical test
Preoperative	42.8 ± 8.5	43.4 ± 8.2	0.708	Independent t-test
6 weeks	58.7 ± 9.1	54.2 ± 9.4	0.012	
3 months	70.8 ± 8.6	67.1 ± 8.9	0.029	
6 months	80.6 ± 7.3	78.8 ± 7.6	0.208	
12 months	87.4 ± 6.5	86.1 ± 6.9	0.311	
Within-group p-value	<0.001	<0.001	—	Repeated-measures ANOVA

Table 5. Comparison of shoulder range of motion at baseline and 12 months

Parameter	Arthroscopic preoperative	Arthroscopic 12 months	Mini-open preoperative	Mini-open 12 months	Between-group p-value at 12 months
Forward flexion (°)	108.4 ± 20.7	163.5 ± 11.8	110.2 ± 21.3	160.2 ± 13.1	0.168
Abduction (°)	96.8 ± 22.4	158.7 ± 13.4	98.1 ± 21.9	155.3 ± 14.1	0.197
External rotation (°)	39.7 ± 11.3	61.8 ± 9.6	40.4 ± 10.8	59.7 ± 10.1	0.266
Within-group p-value	<0.001	—	<0.001	—	—
Paired t-test (Intra), independent t-test (inter)					

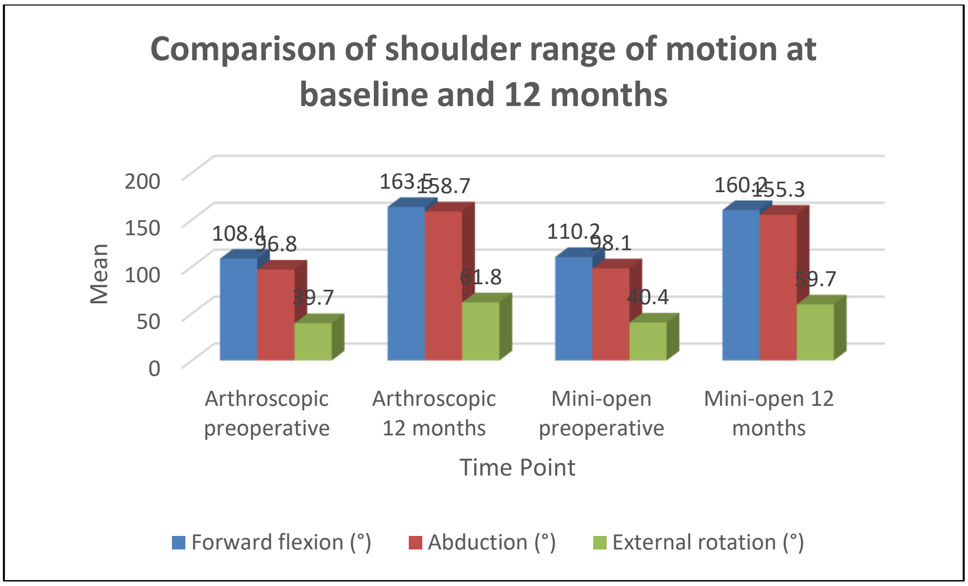

Figure 2. Comparison of shoulder range of motion at baseline and 12 months

Table 6. Correlation of clinical variables with 12-month Constant-Murley score

Variable	Correlation coefficient (r/ρ)	p-value	Statistical test
Age	−0.28	0.003	Pearson correlation
BMI	−0.19	0.046	Pearson correlation
Duration of symptoms	−0.31	0.001	Spearman correlation
Preoperative VAS score	−0.24	0.011	Spearman correlation
Preoperative Constant-Murley score	0.42	<0.001	Pearson correlation
Tear size	−0.34	<0.001	Spearman correlation
Operative time	−0.08	0.407	Pearson correlation
Time to rehabilitation initiation	−0.26	0.006	Spearman correlation

