

A Prospective Study on the Requirements for Arthroscopic Treatment of Anterior Shoulder Instability

Md. Qamar Abdul Azeez¹, Buddharaju Suraj Verma², Krishna Teja K.³

¹Associate Professor, Department of Orthopaedics, NRI IMS Anil Neerukonda Hospital, Visakhapatnam, Andhra Pradesh, India

²Assistant Professor, Department of Orthopaedics, NRI IMS Anil Neerukonda Hospital, Visakhapatnam, Andhra Pradesh, India

³Assistant Professor, Department of Orthopaedics, NRI IMS Anil Neerukonda Hospital, Visakhapatnam, Andhra Pradesh, India

Received: 21-04-2023 / Revised: 28-05-2023 / Accepted: 29-06-2023

Corresponding author: Dr Krishna Teja K.

Conflict of interest: Nil

Abstract:

Background: The objective of this study was to evaluate and contrast the safety and efficacy of open and arthroscopic techniques in managing recurrent anterior shoulder dislocation resulting from traumatic injury.

Methods: The present study enrolled individuals who received medical care at our facility for repetitive anterior shoulder dislocation resulting from traumatic injury over a period of one year. The participants were stratified into two cohorts based on the type of surgical intervention they underwent, namely arthroscopic surgery and open surgery. The study compared the intraoperative duration and haemorrhage, complications associated with the surgery, overall hospital stay duration, occurrence of recurrent shoulder joint dislocation, Visual Analogue Scale (VAS) pain scores, and Rowe scores before surgery and during follow-up appointments in both groups.

Results: A total of 346 individuals were enrolled in the final analysis, consisting of 130 females and 216 males, with ages ranging from 18 to 47 years. The average age of the participants was 28.5 years, with a standard deviation of 10.2. Out of the total sample size, a cohort of 158 individuals underwent arthroscopic surgery, while another group of 188 individuals opted for open surgery. There were no statistically significant differences observed between the two cohorts in terms of demographic variables such as age, gender, and duration of illness. The findings of the study indicate that arthroscopic surgery demonstrated superiority over open surgery in terms of intraoperative haemorrhage, total hospital stay, and VAS pain scores one month post-surgery ($P < 0.01$). However, it was found to be inferior in terms of surgical duration ($P < 0.01$), incidence of recurrent dislocation of the shoulder joint ($P = 0.01$), and Rowe score at the final follow-up ($P < 0.01$). The incidence of surgical complications and the Visual Analogue Scale (VAS) pain scores at the final follow-up did not exhibit any statistically significant differences between the two study cohorts ($p > 0.05$).

Conclusions: While the arthroscopic Bankart surgery is less invasive compared to the open Bankart repair, it is crucial to consider the latter for certain patients owing to its superior long-term stability outcomes in relation to the shoulder joint.

Keywords: Arthroscopic; Repair; Chronic Anterior Instability; Bankart Lesion.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Archaeological investigations have yielded compelling evidence of glenohumeral dislocation in ancient human shoulder specimens dating back several millennia [1]. This condition can be particularly distressing to patients as it manifests with symptoms such as pain, muscular weakness, and impaired shoulder function. The glenohumeral joint is widely recognised as the most frequently dislocated joint in the human anatomy, constituting nearly 50% of all joint dislocations. Its reported incidence stands at 17 per 100,000 individuals annually, as documented in various scholarly sources [2-4].

A joint that is commonly referred to as the shoulder, is a frequently encountered site of major joint dislocation, with a prevalence of approximately 2% among the general populace. The prevalence of shoulder dislocations is primarily anterior, accounting for approximately 80% of cases, while posterior and multidirectional dislocations constitute 10% each. Males exhibit a higher prevalence compared to females, with a ratio of 3:1 [5, 6]. The demographic consisting of young individuals who engage in physical activities constitutes the most significant proportion of individuals diagnosed with shoulder instability.

