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Comparative Evaluation of Early Functional Recovery and Return to Activity Following Mini-Open Versus Arthroscopic Supraspinatus Repair

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KEYWORDS

Supraspinatus repair, rotator cuff tear, arthroscopic surgery, mini-open surgery,early recovery, return to activity

ABSTRACT:

Background: Supraspinatus tendon tears represent a significant subset of rotator cuff injuries, often necessitating surgical repair when conservative treatment fails. Two commonly employed techniques—arthroscopic and mini-open repairs—offer distinct advantages. This study aimed to compare the short-term functional outcomes and return to activity following these two surgical methods.

Methods: A prospective, comparative study was conducted on 60 patients with isolated full-thickness supraspinatus tears treated either with mini-open (n=30) or arthroscopic repair (n=30). All patients were assessed preoperatively and postoperatively at 6 weeks, 3 months, and 6 months using the Visual Analog Scale (VAS), American Shoulder and Elbow Surgeons (ASES) Score, Constant-Murley Score, range of motion (ROM), and time to return to activity. Statistical analysis was performed using independent t-tests with a significance threshold of $p<0.05$.

Results: Both groups showed statistically significant improvements in pain scores and functional outcomes over time. The arthroscopic group demonstrated superior early outcomes, including lower VAS scores ($p=0.03$ at 6 weeks, $p=0.01$ at 3 months) and higher ASES scores ($p=0.02$ at 6 weeks, $p=0.04$ at 3 months). At 6 months, there was no significant difference in ROM or final scores between groups. The mean time to return to activity was significantly shorter in the arthroscopic group (13.4 ± 1.9 weeks) compared to the mini-open group (15.2 ± 2.4 weeks; $p=0.01$).

Conclusion: Both arthroscopic and mini-open techniques effectively restore shoulder function and relieve pain in patients with supraspinatus tears. However, arthroscopic repair offers faster early recovery and quicker return to activity, making it a preferable option for patients seeking minimal downtime. Mini-open repair remains a viable alternative with similar long-term results.

INTRODUCTION

Rotator cuff tears, particularly involving the supraspinatus tendon, are a prevalent source of shoulder pain and dysfunction, notably in elderly individuals and those engaged in repetitive overhead activities[1]. The supraspinatus tendon's unique anatomical orientation and relative hypovascularity render it especially susceptible to both degenerative and traumatic injuries[2]. When conservative management fails, surgical repair remains the standard of care to restore function and alleviate symptoms[3].

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Two widely accepted techniques for supraspinatus repair include the arthroscopic and the mini-open approaches. Arthroscopic repair, a minimally invasive method, provides enhanced intra-articular visualization, reduced soft tissue disruption, and potentially decreased postoperative morbidity[4]. In contrast, the mini-open technique merges the benefits of open tendon repair with limited surgical trauma, allowing for direct visualization and suture placement without extensive deltoid detachment[5].

Although several studies have compared these surgical modalities, there is ongoing debate regarding which technique yields superior outcomes, particularly in terms of early functional recovery and return to activity[6]. This study aims to conduct a short-term comparative analysis of mini-open versus arthroscopic supraspinatus repair, focusing on parameters such as pain, functional scores, range of motion (ROM), and time to resume activities.

MATERIALS AND METHODS

Study Design

This was a prospective, comparative study conducted at a tertiary care orthopedic center between January 2023 and December 2024. A total of 60 patients diagnosed with isolated full-thickness supraspinatus tears were enrolled and divided into two groups based on the surgical approach:
- Group A (Mini-open repair): 30 patients

- Group B (Arthroscopic repair): 30 patients

The study was approved by the Institutional Ethics Committee, and informed consent was obtained from all participants.

Inclusion Criteria

Patients aged 30–65 years

Diagnosed with isolated full-thickness supraspinatus tear confirmed by MRI

Duration of symptoms >3 months

Failure of at least 6 weeks of conservative treatment

Exclusion Criteria

Partial-thickness tears

Massive cuff tears involving multiple tendons

Glenohumeral arthritis

Revision rotator cuff surgery

Neurological disorders affecting the upper limb

Surgical Techniques

Mini-Open Repair: A 4–6 cm incision was made lateral to the acromion. The deltoid was split in line with its fibers, and the torn tendon was identified and repaired using suture anchors.