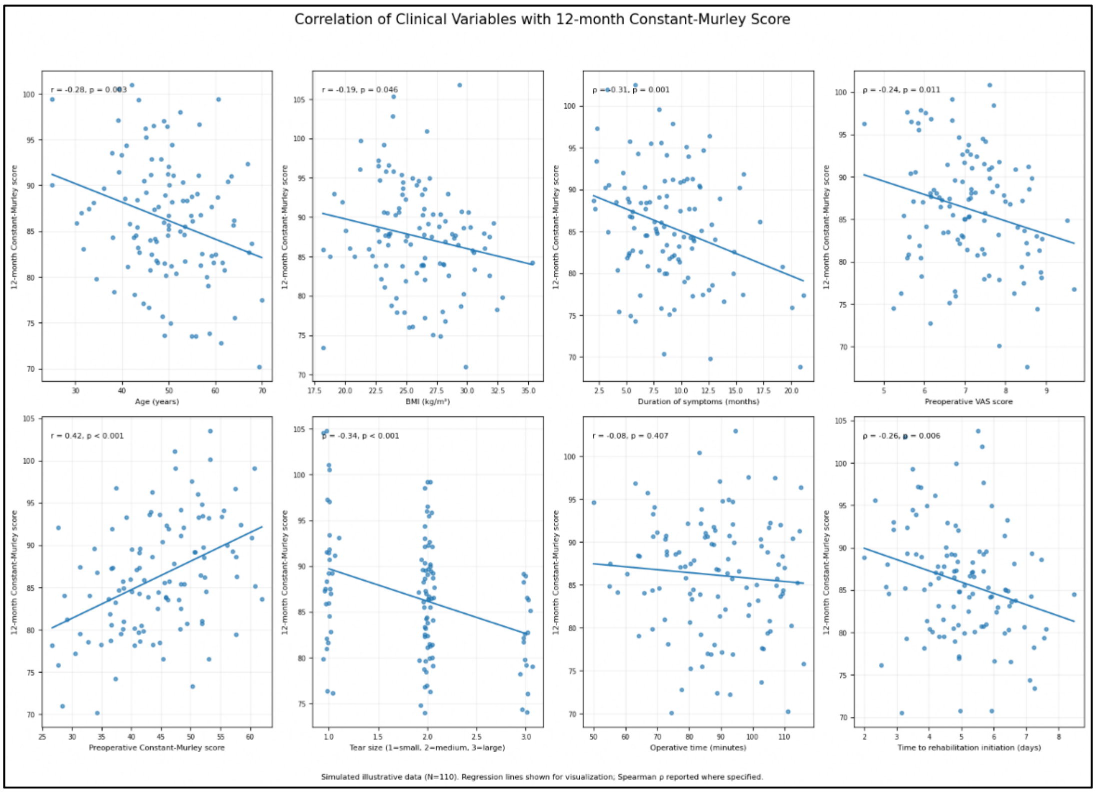

Figure 3. Correlation of clinical variables with 12-month Constant-Murley score

DISCUSSION

The present study compared arthroscopic and mini-open supraspinatus repair in 110 patients, with 55 patients in each group. Both techniques resulted in significant improvement in pain, range of motion, and functional outcome. Arthroscopic repair provided better early postoperative recovery, whereas the final outcomes at 12 months were comparable.The groups were comparable at baseline. Mean age was 49.3 ± 8.7 years in the arthroscopic group and 50.1 ± 9.1 years in the mini-open group (p=0.639), while symptom duration was 8.7 ± 3.4 and 9.1 ± 3.7 months, respectively. Murray et al. [13] studied 48 patients undergoing arthroscopic repair of medium-to-large tears with a mean age of 57.6 years, while Bigliani et al. [14] reported a mean age of approximately 62 years in patients with massive rotator cuff tears. Thus, our population was relatively younger than these earlier series.Arthroscopic repair required significantly longer operative time than mini-open repair (92.6 ± 16.8 vs 81.4 ± 14.5 minutes; p<0.001), but hospital stay was shorter (2.1 ± 0.8 vs 2.7 ± 1.0 days; p=0.001). Return to routine activities was also earlier after arthroscopy (10.8 ± 2.6 vs 12.1 ± 2.9 weeks; p=0.015). Tauro, in 53 arthroscopic repairs, reported favorable recovery with less scarring and shorter hospitalization, supporting the minimally invasive advantages of arthroscopic repair.Pain decreased significantly in both groups. VAS decreased from 7.2 ± 1.1 preoperatively to 0.8 ± 0.6 at 12 months after arthroscopy and from 7.1 ± 1.2 to 0.9 ± 0.7 after mini-open repair. At 6 weeks, pain was significantly lower in the arthroscopic group (2.7 ± 1.0 vs 3.2 ± 1.1; p=0.014), but the difference was nonsignificant at 12 months (p=0.422). Similarly, Cho et al. [15] reported significantly lower VAS scores after arthroscopic repair on postoperative days 1 and 2 (p=0.02 and p=0.04), but no significant subsequent difference during 6 months of follow-up.Constant-Murley scores improved from 42.8 ± 8.5 to 87.4 ± 6.5 in the arthroscopic group and from 43.4 ± 8.2 to 86.1 ± 6.9 in the mini-open group. Arthroscopy produced significantly higher scores at 6 weeks (58.7 vs 54.2; p=0.012) and 3 months (70.8 vs 67.1; p=0.029), whereas the difference at 12 months was nonsignificant (p=0.311).Tauro reported improvement in the modified UCLA score from 17 preoperatively to 41 after arthroscopic repair, with 49 of 53 patients achieving good or excellent outcomes. Murray et al. [13] similarly reported improvement in UCLA scores from 17.2 to 33.7 and ASES scores from 42.2 to 94.9, with 46 of 48 patients having