SSRG International Journal of Medical Science
ISSN: 2393–9117 / https://doi.org/10.14445/23939117/IJMS-V11I1P104

Volume 11 Issue 1, 14-21, Jan-Feb 2024

Original Article

Functional Outcomes of Surgical Treatment for Recurrent Anterior Shoulder Dislocation with Latarjet Technique

Raed Baroudi[1], Ali yousef[2], Safwan yousef[3]

[1,2,3]*Department of Orthopedic Surgery, Tishreen University, Faculty of Medicine, Latakia, Syria.*

[1]*Corresponding Author : raedbaroudi92@gmail.com*

Received: 01 January 2024 Revised: 30 January 2024 Accepted: 11 February 2024 Published: 29 February 2024

Abstract *- Objective: This study aimed to evaluate the functional and clinical outcomes of patients treated surgically for recurrent anterior shoulder dislocation using the Latarjet technique, following the Rowe criteria, over a 12-month follow-up period. Additionally, the study evaluated postoperative complications. Methods: A retrospective analysis was conducted on 22 cases of recurrent traumatic anterior shoulder dislocation in 21 patients who underwent the Latarjet technique at Tishreen University Hospital between 2019 and 2021. Functional outcomes were measured using the Rowe score at 6 and 12 months post-surgery compared to preoperative scores. Range of motion and strength assessments were conducted on both operated and healthy shoulders. Detailed documentation of complications such as dislocation recurrence, graft non-union, resorption, screw loosening, and osteoarthritis was performed. Results: The mean Rowe score significantly improved from 39.21±6.3 pre-surgery to 88.32±5.2 at 6 months post-surgery and further to 90.78±5.8 at 12 months post-surgery ($p<0.001$). The range of motion in the operated shoulder was notably less than in the healthy shoulder, particularly in external rotation movement. At the final follow-up, a single case of dislocation, 4.5%, was reported with no subluxation instances. Graft non-union and resorption each occurred in 4.5% of cases, while screw breakage and migration were absent. Screw loosening was observed in 4.5% of patients, and osteoarthritis was detected in 9% of cases, classified as stage 1 based on the Samilson and Prieto criteria. Conclusions: The Latarjet procedure is a safe and effective technique for managing recurrent anterior shoulder dislocation. It provides excellent stability, functional improvement, and positive radiological outcomes over a one-year follow-up period.*

Keywords *- Anterior shoulder dislocation, Glenohumeral instability, Latarjet, Recurrence rate, Surgery.*

1. Introduction

The shoulder is one of the most unstable and frequently dislocated joints in the human body due to its anatomy and biomechanics. It is responsible for nearly half of all dislocations, with a 2% incidence in the general population.[1] Dislocations of the glenohumeral joint are categorized based on the position of the humeral head relative to the glenoid cavity, with the anteroinferior direction being the most common, accounting for 95% of all dislocations. [2, 3] Glenohumeral joint instability occurs when the joint undergoes excessive or repetitive force that exceeds the capabilities of its dynamic and static stabilizers. The direction of dislocation and the mechanism of injury can lead to damage to one or more of these stabilizers.[4]Factors that influence the probability of recurrent dislocations include age, participation in contact or collision sports, hyperlaxity, and the presence of significant bony defects in the glenoid or humeral head. [1]

Numerous surgical techniques have been described for treating recurrent anterior shoulder dislocation, including soft tissue and osseous procedures. The main surgical interventions for shoulder instability involve repairing the Bankart lesion and performing reconstruction with a coracoid bone block, known as the Latarjet technique.[5] These procedures can be performed using open or arthroscopic approaches.

The Latarjet procedure is a widely accepted surgical intervention that has consistently demonstrated positive outcomes regarding recurrence rate, reoperation rate, and clinical results.[6, 7] Nonetheless, some surgeons have raised concerns regarding potential complications such as loss of motion, recurrence, glenohumeral osteoarthritis development, graft osteolysis, and neurological issues. Recurrence rates have been reported to range from 7.5% to 11.6%.[8, 9] Despite these concerns, there remains a paucity of research specifically focusing on this procedure, with limited information available on its potential complications.[10, 11]

2. Aim of the Study

This study aimed to evaluate the functional and clinical outcomes of patients treated surgically for recurrent anterior shoulder dislocation using the Latarjet technique, following the Rowe criteria, over a 12-month follow-up period.

Additionally, the study evaluated postoperative complications.

3. Materials and Methods

A retrospective analysis was conducted on 22 cases of recurrent traumatic anterior shoulder dislocation in 21 patients who underwent treatment with the Latarjet technique at Tishreen University Hospital between 2019 and 2021.