In cases where non-surgical interventions are employed, there is a notable recurrence rate of dislocation, which reaches approximately 71% [7, 8]. Numerous longitudinal investigations have substantiated a significant association between the frequency of instability episodes and the susceptibility to degenerative arthritis [9, 10]. Shoulders exhibiting recurrent instability, when left untreated, demonstrate a greater prevalence of moderate and severe arthropathy compared to shoulders that undergo surgical treatment [11]. Therefore, the imperative management of instability is

paramount not only for the restoration of functionality but also as a strategy to reduce the prevalence of degenerative arthropathies. Early surgical intervention has been shown to effectively decrease the rates of recurrence and enhance functional outcomes in young adults who actively participate in physical activities [12-14].

The primary objective of the therapeutic approach is to effectively restore the integrity of the capsulolabral ligamentous complex, thereby reinstating glenohumeral stability. Empirical evidence suggests that surgical intervention significantly diminishes the likelihood of recurrence, with recurrence rates ranging from a mere 6% to 23% [15]. In the pursuit of managing the condition of an unstable shoulder, orthopaedic surgeons have delineated various surgical interventions that hold potential in mitigating the likelihood of recurring subluxation or dislocation.

Due to the limited efficacy of conservative treatment modalities such as the Hippocrates and Rowe methods in achieving complete restoration of the shoulder joint, a majority of scholarly sources advocate for surgical intervention as the preferred approach for addressing Bankart injury [4, 5]. Presently, both open and arthroscopic techniques are viable options for the treatment of shoulder joint pathologies in numerous orthopaedic facilities. Nevertheless, a consensus has not been reached regarding the superior approach between the two aforementioned methods [16-18]. The present study was conducted with the objective of determining the comparative efficacy and safety of different treatment modalities for Bankart injury over an extended duration of follow-up.

Materials and Methods

The current study included patients who had a confirmed diagnosis of recurrent anterior dislocation of the shoulder, which was caused by a traumatic injury. These

patients underwent either open or arthroscopic Bankart repairs in our medical department within the past year. X-ray radiographs and three-dimensional computed tomography (CT) scans were utilised to ascertain the presence of any osseous abnormalities.

Inclusion criteria

The selection of patients for inclusion in the study was determined based on the nature of their injury, the presence of any complications, the overall health status of the patients, and their expressed willingness to participate in the surgical procedure. Patients with a documented medical background of traumatic injury to the shoulder joint, with a confirmed occurrence of anterior dislocation of the shoulder joint, underwent manual reduction of the joint using either the Hippocrates or Rowe technique on at least three occasions.

Those who were diagnosed with a Bankart injury through MRI analysis were included in the study. Inclusion criteria encompassed patients who exhibited satisfactory general health status, rendering them eligible for surgical intervention, and who provided informed consent to undergo surgical treatment and actively engage in the research investigation.

Exclusion criteria

Patients who showed instability of the shoulder joint toward multiple directions, anterior to posterior injury of superior labrum, had thickness of the injured bony structure exceeded 5 mm were excluded. Also, patients with large (> 25% of width in axial view) glenoid fractures, instability of multiple joint capsules and refused to participate in the study and pay regular visits to the clinic after the surgery were excluded from the study.

Surgical treatment

During the open surgical procedure, the patients were positioned in a supine posture subsequent to the administration of anaesthesia. The Montgomery & Jobe

method was employed for the open surgical procedure [9]. A surgical procedure involved creating a 2 cm cut from the coracoid process to the anterior axillary fold, following the Langer line. The intermuscular space between the deltoid and pectoralis major muscles was dissected, revealing the subscapularis muscle tendon. A transverse incision was performed in accordance with the orientation of the muscle fibres at the intersection of the upper two-thirds and lower one-third of the subscapularis muscle tendon. Upon the exposure of the joint capsule, a horizontal incision was made along the subscapularis muscle tendon to section the anterior capsule.