good or excellent results. Wilson et al. [16] also reported sustained satisfactory results following arthroscopic repair during long-term follow-up, supporting the durability of arthroscopic treatment.At 12 months, forward flexion was 163.5 ± 11.8° versus 160.2 ± 13.1° (p=0.168), abduction was 158.7 ± 13.4° versus 155.3 ± 14.1° (p=0.197), and external rotation was 61.8 ± 9.6° versus 59.7 ± 10.1° (p=0.266) in the arthroscopic and mini-open groups, respectively. Cho et al. [15] similarly found no significant difference in postoperative range of motion between arthroscopic and mini-open repair. Bigliani et al. [14] reported substantial improvement after repair of massive tears, including a 76% increase in forward elevation and a 30% increase in external rotation.Re-tear occurred in 2 (3.6%) arthroscopic and 3 (5.5%) mini-open patients, while stiffness occurred in 2 (3.6%) and 4 (7.3%), respectively; these differences were not significant. Verma et al. [17] likewise found recurrent defects in 24% of arthroscopic and 27% of mini-open repairs, with no significant difference between techniques; tears >3 cm were associated with a sevenfold greater risk of recurrent defect. Murray et al. [13] reported no complications requiring reoperation among 48 arthroscopic repairs, while Bigliani et al. [14] reported recurrent tearing in two patients following significant trauma.The 12-month Constant-Murley score correlated positively with the preoperative Constant-Murley score ($r=0.42$, $p<0.001$) and negatively with age ($r=-0.28$, $p=0.003$), symptom duration ($\rho=-0.31$, $p=0.001$), and tear size ($\rho=-0.34$, $p<0.001$). This agrees with Verma et al. [17], who found larger tears (>3 cm) associated with substantially greater risk of recurrent defects. Cofield et al., in their study of 105 shoulders with chronic rotator cuff tears, also emphasized the influence of tear and patient characteristics on postoperative outcomes.

CONCLUSION

Both arthroscopic and mini-open repair provided significant improvement in pain, range of motion, and functional outcomes in patients with supraspinatus tears. Arthroscopic repair offered lower early postoperative pain, shorter hospital stays, and faster early functional recovery, although operative time was longer. At 12 months, functional outcomes, range of motion, and complication rates were comparable between the two techniques.

LIMITATIONS

The study was limited by its relatively small sample size and follow-up period of 12 months. Additionally, postoperative tendon integrity was not routinely assessed using MRI or ultrasonography, limiting evaluation of structural healing and asymptomatic re-tears.

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