The study gathered information on the patient's age, gender, occupation, affected side, injury mechanism, dominant hand, history of prior dislocations, age and cause of initial shoulder dislocation, preoperative activity level, and the presence of glenoid or humeral head injury.

Patients with multidirectional instability, non-traumatic anterior dislocations, voluntary dislocations, uncontrolled epilepsy, prior shoulder surgery, long head of the biceps pathology, complete rotator cuff tears, acromioclavicular joint lesions, and systemic diseases affecting bone graft union were excluded from the analysis.

The diagnosis of recurrent anterior shoulder dislocation was made based on medical history, physical examination, and radiographic assessment. Radiographic studies, including true anteroposterior, axillary lateral, scapular Y, and West Point views, were conducted to identify any associated bony lesions in the glenoid or humeral head.

Computed Tomography (CT) with glenoid reconstruction was used to assess bone defects and their size if present. Magnetic Resonance Imaging (MRI) was performed to evaluate soft tissue injuries related to instability.

The study participants were classified based on their physical activity level: individuals who regularly engage in sports (practitioners) and those who do not participate in sports (non-practitioners).

The surgical procedure used in this study for the treatment of recurrent traumatic anterior shoulder dislocation was based on the technique originally described by Latarjet et al. [12]. The surgery was performed with the patient in the beach chair position and under general anesthesia. To facilitate palpation of the coracoid process, a folded sheet, 1 cm thick, was placed under the scapula on the affected side. A vertical incision measuring 4-5 cm was made from the tip of the coracoid process, followed by the development of the deltopectoral interval. The coracoid was then exposed from its tip to the insertion of the coracoclavicular ligaments at the base of the coracoid. The coracoacromial ligament was sharply dissected from the lateral border of the coracoid, while the pectoralis minor tendon was released from the medial border. The osteotomy of the coracoid process was performed using a 90° sagittal saw from medial to lateral at the junction of the horizontal and vertical parts at the origin of the conjoined tendon. The subscapularis muscle was divided at the junction of its superior two-thirds or inferior one-third, in line with its fibers. Then, the joint capsule was vertically opened. The graft was supported along its major axis at the anteroinferior border of the glenoid, which was previously prepared through resection of the labrum and decortication of the glenoid border and neck. The graft was inserted through the soft tissues and positioned flush with the anteroinferior margin of the glenoid. Screws were then used to fix it parallel to the joint surface. The medial border of the capsule was sutured to the stump of the coracoacromial ligament, and the subscapularis tendon was repaired using non-absorbable sutures. The procedure was concluded with standard closure.

All patients received standardized postoperative care and rehabilitation. The operated arm was immobilized with a shoulder brace for 21 days post-surgery, followed by early initiation of hand, wrist, and elbow movements. Clinical and radiological assessments were conducted at the beginning of the fourth week before starting a physical rehabilitation program. Rehabilitation began with passive range of motion exercises and progressed to active range of motion exercises. Isometric exercises began on day 30 after surgery, followed by active resistance exercises on day 45. Return to work and upper limb activities were allowed after 4-6 months based on the recovery of strength and range of motion.

Shoulder function was assessed twice using Rowe et al.'s criteria [13] 6 and 12 months after surgery and compared to the preoperative outcomes. The outcomes were classified as excellent (90-100 points), good (75-89 points), fair (51-74 points), or poor (50 points).

Shoulder motion was measured using a goniometer while the patient was standing. The measurements included elevation, internal rotation, and external rotation (ER1) along the side of the body, as well as external rotation (ER2) at 90° abduction in both limbs for each patient. The results were then compared to those of the non-operative shoulder. Internal rotation strength was assessed by comparing the mean muscle force in kilograms of the operated shoulder over three seconds to that of the non-operated shoulder using an electronic dynamometer.

Postoperative radiographic evaluation was also performed using true anteroposterior, axillary lateral, scapular Y, and West Point views at one month, six months, and 12 months postoperatively to evaluate bone graft consolidation, screw position, and any signs of loosening and to detect the presence of signs of shoulder arthritis. The degree of shoulder arthritis, if present, was determined according to the classification of Samilson and Prieto. [14]

The study assessed the ability of athletic patients to resume sports activities after surgery and gathered patient satisfaction data through a questionnaire that utilized a five-

point Likert scale.

The study used mean and standard deviation to express continuous data and absolute and percentage values to express categorical data. Friedman's test was performed to evaluate the Rowe score over time. A Mann-Whitney U test was performed to compare the external rotation, internal rotation, elevation, and strength scores of the operated and healthy shoulders. Fisher's exact test assessed the independence between pairs of variables. The statistical analysis was conducted using SPSS software, with a significance level of 0.05 ($p < 0.05$) established for all statistical tests.

