Arthroscopic Stabilisation in Anterior Shoulder Instability: An Analysis of Mid-term Outcome

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ABSTRACT

Objective: To assess the clinical outcome of arthroscopic stabilisation for recurrent anterior glenohumeral joint dislocations.

Study Design: Case series.

Place and Duration of the Study: Ghurki Trust Teaching Hospital, Lahore, from May 2018 to December 2022.

Methodology: Fifty-two patients who underwent arthroscopic repair of Bankart lesion were studied. Those who had concomitant fractures, neurological injury or underwent any surgery on the same shoulder were excluded. The outcome was assessed in terms of improvement in pain, constant and Rowe scores, postoperatively.

Results: The mean delay in the procedure after the first dislocation was 65.15±38.23 months, and the mean follow-up period was 26.61±7.55 months. On final follow-up, improvement in pain was statistically significant ($p<0.05$): (VAS: 2.17±1.77 to 0.69±0.64 at rest and from 4.5±2.24 to 1.58±1.85 at motion). On subjective assessment, 50% of the sample was very satisfied, and an objective assessment showed statistically significant ($p<0.05$) improvement in Constant score from 65.4 to 78.6. Rowe score not only showed a significant improvement (from 31.6 to 80.3 with $p<0.05$), but 69.2% of the follow-up scores lied in the good and excellent results range as well. Recurrence was noted in 8 cases (15.3%).

Conclusion: Significant clinical improvement was seen after arthroscopic stabilisation in anterior shoulder instability. However, further research is required regarding the recurrence rate and restriction in the range of motion.

Key Words: *Glenohumeral joint, Dislocation, Stabilisation, Shoulder arthroscopy.*

How to cite this article: Usama M, Faheem MU, Hussain H, Muhammad Z, Dogar A, Javed S. Arthroscopic Stabilisation in Anterior Shoulder Instability: An Analysis of Mid-term Outcome. *J Coll Physicians Surg Pak* 2023; **33(11)**:1283-1287.

INTRODUCTION

One of the most commonly seen dislocations in orthopaedics practice is anterior glenohumeral (shoulder) dislocation. Trauma and physical activities, including sports and social activities, are among the causes of shoulder instability. Prevalence of shoulder instability has been reported as 2%.[1] Forced abduction and external rotation of the humerus head results in shoulder dislocation. Even the first episode of dislocation has high association with instability of the joint.[2] Adult population, from teens to mid-thirties, is most commonly affected.[3] Furthermore; these individuals are at higher risk of recurrence especially after the first episode of traumatic dislocation.[4] The main pathology noted after a shoulder dislocation is a classical Bankart lesion: a typical capsule-labral lesion presenting as anteroinferior glenoid labrum detachment. It has previously been demonstrated in as many as 87 to 100% of the first shoulder dislocations (Figure 1).[5]

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Received: January 29, 2023; Revised: September 03, 2023; Accepted: September 23, 2023
DOI: https://doi.org/10.29271/jcpsp.2023.11.1283

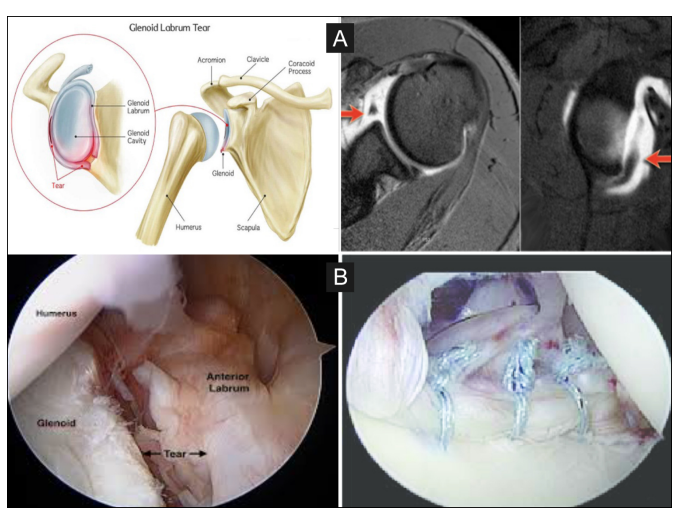

Figure 1: Bankart lesion and Arthroscopic repair: (A) presents Bankart lesion (animated-left, MR image-right); (B) presents arthroscopic views of tear (before repair-left & repaired-right).

