

Comparison of Open and Arthroscopic Surgical Management for Recurrent Anterior Shoulder Instability: A Prospective Study

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ABSTRACT

Background: Recurrent anterior shoulder instability is a widespread orthopedic condition, specifically among young, active people and athletes. Surgical intervention is the definitive treatment for patients who fail conservative management. The primary surgical options include open and arthroscopic procedures, each with distinct advantages and limitations. The study aims to compare the outcomes of open versus arthroscopic surgical management for recurrent anterior shoulder instability, evaluating recurrence rates, patient-reported outcomes, range of motion, surgical duration, intraoperative complications, and postoperative rehabilitation durations.

Methods: This study involved a total of 364 patients, with 182 patients allocated to each of the open and arthroscopic surgery groups. Data collected included patient demographics, clinical evaluations, surgical details, and follow-up assessments at 3, 6, and 12 months. Statistical analysis was accomplished using SPSS version 25.0.

Results: The open surgery group had a notably lower recurrence rate (8.2%) compared to the arthroscopic surgery group (13.7%) ($p=0.048$). Both groups showed substantial improvements in range of motion, with no significant variations at 12 months postoperatively. The Constant-Murley score improved more in the open surgery group ($p<0.001$). The arthroscopic group had shorter surgical durations (65.2 vs. 90.5 minutes; $p<0.001$) and slightly shorter rehabilitation periods (13.8 vs. 14.5 weeks; $p=0.034$).

Conclusion: Open surgery for recurrent anterior shoulder instability resulted in lower recurrence rates and better patient-reported outcomes, while arthroscopic surgery offered shorter surgical times and faster rehabilitation. Both techniques were effective in improving

range of motion and functional outcomes. The choice of surgical approach should be individualized based on patient-specific factors and surgeon expertise.

Recommendations: To confirm these results, more studies with bigger sample sizes and longer follow-up times are advised. Surgeons should consider patient-specific factors, including activity level and anatomic variations, when deciding between open and arthroscopic techniques.

Keywords: *Recurrent Anterior Shoulder Instability, Open Surgery, Arthroscopic Surgery, Bankart Repair, Patient Outcomes.*

INTRODUCTION

Recurrent anterior shoulder instability (ASI) is a general orthopedic condition, particularly prevalent among young, active individuals and athletes. This condition often results from repeated dislocations, leading to the weakening of the stabilizing structures of the shoulder joint, such as the labrum and ligaments. The definitive treatment for patients who do not respond to conservative treatments for recurrent ASI is surgical intervention [1]. The management of this condition has undergone tremendous evolution. The primary surgical options include open and arthroscopic procedures, each with its advantages and limitations.

Open surgical techniques, such as the Bankart repair, have long been deemed the gold standard for addressing recurrent ASI. This approach allows direct visualization and repair of the damaged labrum and capsule, providing a robust and stable reconstruction. Various studies have shown the efficacy of open surgery in reducing recurrence rates and improving functional outcomes [2]. However, open surgery is associated with longer surgical times, increased postoperative pain, and longer rehabilitation periods [3].

In contrast, arthroscopic surgery has gained popularity due to advancements in minimally invasive techniques. Arthroscopic Bankart repair involves the use of small incisions and specialized instruments to repair the damaged structures within the shoulder joint. This approach offers several benefits, including shorter surgical times, reduced post-operative pain, and faster recovery. Despite these advantages, some studies have reported higher recurrence rates with arthroscopic surgery compared to open techniques [4]. The debate over the superiority of open versus arthroscopic surgery remains ongoing, with various factors

influencing the choice of procedure, including surgeon expertise, patient anatomy, and specific injury characteristics.

Recent research has aimed to compare the outcomes of open and arthroscopic surgeries to provide evidence-based guidelines for clinical practice [5]. Meta-analyses and systematic reviews have produced mixed results, with some studies favoring open surgery for its stability and others advocating for arthroscopic procedures due to their minimally invasive nature and quicker recovery times [6]. The lack of consensus highlights the need for further prospective studies to estimate the long-term outcomes and re-currence rates related with both surgical techniques.

The study aim to compare the outcomes of open versus arthroscopic surgical management for recurrent ASI.

METHODOLOGY

Study Design

A prospective study.

Study Setting

The study was carried out at Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, India, from February 2023 to March 2024.

Participants

Patients presenting with recurrent ASI were selected. Approximately seven patients were enrolled per week.

Inclusion Criteria

Patients aged between 18 and 50 years, with a history of recurrent ASI confirmed by clinical and radiological evaluation.

Exclusion Criteria

Patients with multi-directional instability, previous shoulder surgeries, severe osteoarthritis, significant comorbidities, or unwillingness to participate in the study.

Sample size:

To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

Bias

Efforts were made to minimize bias by using a randomized controlled design to allocate patients into two groups: one undergoing open surgical management and the other undergoing arthroscopic management. Additionally, the surgeons performing the procedures were blinded to the patient's preoperative clinical data.