4. Results

The study analyzed 22 cases of recurrent anterior shoulder joint dislocation in 21 patients (20 male, 1 female) who underwent surgical treatment using the Latarjet technique. The mean age of the patients was 29 years ± 4.2 (range: 18-50 years), and the follow-up duration was 12 months.

Of the patients included in the study, the majority (n=16) experienced recurrent anterior shoulder dislocation on their right shoulder, accounting for 76.2% of cases. In contrast, only 19.1% of cases (n=4) involved the left shoulder. Bilateral injury was relatively rare, occurring in just one case, 4.7%. Additionally, injuries were sustained on the dominant side in 81.8% of cases (n = 18).

The majority of patients (68%, n = 15) in the study had their first shoulder dislocation before the age of 25, with a mean age of 22.75 ± 3.9 years. All patients attributed their initial dislocation to acute traumatic injury. Specifically, 50% (n = 11) of these injuries occurred during sports activities, 27.27% (n = 6) resulted from road accidents, and 22.72% (n = 5) occurred due to accidental falls at work. Notably, all injuries were characterized as acute and high-energy traumas.

The mean number of previous dislocations before surgery was 9.22±1.3 times, ranging from 3 to 40 times. The distribution of the number of dislocations before surgery was as follows: 3 to 10 times in 12 shoulders, 11 to 20 times in 7 shoulders, 21 to 30 times in two shoulders, and 31 to 40 times in one shoulder.

Among the sample, 8 shoulders (36.6%) presented a preoperative glenoid bone defect, while 2 shoulders (9.1%) had a Hill-Sachs lesion. Furthermore, 57.1% (n=12) of the participants reported regular participation in sports, and no injuries were reported among the professional athletes.

4.1. Functional Outcome

The study showed a significant improvement in the mean Rowe score after surgery. The scores increased from 39.21±6.3 before surgery to 88.32±5.2 at 6 months post-surgery and 90.78±5.8 at 12 months post-surgery ($p<0.001$) (Table 2). Prior to surgery, most patients had poor results based on the Rowe score. At the final follow-up, 86.36% of cases (n=19) achieved 'excellent' results, while only one case, 4.5%, showed poor results. The remaining cases achieved good or fair results, as shown in Table 3.

Table 1. The general characteristics of the patient sample.

Age [mean]	29	-
Male [n (%)]	20	(95.2)
Dominant side [n (%)]	18	(81.8)
Number of previous dislocations [mean]	9.22	-
Distribution of dislocation numbers. [n (%)]		
3 to 10	12	(54.54)
11 to 20	7	(31.81)
21 to 30	2	(9)
31 to 40	1	(4.54)
Sports activity [n (%)]	12	(57.1)
Preoperative bone defects [n (%)]	10	(45.45)
Glenoid defect [n (%)]	8	(36.3)
Hill-Sachs lesion [n (%)]	2	(9.1)

Table 2. Pre and postoperative functional evaluation.

Rowe Score	Mean ± SD	Min – Max	P-value
Preoperative	39.21 ±6.3	30 – 48	0.0001
6 months	88.32 ±5.2	71-92	0.0001
12 months	90.78 ±5.8	75 – 97	0.0001

Table 3. The pre-and post-operative Rowe score results

Rowe Score		Excellent	Good	Fair	Poor
Preoperative	n	0	0	1	21
	%	0	0	4.5%	95.4%
6 months	n	0	20	2	0
	%	0	90.9%	9.09%	0
12 months	n	19	1	1	1
	%	86.36%	4.5%	4.5%	4.5%

The comparison between the Operated Shoulder (OS) and the Healthy Shoulder (HS) at the final follow-up revealed statistically significant differences in the range of motion and strength. Specifically, there was a 10-degree limitation in external rotation when the arm was adducted to the side (ER1) and a 13-degree limitation in external rotation at 90° abduction (ER2) in the operated shoulder compared to the healthy shoulder. Additionally, there was an average reduction of 3 kg in internal rotation strength in the operated shoulder compared to the healthy shoulder. Furthermore, a decrease of 5 degrees was observed during elevation movement in the operated shoulder compared to the healthy shoulder. These findings indicate some limitations and reductions in the range of motion and strength in the operated shoulder compared to the healthy shoulder at the final follow-up assessment.

The study reported a postoperative recurrence rate of

9.09%, with two out of 22 shoulders experiencing recurrence. One shoulder, 4.5%, showed radiographic evidence of dislocation after a new traumatic event, while the other shoulder, 4.5%, had a positive apprehension test. No cases of subluxation were noted in the study.

Table 4. Range of motion and strength between operated and healthy shoulders at final follow-up.

