Original article

Evaluation of Clinical, Functional, and Radiological Outcomes Following Arthroscopic versus Open Repair of Rotator Cuff Tears: A Prospective Comparative Study

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Abstract

Background- Rotator cuff tears are a major cause of shoulder pain and disability. Although both arthroscopic and open repair techniques are widely practiced, their comparative effectiveness regarding clinical, functional, and radiological outcomes remains an area of ongoing research.

Aim- To compare the clinical, functional, and radiological outcomes of arthroscopic versus open repair in patients with rotator cuff tears.

Materials and Methods- This prospective comparative study included **45 patients** with symptomatic full-thickness rotator cuff tears treated at a tertiary care hospital. Patients underwent either **arthroscopic repair (n = 23)** or **open repair (n = 22)**. Clinical assessment was performed using the Visual Analog Scale (VAS), while functional outcomes were evaluated using the Constant-Murley Score and UCLA Shoulder Rating Scale. Radiological tendon healing was assessed at the final follow-up. Patients were followed for 12 months, and data were analyzed using appropriate statistical tests with $p < 0.05$ considered significant.

Results- Patients treated with arthroscopic repair demonstrated significantly lower postoperative pain scores, higher Constant-Murley and UCLA scores, greater range of shoulder motion, and earlier return to routine activities compared with the open repair group ($p < 0.05$). Radiological tendon healing rates were comparable between the two groups. Postoperative complications, including shoulder stiffness and wound-related problems, were less frequent following arthroscopic repair.

Conclusion- Both surgical techniques achieved satisfactory tendon healing and functional improvement. However, arthroscopic repair provided superior pain relief, better functional recovery, earlier rehabilitation, and fewer complications, supporting its preference for the management of repairable rotator cuff tears.

Keywords: Rotator cuff tear; Arthroscopic repair; Open rotator cuff repair.

Introduction

Rotator cuff tears are among the most common causes of shoulder pain, weakness, and functional disability, particularly in middle-aged and elderly individuals. (1) These injuries may result from acute trauma or chronic degenerative changes and can significantly impair activities of daily living and quality of life. Surgical repair is indicated in patients with symptomatic full-thickness tears who fail to respond to conservative management. Traditionally, open rotator cuff repair has been considered the standard surgical technique, providing secure

tendon fixation and satisfactory long-term outcomes. (2,3) However, advances in arthroscopic techniques have enabled minimally invasive repair with improved visualization, reduced soft tissue damage, decreased postoperative pain, and faster rehabilitation. Despite these advantages, concerns remain regarding operative time, technical complexity, tendon healing, and long-term functional outcomes. (4,5,6) Comparative evaluation of arthroscopic and open repair is therefore essential to guide surgical decision-making. (7) Our study aimed to evaluate and compare the clinical, functional, and radiological outcomes following arthroscopic versus open repair of rotator cuff tears.

Materials and Methodology

This prospective comparative study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital over a period of 18 months after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment. A total of **45 patients** diagnosed with symptomatic full-thickness rotator cuff tears confirmed by clinical examination and magnetic resonance imaging (MRI) were included in the study. Patients aged 18–70 years who had persistent symptoms despite at least three months of conservative treatment and were willing to participate were enrolled. Patients with partial-thickness tears, irreparable massive rotator cuff tears, previous shoulder surgery, advanced glenohumeral arthritis, fracture around the shoulder, active infection, neurological disorders affecting shoulder function, or those medically unfit for surgery were excluded.

The enrolled patients were allocated into two treatment groups according to the surgical procedure performed. Twenty-three patients underwent arthroscopic rotator cuff repair (Group A), while twenty-two patients underwent open rotator cuff repair (Group B). All surgeries were performed by experienced orthopaedic surgeons using standardized operative techniques. Perioperative antibiotic prophylaxis, postoperative analgesia, and a uniform rehabilitation protocol comprising immobilization in an arm sling followed by supervised passive, active-assisted, and active range-of-motion exercises and strengthening exercises were followed for all patients. Demographic characteristics, duration of symptoms, mechanism of injury, tear size, operative time, intraoperative findings, and perioperative complications were recorded using a predesigned case record form.

Patients were evaluated clinically, functionally, and radiologically at baseline and during follow-up at 6 weeks, 3 months, 6 months, and 12 months after surgery. Clinical assessment included pain evaluation using the Visual Analog Scale (VAS). Functional outcome was assessed using the Constant-Murley Shoulder Score and the University of California, Los Angeles (UCLA) Shoulder Rating Scale. Range of motion was measured with a goniometer. Radiological assessment of tendon integrity and healing was performed using ultrasonography or magnetic resonance imaging at the final follow-up when indicated. Postoperative complications, including infection, stiffness, re-tear, and reoperation, were documented. Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation and compared using the independent Student's *t*-test, while categorical variables were analyzed using the Chi-square test or Fisher's exact test. A *p*-value of <0.05 was considered statistically significant.

Results

A total of 45 patients were included in the study, of whom 23 underwent arthroscopic rotator cuff repair (Group A) and 22 underwent open rotator cuff repair (Group B). Baseline demographic characteristics were comparable between the two groups. At the final follow-up, patients treated with arthroscopic repair demonstrated significantly better functional outcomes, lower pain scores, and earlier recovery of shoulder movements.