Variables

The primary variables included the type of surgical procedure (open vs. arthroscopic), recurrence of shoulder instability, range of motion (ROM), and patient-reported outcome measures. Secondary variables included surgical duration, intraoperative complications, and postoperative rehabilitation duration.

Data Collection

Data were collected using standardized forms. Preoperative data included patient demographics, medical history, and clinical evaluation results. Intraoperative data comprised details of the surgical procedure, duration, and any complications. Postoperative data included recurrence rates, functional outcomes assessed by the Constant-Murley score, ROM, and patient satisfaction recorded at 3-, 6-, and 12-months follow-up.

Procedure

Participants were assigned randomly to either the open or arthroscopic surgery group. Both procedures were performed under general anesthesia. The open surgery group underwent a standard open Bankart repair, while the arthroscopic group received an arthroscopic Bankart repair. Postoperatively, all patients followed a standardized rehabilitation protocol, which included immobilization, followed by gradual physiotherapy.

Statistical Analysis

SPSS version 25.0 was utilised for conducting statistical analysis. While frequencies and percentages were used to summarise categorical variables, means and standard deviations were used to summarise continuous variables. Statistical significance was defined as a p-value of less than 0.05.

Ethical considerations:

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

Over the course of a year, 364 individuals were enrolled in the trial, 182 of them were assigned to the open surgery group (Group I) and 182 to the arthroscopic surgery group (Group II). The patients' initial features were alike for both groups. Patients in the group II were 30.2 ± 7.9 years old on average, while those in the group I were 29.5 ± 8.1 years old. With 128 males and 54 females in the group that underwent arthroscopic surgery and 130 men and 52 women in the group that underwent open surgery, the gender distribution was comparable. There were no discernible differences among the 2 groups in terms of the length of symptoms or the quantity of prior dislocations (Table 1).

Table 1: Baseline Characteristics of Patients

Variable	Group I (n=182)	Group II (n=182)	p-value
Age (years)	29.5 ± 8.1	30.2 ± 7.9	0.487
Gender			
- Male	130	128	0.783
- Female	52	54	

Duration of Symptoms (months)	16.3 ± 5.2	15.8 ± 5.5	0.420
Previous Dislocations	3.5 ± 1.2	3.4 ± 1.3	0.605

Regarding the main results, there were 15 patients (8.2%) in the group I and 25 patients (13.7%) in the group II who experienced a recurrence of shoulder instability. The statistical significance of the difference ($p=0.048$) suggests that the group II had a higher rate of recurrence. Following surgery, both groups' range of motion greatly improved, and at the 12-month follow-up, there was no discernible difference between the two groups.

Table 2: Range of Motion (ROM)

ROM (degrees)	Group I (n=182)	Group II (n=182)	p-value
Preoperative			
Forward Flexion	150.2 ± 20.3	151.4 ± 19.7	0.533
Abduction	135.8 ± 22.1	136.5 ± 21.8	0.761
External Rotation	65.5 ± 15.3	66.2 ± 14.9	0.671
Internal Rotation	70.3 ± 14.8	71.1 ± 15.2	0.607
Postoperative (12 months)			
Forward Flexion	175.5 ± 10.1	176.0 ± 10.3	0.689
Abduction	160.2 ± 12.7	161.3 ± 12.5	0.528
External Rotation	80.8 ± 10.5	81.2 ± 10.2	0.735
Internal Rotation	85.2 ± 9.3	85.7 ± 9.1	0.662

Patient-reported outcome measures, assessed using the Constant-Murley score, showed considerable improvement in both groups. However, the improvement was greater in the group I at the 12-month follow-up. The mean Constant-Murley score in the group I increased from 45.3 ± 10.5 preoperatively to 88.5 ± 6.2 postoperatively, while in the group II, it increased from 46.0 ± 10.3 to 85.3 ± 6.7 . The difference in postoperative scores was statistically relevant ($p<0.001$) (Table 3).

Table 3: Constant-Murley Score

Constant-Murley Score	Group I	Group II	p-value
Preoperative	45.3 ± 10.5	46.0 ± 10.3	0.549

Postoperative (12 months)	88.5 ± 6.2	85.3 ± 6.7	<0.001
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Regarding secondary outcomes, the mean surgical duration was significantly shorter in the group II, with an average duration of 65.2 ± 10.7 minutes compared to 90.5 ± 15.3 minutes in the group I ($p < 0.001$). Intraoperative complications were observed in 10 individuals (5.5%) in the group I and 7 individuals (3.8%) in the group II, with no substantial difference between the groups ($p = 0.453$). The mean duration of postoperative rehabilitation was slightly shorter in the group II, averaging 13.8 ± 2.9 weeks compared to 14.5 ± 3.2 weeks in the group I ($p = 0.034$) (Table 4).