	(OS) Mean ±SD	(HS) Mean ±SD	P-value
ER1	76.11 ± 3.9	86.52 ± 3.2	0.01
ER2	71.44 ± 3.6	84.75 ± 2.2	0.004
IR	62 ± 3.1	67 ± 2.9	0.062
ElEV	169.21 ± 4.1	174.22 ± 2.2	0.04
IR-strength	5.2 ± 1.9	8.3 ± 2.1	0.02

ER1: External rotation with the arm adducted to the side. ER2: External rotation at 90° abduction. IR: Internal rotation. ELEV: Elevation
OS: Operated shoulder, HS: Healthy shoulder. SD: Standard deviation

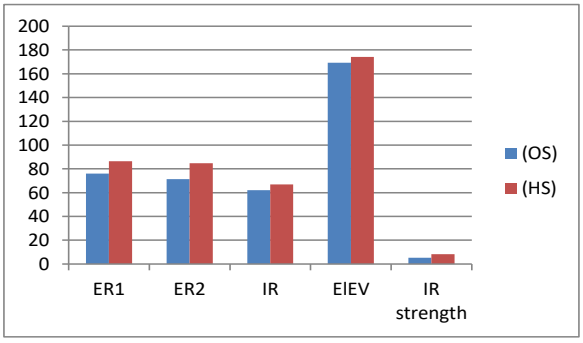

Fig. 1 Differences in range of motion and strength between operated and healthy shoulders at final follow-up.

Table 5. Postoperative Recurrence Rates

Type of recurrence	n	%
Dislocation	1	4.5
Subluxation	0	0
Positive apprehension test	1	4.5

The study findings indicated that 75% of patients engaged in sports successfully resumed their pre-injury activity level. Conversely, only 16.6% managed to return to sports at a diminished capacity. Unfortunately, 8.3% of patients were unable to participate in sports due to recurrent dislocation post-surgery (Figure 2).

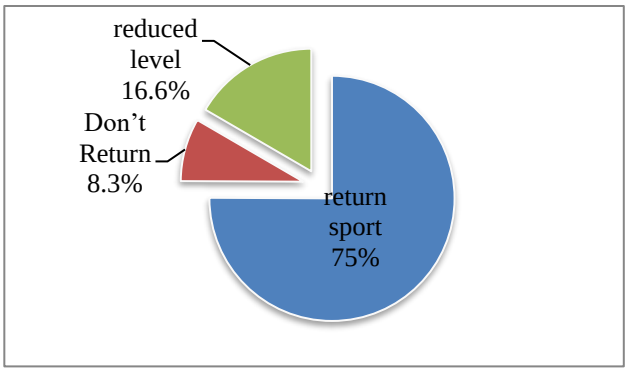

Fig. 2 The distribution of patients according to their resumption of sports activities post-surgery.

The study findings showed no cases of superficial or deep infections, neurovascular injuries, venous thromboembolism, or hematoma. Patients generally responded positively to the surgical outcomes, with 95.2% expressing satisfaction and only 4.5% reporting disappointment.

4.2. Radiographic Results

The postoperative radiological follow-up revealed that the coracoid graft positioning was medially located in one case at 4.5%, flush with the glenoid in 19 cases at 86.36%, and with lateral overhang in two cases at 9.09%.

During the final follow-up, the sample showed a low incidence of radiographic complications. Only one case, 4.5%, reported graft non-union, and in another case, 4.5% showed graft resorption. No occurrences of bone graft dislocation or fracture were observed. Screw breakage or migration did not occur, although screw loosening was experienced in one shoulder 4.5%. Osteoarthritis (OA) was detected in 9% (n=2) of the patients, characterized as (grade I) according to Samilson and Prieto.

Table 6. Postoperative radiographic results

		N	%
Bone graft	**Non union**	1	4.5
	Fracture	0	0
	Resorption	1	4.5
	Dislocation	0	0
	Well Positioning	19	86.36
	Lateral Positioning	2	9.09
	Medial Positioning	1	4.5
Screws	**Loosing**	1	4.5
	Fracture	0	0
	Migration	0	0
Osteoarthritis (grade I)		2	9

The study did not find any significant correlation between the patient's sex, age, dominant shoulder, and the outcomes of the cases.

5. Discussion

The study's results indicate a significant improvement in the mean Rowe score from 39.21 preoperatively to 90.78 after 12 months following the Latarjet procedure, consistent with previous research, such as Roberto et al.'s[15] study. In their study, which included 26 Latarjet procedures with a mean follow-up of 38 months, the mean Rowe score also showed a substantial increase from 36 before the operation to 93 after the operation.