A suspension technique was employed to reposition the upper and lower capsule of the glenoid labrum, facilitating its retraction in bilateral directions. A narrow retractor was utilised to laterally displace the head of the humerus, while the anterior joint capsule was meticulously separated from the periosteum. Perforations were made on the glenoid rim at the 2, 4, and 6 o'clock positions. Anchors utilising nonabsorbable suture material (Smith & Nephew, Memphis, USA) were meticulously inserted into each respective aperture. The sutures were appropriately tensioned in order to establish secure anchorage. The substandard flap was surgically repaired on the cervical region of the scapula, resulting in the repositioning of the capsule in a superior direction. The superior flap was repositioned in a downward direction, resulting in its overlap and reinforcement of the inferior flap. The upper extremity was positioned in a 45-degree abduction and 45-degree external rotation, followed by the application of nonabsorbable sutures to loosely approximate the joint capsule. Subsequently, the incision was meticulously closed using layered suturing techniques.

The patients were positioned in a lateral decubitus posture for the arthroscopic

Bankart repair procedure. The arthroscope was inserted through the posterolateral acromion using a minimally invasive surgical technique. The examination of the glenoid labrum, biceps brachii tendon, and presence of loose bodies within the joint was conducted via the portal. A diagnostic arthroscopy was performed on the patient's anterior shoulder joint to debride the margins of the glenoid labrum. Additionally, a motorised burr was utilised to debride the anterior scapular neck. Subsequently, a total of 3 to 5 titanium anchors (manufactured by Smith & Nephew, headquartered in Memphis, USA) were meticulously inserted onto the glenoid labrum using 2-0 sutures. The inferior glenohumeral ligament was subsequently reattached utilising surgical anchors. The capsule underwent a positional shift from an inferior to a superior orientation. In cases of significantly inferior detachments, a stitch was executed through the posterior portal, aiming to enhance accessibility [10].

Statistical Analysis

All data was analyzed by SPSS22.0 software (IBM, IL, USA). Duration of the disease, intraoperative time, hemorrhage,

total stay in hospital, time of recurrence dislocation, VAS pain scores, and Rowe stability scores before and after the surgery, and the last follow-up were recorded and compared between the two groups using one way ANOVA and X2 analysis. Differences were considered significant when $P < 0.05$.

Results

During the duration of the research, a total of 346 patients (130 female, 216 male) with ages ranging from 18 to 47 years (mean age: 28.5 ± 10.2) underwent surgical intervention for the management of recurrent anterior dislocation of the shoulder following traumatic injury.

This study was conducted at our medical centre and involved a total of 352 affected shoulders. Among the cohort of patients, a total of 158 individuals underwent arthroscopic surgery, while 188 patients underwent open surgery.

There were no statistically significant differences observed between the two cohorts in terms of age, gender, and disease duration, as indicated in Table 1.

Table 1: Demographic characteristics of the sample population

	Arthroscopic		Open
Gender	Male	102	114
	Female	56	74
Age		31.6 ± 8.6	32.2 ± 12.2
Duration (days)		12.2 ± 6.8	16.0 ± 8.3
Times of dislocation		5.8 ± 3.3	6.2 ± 3.6
Origin of injury	Falls	27	31
	Sports	72	95
	Bicycle accident	9	11
	Car accident	18	22
	Other	32	29

All patients were admitted to the hospital prior to undergoing surgical procedures, and all surgeries were performed in accordance with the initial surgical protocol. Importantly, none of the arthroscopic surgeries necessitated a conversion to open surgery. The duration of

the surgical procedure was notably extended in the arthroscopic surgery cohort compared to the open surgery cohort ($P < 0.01$). The study findings indicate that there was a statistically significant difference in intraoperative blood loss between the open

surgery group and the arthroscopic surgery group ($P < 0.01$).

Additionally, the open surgery group had a significantly longer total duration of hospital stay compared to the arthroscopic surgery group ($P < 0.01$).

There were no statistically significant differences observed in the occurrence of surgery-related complications, such as neural injury and wound infection, between the study groups ($P > 0.05$) (Table 3).