As per the literature, repair of this capsule-labral pathology by open or arthroscopic intervention is the mainstay in preventing further dislocations.[6] Weakness and instability of shoulder stabilisers is the basic cause of shoulder instability.[7] It is noteworthy that concomitant injuries: including rotator cuff tear, greater tuberosity fracture, and nerve injury, are fairly common. Furthermore, the literature review suggested that the pathophy-

siology of injury patterns varies with age.[8] In older population group (i.e. above 40 years), anterior recurrent shoulder dislocation has high association with rotator cuff tears.[8]

The management of anterior shoulder instability is being done *via* both open and arthroscopic means as each technique has its merits. Though the arthroscopic approach has become more popular since its emergence in the 1990s, it has previously been associated with higher re-dislocation rates.[9] Long-term follow-up of arthroscopic stabilisation has revealed re-dislocation rates of 3% to 35%.[10] Whereas, the noted failure rate after the traditional open approach of Bankart repair with capsular shift is 5%.[11] Similarly the Latarjet procedure, the transfer of coracoid process, has produced even better results (re-dislocation rates between 0% to 5%).[12] Nevertheless, with modern techniques and availability of suture anchors, the re-dislocation rates of arthroscopic approach are quite similar to that of open Bankart repair.[13] On the other hand, the Arthroscopic approach has been gaining familiarity with surgeons and patients because it is minimally invasive and has not been associated with a higher complication rate than open procedures. Complication rates up to 30%, including nonunion, early onset arthrosis, and stiff and nerve injury, have been associated with Latarjet.[14] Thus, clinical conundrum is to individualise the approach based on the risk of recurrent dislocation, providing each patient with a proper stabilisation and rehabilitation plan tailored to his scenario. This study quantified the results of the aforementioned procedure. Very little data regarding the arthroscopic management of shoulder instability had been published in this region of the world. The rationale is to add to the pre-existing data pool available regarding the management of the condition. This will be very beneficial as these inferences can be used in development of best practice guidelines regarding the management of shoulder instability.

The project aimed to investigate the clinical outcome of arthroscopic repair by studying functional outcome in terms of improvement in pain (VAS), Constant and Rowe score. Furthermore association of treatment failure with preoperative factors like delay in embarking operative management and the number of preoperative dislocations will also be studied.

METHODOLOGY

After getting approval from institutional ethical board, a descriptive case series was conducted at the Department of Orthopaedics, Ghurki Trust Teaching Hospital, Lahore, from 1st May 2018 to 31st December 2022. After taking consent regarding inclusion in the study a total of 52 patients were studied. All patients with recurrent anterior shoulder dislocation, only had a Bankart lesion, and underwent arthroscopic repair of the lesion were included. During the study sample selection, the patients who previously underwent surgery on the same shoulder, had a concomitant proximal humeral fracture or associated neurological deficit were excluded. All the other cases, irrespective of gender, who underwent arthroscopic stabilisation for recurrent anterior shoulder instability during the study period and had complete follow-up period were included in the study.

All the admitted patients underwent thorough clinical and radiological assessment. On the day of the surgery, plans were reassessed in a departmental meeting. Postoperatively, the patients followed at 3-week, 6-week, 3-monthly and then, at every three months interval, and all the relevant data was saved *via* HIMS and the hospital's patient database. The outcome was planned to be inferred as per globally accepted outcome scores (i.e. Rowe and Constant score) rather than individual return to previous professional or sporting activities. Thus, the sample population was not categorised as per their occupation or level of preoperative sporting activities level. Alongside these objective assessment tools, subjective analysis of patients' satisfaction was done by categorising them into satisfied, dissatisfied, and neutral.

The data collection was done retrospectively by the use of the aforementioned database and OPD assessment of the included subjects. Proformas were filled by the authors themselves and entered into SPSS for analysis.

The procedure was carried out with patient in a modified beach-chair position. After getting the patient anaesthetised, stability testing was repeated by the surgeon. Procedure commenced with diagnostic arthroscopy *via* a posterior visualising port: visualising the entire 360 degrees of the joint. After identification of lesion and its extent, planned portals were made *via* needle localisation (18-gauge spinal needle). Arthroscopic elevator was first used to dissect 1.5-2 cm along anterior glenoid neck, medially. Next, debridement of the neck to bleeding bone was done with burr after clearing the impeding soft tissue with a shaver. Anchor-first technique was implemented with placement of first anchor at 5 o'clock with a medial inclination angle of 45 degrees: 1.5 to 2 cm onto the glenoid articular rim. The capsulo-labral lesion was then secured by non-sliding Revo knots with alternating half hitches. Similarly laid additional 2 to 4 sutures were used to secure the whole of the tear onto the glenoid rim.

Postoperatively, the patients' interaction with a fully-equipped physiotherapy team started on the very first postoperative day and then, were followed by the team regularly. The rehabilitation protocol for these patients included the commencement of active and passive range of motion exercises after 3 weeks of surgery. Then, strengthening exercises at 6-week postoperatively, including rotator cuff, deltoid, bicep, and shoulder stabilisers strengthening were started. Demanding activities were restricted in the early postoperative period: less-demanding exercises like swimming were allowed only after 3 months, and sports were permitted only after 6 months of closely monitored rehabilitation.