Schroder et al.'s[16] study provides additional context for

the results of the current study on the Latarjet procedure. They also reported good and excellent functional and stability outcomes based on the Rowe score but with a slightly lower mean score of 81.8 compared to the current study's mean score of 90.78 after 12 months. Schroder et al. [16]. reported that out of 52 patients, 36 achieved excellent results, 5 achieved fair results, and 11 achieved poor results. The study also found that 30.7% of the results were unsatisfactory, which contrasts with the high rate of excellent outcomes, 86.36% and the low rate of poor outcomes, 4.5%, found in this study.

The study found that the range of motion in the Operative Shoulder (OS) was lower than that of the Healthy Shoulder (HS), particularly in External Rotation (ER). The mean loss of external rotation range in neutral (ER1) and 90° abduction (ER2) was 10 and 13 degrees, respectively. Additionally, the strength of internal rotation in the affected shoulder decreased by approximately 3 kg compared to the healthy shoulder. Most studies report a mean loss of 10-15 degrees of external rotation after the procedure, although some have described a loss of up to 20 degrees. [10, 17, 18] Chillemi et al.[19] studied 40 patients with a mean follow-up of 24 years. The study confirms that external rotation (ER) is limited in both neutral and 90° abduction, with a mean loss of 9° and 10.4°, respectively. They also found that the operated shoulder had a mean reduction of 2.3 kg in internal rotation strength compared to the contralateral shoulder. In contrast, Godinho et al. [20] found that a larger proportion of patients (13 out of 40) experienced decreased internal rotation, while only 11 patients had limited lateral rotation, with an average of 14.1 degrees.

The variability in outcomes across studies highlights the individualized nature of patient responses to surgery. Factors that contribute to the loss of external rotation include the tethering effect of the transferred conjoined tendon, [6] internal rotator contracture, malpositioning of the bone block, adhesions in the glenohumeral joint, and scapular dyskinesis. [22, 23] The study found that patients' ability to perform daily activities was not significantly affected despite the limitations in range of motion. However, it did impact sports participation. Therefore, it is essential to comprehend the possible postoperative alterations in range of motion and strength subsequent to the Latarjet procedure. This comprehension will aid in customizing rehabilitation strategies and enhancing functional outcomes for each patient.

The study revealed that one patient, 4.5%, experienced a recurrence of dislocation due to poor graft positioning. The bone graft was placed in a medial position that did not follow the natural contour of the anterior glenoid rim, leading to non-union and repeated dislocation during exercises. This study's recurrence rate of dislocation is consistent with the low rates reported in the literature, which range from 0 to 10%. [11, 16] In their systematic review of 1904 shoulders, Griesser et al. [24] found a recurrence rate of 2.9%. Similarly, Malavolta et al. [25] reported a recurrence rate of 4.8% in their sample of 41 shoulders, with 17.1% of cases testing positive on the apprehension test. In the present study, only one case, 4.5%, tested positive on the apprehension test. This emphasizes the importance of correct graft placement in the Latarjet procedure. Hovelius et al. [26] demonstrated in their study that recurrent instability occurred in 83% of patients when the graft was positioned 1 cm or more medial to the anterior glenoid rim. To ensure optimal outcomes and prevent recurrent instability, consensus guidelines recommend placing the graft between 2 o'clock and 5 o'clock on the glenoid surface for the right shoulder and between 10 o'clock and 7 o'clock for the left shoulder, just medial to the chondral surface of the glenoid.[27] It is crucial that the screws pass through both cortical layers and that the graft is positioned carefully, with the limb rotated internally to accept a slight medial position of a few millimeters at most and to avoid the lateral border of the glenoid.[28] By adhering to these recommendations, surgeons can help reduce the risk of recurrent instability and improve the overall success of the Latarjet procedure for shoulder instability.

This study found that the number of preoperative dislocation episodes did not affect the recurrence rates after surgery. In a study of 308 patients, Hardy et al. [29] discovered that the recurrence rates after a Latarjet procedure were not influenced by the number of preoperative dislocation episodes. This finding contrasts with previous research on arthroscopic Bankart repair. [30] This may be due to the fact that the Latarjet procedure is not an anatomic procedure; its stabilization mechanism does not rely on the preoperative status of the anteroinferior capsuloligaments complex, which is likely to be severely damaged after multiple episodes of dislocation.