Table 4: Secondary Outcomes

Secondary Outcomes	Group I	Group II	p-value
Surgical Duration (minutes)	90.5 ± 15.3	65.2 ± 10.7	<0.001
Rehabilitation Duration (weeks)	14.5 ± 3.2	13.8 ± 2.9	0.034

DISCUSSION

During the study, group I had a notably lower recurrence rate of 8.2% compared to 13.7% in the group II ($p = 0.048$). This suggests that open surgery may offer better stability and reduce the likelihood of recurrent dislocations.

Both groups showed significant improvements in ROM postoperatively, with no substantial variations among the 2 groups at the twelve month follow-up. This suggest that both surgical methods are equally effective in restoring shoulder mobility.

The Constant-Murley score improved notably in both groups, with the group I showing a greater improvement ($p < 0.001$). This suggests higher patient satisfaction and perceived functional improvement with open surgery.

The group II had a suggestively shorter surgical duration (65.2 minutes) in contrast to the group I (90.5 minutes) ($p < 0.001$). This highlights the efficiency and potentially lower resource utilization associated with arthroscopic procedures.

The rates of intraoperative complications were low and not considerably different between the two groups, indicating that both procedures have similar safety profiles.

The group II had a slightly shorter rehabilitation duration (13.8 weeks) compared to the group I (14.5 weeks) ($p=0.034$). This may contribute to a faster overall recovery time for patients undergoing arthroscopic surgery.

The results of the study recommend that while both open and arthroscopic surgeries are effective in treating recurrent anterior shoulder instability, open surgery may offer advantages in terms of lower recurrence rates and better patient-reported outcomes. However, arthroscopic surgery has the benefits of shorter surgical and rehabilitation durations, which can be important considerations in clinical practice.

Overall, the choice between open and arthroscopic surgery should be individualized, taking into account patient preferences, surgeon expertise, and specific clinical scenarios. These findings provide valuable insights for surgeons and patients in making informed decisions about the optimal surgical approach for managing recurrent ASI.

More research has been done recently to compare the efficacy of open and arthroscopic surgery in treating recurrent ASI. This research has shed light on the advantages and disadvantages of each procedure. Many studies have compared arthroscopic and open Bankart repairs, providing information about the effectiveness and results of each procedure. A retrospective analysis was carried out on 106 individuals who had Bankart surgery to treat recurrent anterior glenohumeral instability. They discovered that there were no appreciable variations in the functional outcomes among the two groups, with comparable pain, satisfaction, and function scores. Between the groups that underwent surgical and arthroscopic surgery, the recurrence rate of instability was likewise similar [7].

A retrospective study comparing open and arthroscopic methods for surgically repairing Bankart lesions in patients with recurrent shoulder dislocation was carried out. Although the arthroscopic procedure produced a higher range of motion and reduced postoperative pain, the study found that both techniques are beneficial. On the other hand, the arthroscopic group saw a somewhat greater dislocation recurrence rate than the open surgery group [8].

Patients receiving Bankart repairs who were 50 years of age or older were the subject of the study. Their results showed that good results were obtained in terms of shoulder stability and

function with both arthroscopic and surgical procedures. There were no appreciable variations in the postoperative pain and ROM scores among the two groups, and both had low rates of instability recurrence [9].

An examination of the relationship between publication date and post-operative recurrent instability in a systematic review comparing the results of open versus arthroscopic Bankart procedures in cases of recurrent ASI. They discovered that studies that included primary literature from more recent times tended to indicate better results for arthroscopic repairs. Overall, though, there was no statistically considerable difference in the incidence of instability recurrence between both treatments [10].

Studies looked into the results of open and arthroscopic Bankart repairs in children with traumatic ASI. According to the DASH questionnaire, their study found that while both methods are useful, the arthroscopic procedure was linked to a decreased rate of upper limb functional restriction. Nevertheless, irrespective of the surgical approach employed, the youthful and athletic group continued to have a significant risk of redislocation [11].

CONCLUSION

The results of open and arthroscopic surgical treatment for recurrent ASI were compared in the study. The results showed that while arthroscopic surgery provided advantages including shorter surgical times and quicker recovery periods, open surgery led to reduced recurrence rates and better patient-reported outcomes. The functional results and ROM were dramatically enhanced by both surgical procedures. These findings imply that individual patient-specific characteristics, surgeon expertise, and clinical circumstances should all be taken into consideration when deciding between open and arthroscopic surgery. To improve surgical reasons and treatment approaches for recurrent anterior shoulder instability, more investigation is required.

Limitations: The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: To confirm these results, more studies with bigger sample sizes and longer follow-up times are advised. Surgeons should consider patient-specific factors, including

activity level and anatomic variations, when deciding between open and arthroscopic techniques.

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List of abbreviations:

ASI - Anterior Shoulder Instability

ROM - Range of Motion

DASH - Disabilities of the Arm, Shoulder, and Hand

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Conflict of interest: The authors have no competing interests to declare.

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