The mean follow-up period was 26.61 (16-48) months. Among the parameters studied were pain, range of movement at the shoulder joint, and assessment of the shoulder by internationally recognised scoring systems: Constant and Rowe scores. Shoulder ROM was assessed in forward flexion, external rotation at the side, external rotation at abduction, internal rotation at abduction, internal rotation to the posterior, cross-body adduction, and abduction.

Table I: Pre- and postoperative comparison of various quantitative variables.

Variables	Categories	Preoperative	Postoperative	t-value (df)	p-value*
Range of motion	Forward flexion	169.21±6.64	162.01±5.22	6.73 (51)	<0.001
	External rotation at side	59.56±9.23	49.30±5.68	7.71 (51)	<0.001
	External rotation in abduction	79.5±4.52	72.57±3.12	9.94 (51)	<0.001
	Internal rotation in abduction	64.04±3.05	62.5±3.77	2.44 (51)	0.018
	Internal rotation to posterior	8.16±0.52	8.41±0.32	-2.97 (51)	0.004
	Cross body abduction	16.17±0.51	14.03±1.0	14.18 (51)	<0.001
	Abduction	169.01±4.12	166.53±3.27	5.32 (51)	<0.001
Constant score	Pain	7.25±2.39	12.9±1.31	-13.49(51)	<0.001
	Activities of daily life	9.57±2.26	15.59±2.38	-14.07(51)	<0.001
	Range of motion	32.25±3.12	31.71±2.85	0.81 (51)	0.417
	Power	15.34±2.67	18.57±3.54	-4.91 (51)	<0.001
	Total score	65.40±3.25	78.17±4.39	-16.03(51)	<0.001
Rowe score	Stability	0.0±0.0	37.69±14.36	-18.92(51)	<0.001
	Motion	14.80±5.59	13.84±6.07	0.86 (51)	0.389
	Function	16.92±9.75	28.65±2.23	-8.5 (51)	<0.001
	Total	31.63±9.98	80.48±16.24	-16.06(51)	<0.001

**Dependent sample t-test was applied.*

Table II: Pre- and postoperative comparison of various categorical variables.

Variable	Categories	Frequency (percentage)
Rowe score	Excellent (90-100)	16 (30.8)
	Good (75-89)	20 (38.5
	Fair (50-74)	8 (15.4)
	Poor (<50)	8 (15.4)
Satisfaction level	Satisfied	26 (50)
	Neutral	14 (26.9)
	Dissatisfied	4 (7.7)

Rowe score was used to derive inferences by quantifying the outcome scores as well as by categorising scores into groups (from poor to excellent outcomes). A score of 90 or above was deemed excellent, 75 to 89 as good, 50 to 74 as fair, and less than 50 as poor. Alongside this objective evaluation, subjective assessment was done in terms of patient satisfaction by categorising the subjects into satisfied, neutral, and dissatisfied groups.

SPSS was used for data entry and derivation of inferences. Categorical and quantities variables were presented in frequencies/percentages and measures of central tendencies, respectively. Paired sample t-test was applied to detect the statistically significant difference at 95% confidence interval among preoperative and postoperative readings of the studied variables.

RESULTS

Among the 52 cases studied, majority were male (63.5%), more than half (55.8%) had involvement of their dominant arm, and the most common cause of primary dislocation was road traffic accidents (69.2%). Measures of central tendency revealed that the mean age of the sample was 42.71±8.43 years, while the age at first dislocation was 36.28±8.38 years. An average of preoperative dislocations of 11.48±5.01 was noted for a mean measured delay of 65.15±38.22 months between the first dislocation and the operative management. The sample was followed over 26.61±7.54 months. Statistically significant improvement in pain was gauged over VAS: from 2.17±1.77 to 0.69±0.64 at rest (t=5.57, p<0.001) and from 4.5±2.24 to 1.58±1.85 in motion (t=7.705, p<0.001), respectively.

Table I indicates the pre- and postoperative shoulder range of motion, and the findings demonstrate that statistically significant restrictions were observed among patients in forward flexion as the preoperative flexion was 169.21±6.64 and postoperative flexion was 162.01±5.22 (p<0.001), though the magnitude of restriction is minimal. The external rotation at the side, abduction, internal rotation in the abduction and to posterior, cross-body adduction, and abduction scores also showed a significant decline postoperatively as p<0.05. According to Constant scores, the average preoperative score was 65.40±3.25, and the postoperative score was 78.17±4.39, indicating that patients showed significant improvement in shoulder function and returned to their routine activities with p<0.001. The same table reveals the outcome assessment by using Rowe's score. The results indicated that the preoperative score was 31.63±9.98, that is significantly lower than the postoperative score of 80.48±16.24, implementing that the patients reported a significant improvement in stability, function, and motion parameters (p<0.001).