In the study sample, the mean number of episodes of dislocation prior to surgery was 9.22±1.3, ranging from 3 to 40 episodes. The results indicated that 36.6% of patients had a glenoid bone defect prior to surgery. This finding is attributed to the increased likelihood of soft tissue and bone damage with each anterior shoulder dislocation, leading to an increased risk of recurrence. [24] According to Itoi et al.[31], glenoid bone defects larger than 21% resulted in a 50% decrease in the force required to dislocate the shoulder compared to cases without such erosion. Applying a bone graft to the glenoid defect can increase shoulder stability, reducing the likelihood of dislocation. Therefore, due to the significance of glenoid bone loss in glenohumeral biomechanical stability and the difficulty of glenoid reconstruction in most cases of recurrent traumatic anterior shoulder dislocation, the Latarjet surgery is recommended as the most appropriate procedure for most patients with this condition, especially those who present other risk factors for concomitant instability. This recommendation is supported by the study of Roberto et al. [15]

The study reported a low incidence of complications associated with bone graft, such as non-union or resorption of the graft, at a rate of 4.5% (as shown in Table 6). This low incidence is likely due to the prevention of common technical errors, such as using malleolar screws instead of cancellous screws with a lag effect that can facilitate bone union. [24] In contrast, Chillemi et al. [19] reported non-union in 12.5% of cases (5 patients), partial graft resorption in 7.5% of cases (3 patients), and total resorption in 5% of cases (2 patients).

After surgery, 75% of the athletic patients were able to return to their pre-injury activity level, as shown in Figure 2, with excellent Rowe score results. In contrast, only 16.6% of the athletic patients returned to sports, but with a reduced level of competition or even a change in sport, despite good Rowe functional scores. However, only 8.3% of the athletic patients did not return to sports after surgery. The patient's Rowe score indicated poor functional scores. However, Mizuno et al.[32] the long-term study reported that 57 patients, 93.4%, returned to sport at the same level. In comparison, 5 patients, 8.2%, changed to another type of sport or participated at a lower level due to shoulder-related issues. The primary reasons for this change were suggested to be psychological factors, such as loss of confidence and fear of further injury to the shoulder. It is important to note that psychological factors can influence an individual's decision to participate in various sporting activities.

The study's findings show a low incidence of postoperative osteoarthritis in only two patients (9 % Grade I), which contrasts with previous reports in the medical literature, which have shown osteoarthritis rates ranging from 9% to 30% following Latarjet surgery with longer follow-up periods of up to 40 years.[18, 33]. The differences in results may be due to factors such as the low recurrence rate and the relatively short one-year follow-up period in this study. Other long-term studies have reported varying rates of postoperative arthritis, with some showing higher percentages of more severe arthritis stages. For example, Mizuno et al.[32] reported stage 1 arthritis in 14.7% of cases, stage 2 in 5.9%, and stage 3 in 8.8%, with no cases of stage 4 arthritis during a 20-year follow-up period. In contrast, Roberto et al.[15] found that 42% of patients had no signs of arthropathy, while 42% had mild arthropathy (grade I), 12% had moderate arthropathy (grade II), and 4% had severe arthropathy (grade III) during a mean follow-up period of 38 months.

Additionally, Allain et al. [10] reported that 53% of their patients had lateral overhang of the coracoid graft, which was associated with the development of arthritis. In this study, it was observed that the coracoid graft was positioned laterally in only 9% of cases. The lateral overhang of the coracoid graft is a well-known risk factor for postoperative arthritis. [10, 33] Therefore, it is crucial for the surgeon to prevent lateral overhang of the coracoid graft, which is the most important variable within their control from a technical perspective.

The study did not report any infection or neurological damage cases, which is consistent with the findings of Andrade et al. [34] and Malavolta et al.[25] who also did not report any such complications after Latarjet surgery. These findings are reassuring and suggest an overall safe procedure profile when performed by experienced surgeons. In contrast, according to Gilat et al.'s [21] meta-analysis, infection occurs in approximately 0.7% of cases, while neurological injury occurs in around 0.1% of cases after Latarjet surgery. Although relatively low, these rates emphasize the importance of vigilance and adherence to proper surgical techniques to minimize the risk of such complications.

6. Conclusion

In summary, this study supports using the Latarjet procedure as a reliable and efficient surgical method for managing recurrent anterior shoulder dislocation. The study found excellent postoperative stability, positive functional outcomes, and favourable radiologic outcomes during a follow-up period of at least one year.

References

[1] Frederick M. Azar, S. Terry Canale, and James H. Beaty, *Campbell's Operative Orthopaedics*, 14th ed., Philadelphia, Pa, Elsevier, 2020. [Google Scholar] [Publisher Link]

[2] G. Matthes et al., "Oldie but Goldie: Bristow-Latarjet Procedure for Anterior Shoulder Instability," *Journal of Orthopaedic Surgery*, vol. 15, no. 1, pp. 4-8, 2007. [CrossRef] [Google Scholar] [Publisher Link]

[3] Vilson Ruci et al., "Bristow-Latarjet Technique: Still a Very Successful Surgery for Anterior Glenohumeral Instability - A Forty Year One Clinic Experience," *Open Access Macedonian Journal of Medical Sciences*, vol. 3, no. 2, pp. 310-314, 2015. [CrossRef] [Google Scholar] [Publisher Link]