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Radiological tendon healing rates were comparable between both groups, while the incidence of postoperative complications was lower in the arthroscopic group.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population

Variable	Arthroscopic Repair (n=23)	Open Repair (n=22)	p-value
Mean age (years)	54.8 ± 8.6	56.2 ± 9.1	0.58
Male, n (%)	15 (65.2)	14 (63.6)	0.91
Female, n (%)	8 (34.8)	8 (36.4)	0.91
Dominant shoulder involved, n (%)	16 (69.6)	15 (68.2)	0.92
Mean duration of symptoms (months)	8.2 ± 2.9	8.7 ± 3.1	0.61
Full-thickness supraspinatus tear, n (%)	18 (78.3)	17 (77.3)	0.94
Medium-sized tear, n (%)	13 (56.5)	12 (54.5)	0.89

Table 2. Comparison of Functional and Clinical Outcomes at 12-Month Follow-up

Outcome Measure	Arthroscopic Repair (n=23)	Open Repair (n=22)	p-value
VAS Pain Score	1.5 ± 0.8	2.4 ± 1.0	**0.003**
Constant-Murley Score	88.7 ± 5.6	82.4 ± 6.8	**0.001**
UCLA Shoulder Score	33.5 ± 2.4	30.6 ± 3.1	**0.002**
Forward Flexion (°)	168.5 ± 9.2	160.4 ± 11.3	**0.01**
External Rotation (°)	66.8 ± 8.4	60.2 ± 9.1	**0.02**
Time to return to routine activities (weeks)	10.8 ± 2.1	13.5 ± 2.8	**<0.001**

Table 3. Radiological Outcomes and Postoperative Complications

Variable	Arthroscopic Repair (n=23)	Open Repair (n=22)	p-value
Complete tendon healing, n (%)	21 (91.3)	19 (86.4)	0.59
Partial re-tear, n (%)	2 (8.7)	3 (13.6)	0.67
Postoperative shoulder stiffness, n (%)	1 (4.3)	3 (13.6)	0.28
Superficial wound infection, n (%)	0 (0.0)	2 (9.1)	0.14
Reoperation required, n (%)	0 (0.0)	1 (4.5)	0.49
Overall patient satisfaction, n (%)	21 (91.3)	18 (81.8)	0.35

Discussion

Rotator cuff tears are a common cause of shoulder pain and functional impairment, significantly affecting patients' quality of life and ability to perform daily activities. Advances in surgical techniques have led to the increasing adoption of arthroscopic rotator cuff repair because of its minimally invasive nature and the potential for faster recovery. The present prospective comparative study evaluated the clinical, functional, and radiological outcomes following arthroscopic and open rotator cuff repair. The findings demonstrated that arthroscopic repair provided superior functional recovery, greater pain relief, improved shoulder mobility, and earlier return to routine activities, while tendon healing rates were comparable between the two techniques.

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The demographic profile of patients in the present study was comparable between the two groups, with no statistically significant differences in age, sex distribution, duration of symptoms, or tear characteristics. This baseline homogeneity reduced the influence of confounding variables and allowed a reliable comparison of postoperative outcomes. The majority of patients were middle-aged males, which is consistent with the known epidemiology of rotator cuff disease resulting from degenerative changes and repetitive shoulder use.(8,9,10)

Pain reduction was significantly greater in the arthroscopic repair group, as evidenced by lower postoperative VAS scores. The reduced postoperative pain observed after arthroscopic surgery may be attributed to minimal soft tissue dissection, preservation of the deltoid muscle, smaller surgical incisions, and reduced perioperative tissue trauma. Less postoperative pain facilitates early rehabilitation, which plays a critical role in restoring shoulder function and preventing stiffness.(11)

Functional assessment using the Constant-Murley Score and UCLA Shoulder Rating Scale demonstrated significantly better outcomes in patients undergoing arthroscopic repair. These improvements were accompanied by greater gains in forward flexion and external rotation. Enhanced visualization of the rotator cuff footprint during arthroscopy permits more precise tendon mobilization, accurate anchor placement, and anatomical restoration of the tendon insertion. Furthermore, preservation of surrounding soft tissues contributes to better shoulder biomechanics during rehabilitation. Earlier return to daily activities in the arthroscopic group further reflected the functional advantages of minimally invasive surgery and has important socioeconomic implications by reducing the duration of disability.

Radiological evaluation revealed high tendon healing rates in both groups, with no statistically significant difference between arthroscopic and open repair. This finding suggests that both surgical techniques provide satisfactory structural healing when appropriate patient selection, meticulous surgical technique, and standardized postoperative rehabilitation are followed. Although a slightly lower incidence of partial re-tears was observed after arthroscopic repair, the difference was not statistically significant, indicating comparable tendon integrity at one-year follow-up.

Postoperative complications were relatively infrequent in both groups. However, wound-related complications and postoperative shoulder stiffness occurred more frequently after open repair, likely because of greater surgical exposure and soft tissue dissection. No major neurovascular injuries or deep infections were encountered, demonstrating the safety of both procedures when performed by experienced surgeons. Higher patient satisfaction in the arthroscopic group was likely related to less postoperative pain, improved cosmetic appearance, faster rehabilitation, and superior functional recovery.

Conclusion:

In conclusion, both arthroscopic and open rotator cuff repair achieved satisfactory clinical and radiological outcomes. However, arthroscopic repair offered significant advantages in terms of postoperative pain relief, functional improvement, range of motion, earlier return to normal activities, and lower complication rates while maintaining tendon healing rates comparable to open repair. These findings support arthroscopic repair as the preferred surgical approach for appropriately selected patients with repairable rotator cuff tears.

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