Table 3: Total operation time in arthroscopic surgery group and open surgery group

Approach	Time (minutes)	Hemorrhage (ml)	Total hospital Stay (days)	Complications	
				Nerve Injury	Infection
Arthroscopic	94 ± 8.6	15 ± 6.9	4.3 ± 1.5	1	0
Open	65 ± 10.6	137 ± 22.6	7.2 ± 2.6	1	4
P value	< 0.01	< 0.01	< 0.01	1.0	0.13

Discussion

Recurrent shoulder joint dislocation is a frequently encountered complication associated with traumatic anterior instability. The prevalence of recurrence rate in the majority of documented literature was found to be substantial within the younger demographic, reaching as high as 71% [8-11]. In the current investigation, the average age of the arthroscopic group was 31.6 ± 8.6 years, while the average age of the open surgery group was 32.2 ± 12.2 years.

Arthroscopic techniques have been utilised in the restoration of shoulder stability since the 1980s [18, 19]. They were developed with the intention of mitigating the occurrence of extensive incisions that could potentially lead to heightened intraoperative haemorrhaging, tissue trauma, and postoperative scarring. U-shaped anchors, transglenoid sutures, bioabsorbable tacks, and suture anchors have been employed in the surgical procedure, yielding varying outcomes [20, 21].

Arthroscopic Bankart repair has gained significant popularity in the management of anterior shoulder instability within numerous orthopaedic centres, primarily attributed to its minimally invasive characteristics. The present study provides evidence that arthroscopic Bankart repair

demonstrates efficacy in mitigating both intraoperative and postoperative pain. Nevertheless, the existing literature has documented a prevalence of recurrent shoulder dislocation following arthroscopic Bankart repair, with reported ratios ranging from 2 to 10 percent [22]. In the present investigation, a total of 8 individuals (2.5%) in the arthroscopy cohort exhibited instances of recurrent shoulder dislocation or subluxation.

Conversely, within the open surgery cohort, only one participant experienced recurrent shoulder dislocation subsequent to the surgical procedure. This finding exhibits similarity to prior research investigations. Nevertheless, the advancement of arthroscopic surgical methodology has the potential to augment the stability of the shoulder in forthcoming investigations.

The assessment of the safety of a surgical procedure is frequently evaluated through the determination of the prevalence of complications directly associated with the surgery.

In the present investigation, notable disparities were observed between two cohorts with regards to the prevalence of postoperative wound infection ($P = 0.16$) and neural injury ($P = 1.0$). One patient in each cohort exhibited dysesthesia following the surgical procedure, which resolved within a six-month period during the

postoperative follow-up. There were four individuals within the open surgery cohort who presented with superficial surgical site infections.

However, it is noteworthy that all cases were successfully resolved through the administration of appropriate antibiotic therapy and regular dressing changes. The findings suggest that through comprehensive training of the medical professional, both open and arthroscopic Bankart repair procedures demonstrate comparable levels of safety as surgical interventions. The prevention of damage to vascular or neural structures can be achieved through thorough preoperative planning and precise surgical techniques.

Conclusion

Based on the afore mentioned findings, it can be inferred that despite the higher invasiveness associated with open Bankart repair in comparison to arthroscopic Bankart surgery, the former should be taken into consideration for certain patients owing to its impact on the long-term stability of the glenohumeral joint. Nevertheless, arthroscopic surgery may be given precedence over open surgery in numerous patients due to its propensity for reduced haemorrhage, shorter hospitalisation periods, diminished scarring, and decreased postoperative pain. Given the ongoing evolution of the arthroscopic Bankart repair technique, it is plausible to anticipate that there will be continued enhancements in functional recovery and stability following arthroscopic surgeries in the foreseeable future.