[4] Adam Rumian et al., "Acute First-Time Shoulder Dislocation," *Orthopaedics and Trauma*, vol. 25, no. 5, pp. 363-368, 2011. [CrossRef] [Google Scholar] [Publisher Link]

[5] M. Latarjet, "Technic of Coracoid Preglenoid Arthroereisis in the Treatment of Recurrent Dislocation of the Shoulder," *PubMed*, vol. 54, no. 4, pp. 604-607, 1958. [Google Scholar] [Publisher Link]

[6] Stephen S. Burkhart et al., "Results of Modified Latarjet Reconstruction in Patients with Anteroinferior Instability and Significant Bone Loss," *Arthroscopy: The Journal of Arthroscopic and Related Surgery*, vol. 23, no. 10, pp. 1033-1041, 2007. [CrossRef] [Google Scholar] [Publisher Link]

[7] Allan A. Young et al., "Open Latarjet Procedure for Management of Bone Loss in Anterior Instability of the Glenohumeral Joint," *Journal of Shoulder and Elbow Surgery*, vol. 20, no. 2, pp. S61-S69, 2011. [CrossRef] [Google Scholar] [Publisher Link]

[8] Umile Giuseppe Longo et al., "Latarjet, Bristow, and Eden-Hybinette Procedures for Anterior Shoulder Dislocation: Systematic Review and Quantitative Synthesis of the Literature," *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, vol. 30, no. 9, pp. 1184-1211, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[9] Vincent Vinh Gia An et al., "A Systematic Review and Meta-Analysis of Clinical and Patient-Reported Outcomes Following Two Procedures for Recurrent Traumatic Anterior Instability of the Shoulder: Latarjet Procedure vs. Bankart Repair," *Journal of Shoulder and Elbow Surgery*, vol. 25, no. 5, pp. 853-863, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[10] J. Allain et al., "Long-Term Results of the Latarjet Procedure for the Treatment of Anterior Instability of the Shoulder," *The Journal of Bone & Joint Surgery*, vol. 80, no. 6, pp. 841-852, 1998. [CrossRef] [Google Scholar] [Publisher Link]

[11] Alexandre Lädermann, et al., "Risk Factors for Dislocation Arthropathy after Latarjet Procedure: A Long-Term Study," *International Orthopaedics*, vol. 37, pp. 1093-1098, 2013. [CrossRef] [Google Scholar] [Publisher Link]

[12] M. Latarjet, "Treatment of Recurrent Dislocation of the Shoulder," *Lyon Chirurgival*, vol. 49, no. 8, pp. 994-997, 1954. [Google Scholar] [Publisher Link]

[13] C.R. Rowe, D. Patel, and W.W. Southmayd, "The Bankart Procedure: A Long-Term End-Result Study," *The Journal of Bone and Joint Surgery*, vol. 60, no. 1, pp.1-16, 1978. [Google Scholar] [Publisher Link]

[14] R.L. Samilson, and V. Prieto, "Dislocation Arthropathy of the Shoulder," *The Journal of Bone & Joint Surgery*, vol. 65, no. 4, pp. 456-460, 1983. [CrossRef] [Google Scholar] [Publisher Link]

[15] Roberto Yukio Ikemoto et al., "Results from Latarjet Surgery for Treating Traumatic Anterior Shoulder Instability Associated with Bone Erosion in the Glenoid Cavity, after Minimum Follow-up of One Year," *Brazilian Journal of Orthopedics*, vol. 46, no. 5, pp. 553-560, 2011. [CrossRef] [Google Scholar] [Publisher Link]

[16] David T. Schröder et al., "The Modified Bristow Procedure for Anterior Shoulder Instability," *American Journal of Sports Medicine*, vol. 34, no.5, pp. 778-786, 2006. [CrossRef] [Google Scholar] [Publisher Link]

[17] Michael P. Banas et al., "Long-Term Follow up of the Modified Bristow Procedure," *The American Journal of Sports Medicine*, vol. 21, no. 5, pp. 666-671, 1933. [CrossRef] [Google Scholar] [Publisher Link]

[18] Gian C. Singer, P.M. Kirland, and R.J. Emery, "Coracoid Transposition for Recurrent Anterior Instability of the Shoulder. A 20-Year Follow-up Study," *The Bone and Joint Journal*, vol. 77-B, no. 1, pp. 73-76, 1995. [CrossRef] [Google Scholar] [Publisher Link]

[19] Claudio Chillemi et al., "Latarjet Procedure for Anterior Shoulder Instability: A 24-year Follow-up Study," *Archives of Orthopaedic and Trauma Surgery*, vol. 141, pp. 189-196, 2021. [CrossRef] [Google Scholar] [Publisher Link]