Arthroscopic Repair: Performed using standard posterior and lateral portals. The torn tendon was debrided and repaired using a single-row suture anchor technique.

All procedures were performed by experienced shoulder surgeons following a uniform surgical protocol.

Postoperative Rehabilitation

Both groups followed a standardized rehabilitation protocol:

- Weeks 0–4: Immobilization with passive ROM
- Weeks 4–8: Active-assisted ROM exercises
- Weeks 8–12: Active ROM and strengthening
- >12 weeks: Return to activity encouraged

Outcome Measures

Patients were assessed at 6 weeks, 3 months, and 6 months postoperatively using:

- Visual Analog Scale (VAS) for pain
- Constant-Murley Shoulder Score
- American Shoulder and Elbow Surgeons (ASES) Score
- Range of Motion (ROM) – forward flexion, abduction, external rotation
- Time to return to activities (measured in weeks)

Statistical Analysis

Data were analyzed using SPSS v25.0. Mean values were compared using independent t-tests. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Demographics

Variable	Group A (Mini-Open)	Group B (Arthroscopic)	p-value
Mean Age (years)	53.6 ± 8.3	52.1 ± 7.9	0.42
Male:Female Ratio	18:12	19:11	0.79
Dominant Side Involved	20	21	0.83

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There were no significant differences in age, gender, or dominant arm involvement between the two groups.

Table 2: Functional Scores

Score	6 Weeks	3 Months	6 Months
VAS - Mini-Open	4.8 ± 1.1	2.5 ± 0.9	1.1 ± 0.7
VAS - Arthroscopic	3.9 ± 1.0	1.8 ± 0.6	1.0 ± 0.5
p-value	0.03	0.01	0.56
ASES - Mini-Open	58.4 ± 6.8	72.6 ± 7.3	85.2 ± 5.9
ASES - Arthroscopic	64.2 ± 6.4	78.9 ± 6.7	86.7 ± 6.1
p-value	0.02	0.04	0.38

Both groups showed significant improvements over time. However, Group B showed slightly faster improvements in VAS and ASES scores in early follow-up.

Table 3: Range of Motion (ROM)

ROM (Degrees)	Group A	Group B	p-value
Forward Flexion (6 months)	158.2 ± 12.5	160.6 ± 11.8	0.45
Abduction (6 months)	144.6 ± 13.3	146.8 ± 12.1	0.52
External Rotation (6 months)	52.3 ± 8.4	54.1 ± 7.9	0.37

At 6 weeks, Group B showed superior ROM, but by 6 months, both groups achieved similar outcomes.

Table 4: Return to Activity

Parameter	Group A	Group B	p-value
Mean Time to Return to Activity (weeks)	15.2 ± 2.4	13.4 ± 1.9	0.01