References

1. Cerciello S, Visonà E, Morris BJ, Corona K. Bone block procedures in posterior shoulder instability. *Knee Surg Sports Traumatol Arthrosc* 2016; 24: 604-11.
2. DeLong JM, Bradley JP. Posterior shoulder instability in the athletic population: Variations in assessment, clinical outcomes, and return to sport. *World J Orthop* 2015; 6: 927-34.
3. Longo UG, Rizzello G, Loppini M, Locher J, Buchmann S, Maffulli N, Denaro V. Multidirectional instability of the shoulder: a systematic re- view. *Arthroscopy* 2015; 31: 2431-43.
4. DeLong JM, Jiang K, Bradley JP. Posterior instability of the shoulder: a systematic review and meta-analysis of clinical outcomes. *Am J Sports Med* 2015; 43: 1805-17.
5. Levy DM, Cole BJ, Bach BR Jr. History of surgical intervention of anterior shoulder instability. *J Shoulder Elbow Surg* 2016; 25: e139-50.
6. Rhee YG, Ha JH, Cho NS. Anterior shoulder stabilization in collision athletes: arthroscopic versus open Bankart repair. *Am J Sports Med* 2006; 34: 979-85.
7. Bottoni CR, Smith EL, Berkowitz MJ, Towle RB, Moore JH. Arthroscopic versus open shoulder stabilization for recurrent anterior instability: a prospective randomized clinical trial. *Am J Sports Med* 2006; 34: 1730-7.
8. Fletcher C. Comparison of open and arthroscopic stabilization for anterior shoulder instability. *EC Orthopaedics* 2017; 5: 34-40.
9. Montgomery WH 3rd, Jobe FW. Functional out- comes in athletes after modified anterior capsulolabral reconstruction. *Am J Sports Med* 1994; 22: 352-8.
10. Morgan CD, Bodenstab AB. Arthroscopic Bankart suture repair: technique and early results. *Arthroscopy* 1987; 3: 111-22.
11. Luedke C, Tolan SJ, Tokish JM. Arthroscopic repair of posterior bony bankart lesion and sub- scapularis remplissage. *Arthrosc Tech* 2017; 6: e689-e694.
12. Bankart ASB: the pathology and treatment of recurrent dislocation of the shoulder joint. *British Journal of Surgery* 1938; 26: 23-29.

13. Neviaser RJ, Benke MT, Neviaser AS. Mid-term to long-term outcome of the open Bankart re- pair for recurrent traumatic anterior dislocation of the shoulder. *J Shoulder Elbow Surg* 2017; 26: 1943-1947.
14. Hatch MD, Hennrikus WL. The open Bankart repair for traumatic anterior shoulder instability in teenage athletes. *J Pediatr Orthop* 2018; 38: 27-31.
15. Weber SC. Stabilization options in the adolescent: open bankart repair[M]//shoulder instability across the life span. Springer Berlin Heidelberg 2017; pp. 73-78.
16. Argintar E, Heckmann N, Wang L, Tibone JE, Lee TQ. The biomechanical effect of shoulder remplissage combined with Bankart repair for the treatment of engaging Hill-Sachs lesions. *Knee Surg Sports Traumatol Arthrosc* 2016; 24: 585-92.
17. Atef A, El-Tantawy A, Gad H, Hefeda M. Prevalence of associated injuries after anterior shoulder dislocation: a prospective study. *Int Orthop* 2016; 40: 519-24.
18. Shea KP. Arthroscopic Bankart repair. *Clin Sports Med* 1996; 15: 737-51.
19. Aboalata M, Plath JE, Seppel G, Juretzko J, Vogt S, Imhoff AB. Arthroscopic Bankart repair. *Am J Sports Med* 2017; 45: 782-787.
20. Warner JJP, Warren RF. Arthroscopic Bankart repair using a cannulated, absorbable fixation device. *Operative Techniques in Orthopaedics* 1991; 1: 192-198.
21. Ide J, Maeda S, Takagi K. Arthroscopic Bankart repair using suture anchors in athletes: patient selection and postoperative sports activity. *Am J Sports Med* 2004; 32: 1899-905.
22. Bessière C, Trojani C, Carles M, Mehta SS, Boileau P. The open Latarjet procedure is more reliable in terms of shoulder stability than arthroscopic Bankart repair. *Clin Orthop Relat Res* 2014; 472: 2345-51.