[20] Glaydson Gomes Godinho, and Paulo Cezar Ventura Monteiro, "Surgical Treatment of Anterior Shoulder Instability using the Didier-Patte Technique," *Revista Brasileira de Ortopedia*, vol. 28, no. 9, pp. 640–644, 1993. [Google Scholar] [Publisher Link]

[21] Ron Gilat et al., "Outcomes of the Latarjet Procedure Versus Free Bone Block Procedures for Anterior Shoulder Instability: A Systematic Review and Meta-Analysis," *The American Journal of Sports Medicine*, vol. 49, no. 3, pp. 805-816, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[22] Stefano Carbone et al., "Scapular Dyskinesis after Latarjet Procedure," *Journal of Shoulder and Elbow Surgery*, vol. 25, no. 3, pp. 422-427, 2016. [CrossRef] [Google Scholar] [Publisher Link]

[23] Matthew D. Saltzman et al., "Efficacy of Surgical Preparation Solutions in Shoulder Surgery," *The Journal of Bone and Joint Surgery*, vol. 91, no. 8, pp. 1949-1953, 2009. [CrossRef] [Google Scholar] [Publisher Link]

[24] Michael J. Griesser et al., "Complications and Re-Operations after Bristow-Latarjet Shoulder Stabilization: A Systematic Review," *Journal of Shoulder and Elbow Surgery*, vol. 22, no. 2, pp. 286-292, 2013. [CrossRef] [Google Scholar] [Publisher Link]

[25] Eduardo Angeli Malavolta et al., "Treatment of Recurrent Anterior Shoulder Dislocation using the Latarjet Technique," *Acta Ortopédica Brasileira*, vol. 31, no. 1, 2023. [CrossRef] [Google Scholar] [Publisher Link]

[26] Lennart Hovelius et al., "The Effect of Capsular Repair, Bone Block Healing, and Position on the Results of the Bristow-Latarjet Procedure (Study III): Long-Term Follow-up in 319 Shoulders," *Journal of Shoulder and Elbow Surgery*, vol. 21, no. 5, pp. 647-660, 2012. [CrossRef] [Google Scholar] [Publisher Link]

[27] Ashish Gupta et al., "Complications of the Latarjet Procedure," *Current Reviews in Musculoskeletal Medicine*, vol. 8, pp. 59-66, 2015. [CrossRef] [Google Scholar] [Publisher Link]

[28] T. Bradley Edwards, and Gilles Walch, "The Latarjet Procedure for Recurrent Anterior Shoulder Instability: Rationale and Technique," *Operative Techniques in Sports Medicine*, vol. 10, no. 1, pp. 25-32, 2002. [CrossRef] [Google Scholar] [Publisher Link]

[29] Alexandre Hardy et al., "Outcomes After Latarjet Procedure: Patients with First-Time versus Recurrent Dislocations," *American Journal of Sports Medicine*, vol. 48, no. 1, pp. 21-26, 2020. [CrossRef] [Google Scholar] [Publisher Link]

[30] Tyler Marshall et al., "Outcomes After Arthroscopic Bankart Repair: Patients with First-Time versus Recurrent Dislocations," *The American Journal of Sports Medicine*, vol. 45, no. 8, pp. 1776-1782, 2017. [CrossRef] [Google Scholar] [Publisher Link]

[31] Eiji Itoi et al., "The Effect of a Glenoid Defect on Anteroinferior Stability of the Shoulder after Bankart Repair: A Cadaveric Study," *The Journal of Bone and Joint Surgery*, vol. 82, no. 1, pp. 35-46, 2000. [CrossRef] [Google Scholar] [Publisher Link]

[32] Naoko Mizuno et al., "Long-Term Results of the Latarjet Procedure for Anterior Instability of the Shoulder," *Journal of Shoulder and Elbow Surgery*, vol. 23, no. 11, pp. 1691-1699, 2014. [CrossRef] [Google Scholar] [Publisher Link]

[33] Lennart Hovelius et al., "One Hundred Eighteen Bristow-Latarjet Repairs for Recurrent Anterior Dislocation of the Shoulder Prospectively Followed for Fifteen Years: Study I-Clinical Results," *Journal of Shoulder and Elbow Surgery*, vol. 13, no. 5, pp. 509-516, 2004. [CrossRef] [Google Scholar] [Publisher Link]

[34] Luciana Andrade da Silva et al., "Evaluation of the Results and Complications of the Latarjet Procedure for Recurrent Anterior Dislocation of the Shoulder," *Brazilian Journal of Orthopedics*, vol. 50, no. 6, pp. 652-659, 2015. [CrossRef] [Google Scholar] [Publisher Link]