Charts and Figures

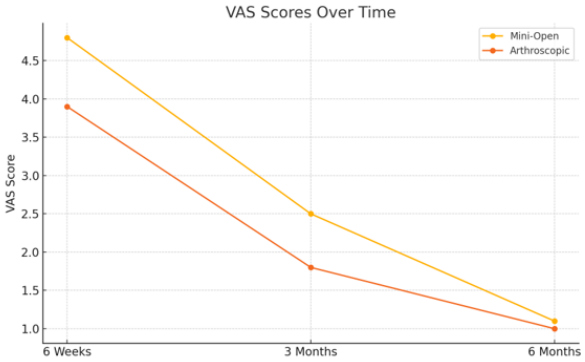

Figure 1: VAS Scores Over Time

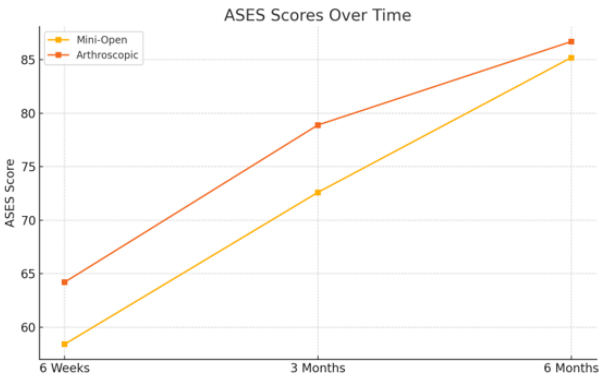

Figure 2: ASES Scores Over Time

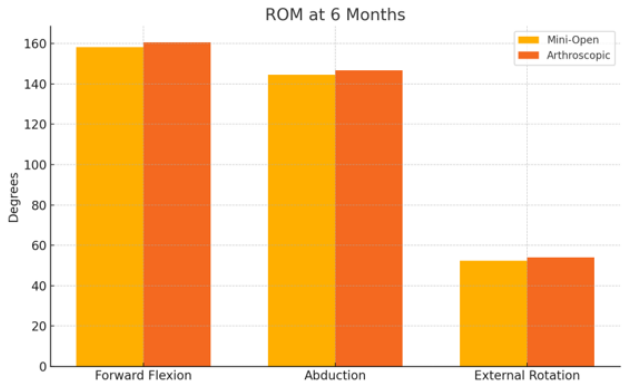

Figure 3: ROM at 6 Months

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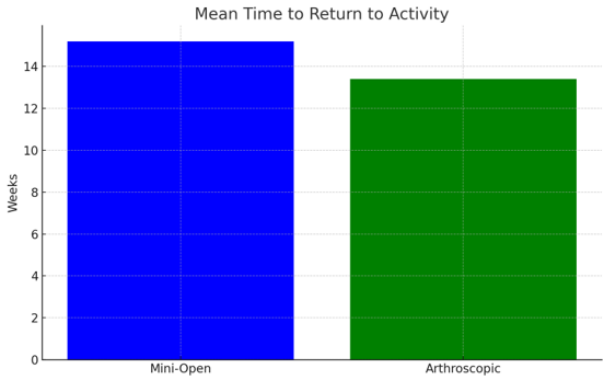

Figure 4: Mean Time to Return to Activity

DISCUSSION

The present study provides a comparative evaluation of early functional outcomes following mini-open versus arthroscopic repair of isolated full-thickness supraspinatus tears. Both surgical groups demonstrated significant postoperative improvements across all outcome parameters, yet arthroscopic repair was associated with better early results, particularly in pain scores and time to return to activity.

At the 6-week and 3-month intervals, patients in the arthroscopic group exhibited significantly lower VAS scores and higher ASES scores than those in the mini-open group. These findings are consistent with existing literature, which attributes such early advantages to the arthroscopic technique's less invasive nature, resulting in reduced soft tissue damage and postoperative pain[7–9].

Despite these early differences, by the 6-month follow-up, both groups achieved comparable results in terms of functional scores and ROM, suggesting that the long-term outcomes of both surgical approaches are effectively equivalent. Prior studies have similarly shown no significant difference in shoulder strength, ROM, or tendon integrity between the two techniques beyond the early postoperative phase[10–12].

Return to activity was significantly quicker in the arthroscopic cohort. This is an important clinical consideration, especially for patients aiming for early reintegration into professional or recreational activities. Similar findings have been reported in prior randomized trials and meta-analyses comparing early recovery metrics between these techniques[13–15].

However, several limitations must be considered. The relatively small sample size and single-center design may limit the generalizability of results. Additionally, factors such as surgeon expertise and patient-specific variables, including tendon quality and adherence to rehabilitation, may influence outcomes. Moreover, the study did not assess structural integrity of the repair via imaging, which may have added further insight into the durability of outcomes.

CONCLUSION

Both mini-open and arthroscopic techniques for supraspinatus tendon repair result in substantial improvements in shoulder function, pain relief, and ROM over a 6-month postoperative period. However, the arthroscopic method is associated with significantly faster early recovery, including reduced pain and earlier return to activity. Given these findings, arthroscopic repair may be preferable in patients prioritizing minimal recovery time. Nonetheless, the mini-open technique remains a viable alternative with comparable outcomes in the longer term. Future studies with larger sample sizes and longer follow-up, including radiological assessment, are warranted to further validate these findings.

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