Table II depicts the same results: most cases reported good outcome and fewer cases showed poor result. According to patients' satisfaction, half of the cases were satisfied with the improvement, whereas neutral and dissatisfied responses were seen in fewer cases.

DISCUSSION

The inferential analysis suggested that the arthroscopic stabilisation procedure significantly improves the clinical stability and functional status of the shoulder. The only demerit computed was statistically significant but slight restriction in the range of motion of the treated shoulder, including restriction in forward flexion, external rotation at the side, external rotation in abduction, internal rotation to posterior, and cross

body adduction. Both clinical scoring systems, Constant and Rowe score, also pointed towards restriction in range of motion. However, as activities of daily life and function assessed by the scoring system improved significantly, this restriction in range of motion has no significant implications on daily life. Regarding shoulder range of motion, Tahta *et al*., in their study, pointed out that Arthroscopic Bankart repair in the adult population is not related to any restriction in range of motion or activities of daily life.[15] The only significant finding they commented on was the reduction in strength of internal rotation at 2-year follow-up visit. For external rotation, the published figures showed a reduction in range of motion between 0 to 8˚ after Arthroscopic Bankart repair.[16] One plausible explanation could be that shoulder muscles get weaker because of underuse during the long period of instability in an attempt to keep the shoulder reduced, and this weakness does not recover completely even with postsurgical rehabilitation.

Over the past, multiple studies have been performed to compare different aspects of open and arthroscopic management of post-traumatic shoulder instability. Meta-analyses, thus, presented figures of 10% against 20% recurrence following open and arthroscopic repair, respectively.[17] Arthroscopic management of shoulder instability has been associated with higher recurrence than open surgical management. Similarly, a Swedish researcher published a 15% recurrence for arthroscopic repair with biodegradable tacks against 10% for open repair with suture anchors at a minimum of 2-year follow-up period.[18] Against the aforementioned figures, Kim *et al*. did not find any statistically significant difference in the recurrence rate when they compared the open and arthroscopic approaches. Their results were 6.7% recurrence in open repairs against 3.4% in arthroscopic repairs in a non-randomly selected study group.[19] Similar inferences were made by Cole *et al*. when they examined their patients who underwent open or arthroscopic repair depending on the pathologic finding preoperatively.[20] Thus, these results of 8 cases of recurrence (15.3%) are similar to the previously published results of 14%.[21] Previously, the mentioned risk factors for this recurrence included younger age at the first dislocation, larger number of preoperative dislocations, and delay in therapeutic intervention. All these factors were present in this study's sample population, as in any third-world country like Pakistan, surgical treatment for this type of condition was not sorted early. Thus, it can be concluded that the recurrence rate was determined not only by the treatment modality but also by sociodemographic aspects of the study population.

The analysis revealed highly significant improvement in the assessed clinical scores: Rowe and Constant. The previously published data regarding the clinical outcome of arthroscopic stabilisation in various scoring systems had shown promising results. A study with a similar methodology reported improvement in both the Rowe and Constant scores from 35$\pm$7.2 and 65$\pm$6.3 to 93.6$\pm$5.3 and 92$\pm$4.3, respectively.[22] These are in concordance with this study's results. A study constituting 104 patients that were followed over 15 months revealed an average improvement from 41.8$\pm$11.72 to 94.4$\pm$1.66 ($p<0.05$).[23] Similarly, Baber *et al*. published a final follow-up Rowe score of 93 and Pamar *et al*. computed a figure of 94.16; both the researchers followed their sample for two years post-operatively.[24,25]

The study sample was small as it was a unicentric study. To make more generalised results, a multicentric study must be carried out. However, a longer follow-up period was a factor that validated the study's inferences. A comparative analysis with an open technique for managing recurrent instability in the setup would add to the knowledge about the best treatment guidelines.

CONCLUSION

The arthroscopic approach for managing recurrent glenohumeral dislocation effectively can result in excellent clinical outcomes and patient's satisfaction. However, slightly higher risk recurrence compared to the open technique and mild reduction in the range of motion are possible downsides of the procedure.

ETHICAL APPROVAL:
This study has been approved by Ethical Review Committee, Ghurki Trust Teaching Hospital (Ref. No. 2022/12/R-02).

PATIENTS' CONSENT:
Informed consents were obtained from all patients.

COMPETING INTEREST:
The authors declared no competing interest.

AUTHORS' CONTRIBUTION:
MU, UF: Jointly proposed the study, analysed the data and prepared the final draft.
HH, ZM, AD, SJ: Contributed to the study design, data interpretation and review of the final manuscript.
All authors approved the final version of the manuscript to be published.

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