

Treatment of Bony Defects in Anterior Shoulder Dislocation-Latarjet Procedure: Short-Term Results

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ABSTRACT

Background: Anterior glenohumeral dislocation is a widespread problem among young athletic populations.

Objective: This study was aimed to evaluate the clinical and the radiological results of patients with recurrent traumatic anterior shoulder instability treated with Latarjet procedure.

Patients and Methods: A clinical trial study was conducted on 18 patients with recurrent traumatic anterior shoulder instability treated at the Department of Orthopedic, Faculty of Medicine, Zagazig University Hospitals. Pre- and post-operative clinical evaluation and radiological assessment was applied.

Results: The average glenoid bone loss was (24.1±2.3 %) ranging from 20 to 27. All cases showed postoperative union and most of them (94.4%) had bony union and only (5.6%) had a fibrous union. Regarding range of motion and the shoulder functional evaluation there was a highly statistically significant improvement in all examined items (p-value<0.001). 123.0 % improvement postoperatively with a highly statistically significant increase in the constant score from (48.1±6.2) to (91.4±3.7) (p-value<0.001). 93.6 % improvement postoperatively with a highly statistically significant increase in the ULCA score from (14.6±2.9) to (31.3±1.8) (p-value<0.001). Most of the studied group (16 cases, 88.8%) didn't have any postoperative complications, one case had a hematoma (5.6%) and one case had a superficial infection (5.6%).

Conclusion: It could be concluded that the open Latarjet procedure has confirmed to be an effective and efficient procedure for shoulder stabilization.

Keywords: Anterior Shoulder, Glenohumeral joint, Latarjet, dislocation.

INTRODUCTION

The glenohumeral joint, which accounts for 50% of all major joint dislocations, is the one that dislocates most frequently. A glenohumeral dislocation affects 1% to 2% of the general population at some point in their lives. Because of its large range of motion and shallow glenoid cavity, which only articulates with a small portion of the humeral head, the shoulder is an unstable joint and is therefore more prone to injury ⁽¹⁾.

The glenohumeral joint capsule, the cartilaginous glenoid labrum (which expands the shallow glenoid fossa), and the rotator cuff muscles all work together to keep the shoulder stable. With a rate of over 95%, anterior dislocation accounts for the majority of shoulder dislocations; however, posterior, inferior (luxatio erecta), superior, and intrathoracic dislocations are also conceivable ⁽²⁾.

Both structural and functional instability, as well as both, can contribute to shoulder instability. Successful therapy depends on determining the source and eliminating it, either surgically in the case of structural instability or physiotherapeutically in the case of functional instability. Patients can experience low incidence of problems, good range of motion, stable repairs, and minimal incidence of recurrence if these crucial parameters are taken care of ⁽³⁾.

Trauma and a number of predispositions can disrupt the shoulder joint's ability to function harmoniously, resulting in the loss of the joint's congruence. The Latarjet procedure, one of the most successful methods, has been proven to be superior, at

least in circumstances with severe glenoid bone loss, among the numerous surgical procedures that have been reported for the treatment of recurrent anterior shoulder dislocation ⁽⁴⁾.

For the treatment of traumatic and nontraumatic anterior shoulder subluxations and dislocations, latarjet surgery is recommended. When there are bone defects that account for more than 25% of the glenoid surface area, it is a reliable surgical option. It can also be used as the primary treatment for recurrent instability in high-risk contact athletes, even when there is just a little bony deficit ⁽⁵⁾.

This study was performed to evaluate the clinical and the radiological results of patients with recurrent traumatic anterior shoulder instability treated with Latarjet procedure.

PATIENTS AND METHODS

This prospective clinical randomized trial study included a total of 18 patients with recurrent traumatic anterior shoulder instability treated at the Department of Orthopedic, Faculty of Medicine, Zagazig University Hospitals.

The 18 patients were 16 males and 2 females, and their average age was (24.3±4.2) ranged from 18 to 35 years.

Ethical consent:

This study was ethically approved by Zagazig University's Research Ethics Committee. Written informed consent of all the participants was obtained. This Work was performed according to

the code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria:

Age from 17 to 40 years, anterior glenohumeral instability with glenoid bone loss > 25%, young patients with heavy physical activity, after failed previous Bankart repair for shoulder instability with bone loss, the presence of a large off-track Hill-Sachs lesion, recurrent anterior glenohumeral instability with epilepsy, patient with severe irreparable soft tissue loss involving the anterior labroligamentous structures and patient with Instability Severity Index Score (ISIS) more than 6.

Exclusion criteria:

Uncontrolled epilepsy. Multidirectional instability of the shoulder (in these traumatic dislocations, patients were able to voluntarily dislocate and relocate the shoulder). Instability associated with paresis of the deltoid rotator cuff, and/or periscapular musculature. Dislocations, laxity in psychiatric patients due to repeated injury (e.g. competitive swimmers), and congenital collagen abnormalities (such as Ehlers-Danlos syndrome and Marfan disease).

Pre-operative assessment:

All patients underwent full clinical evaluation and radiological assessment. Patients counseling was important to decrease patient anxiety and achieve maximum patient compliance. All the patients had their first dislocation reduced in a hospital under sedation or anesthesia. Comparative evaluation of both shoulders was performed for all patients. Any visible deformity and/or muscle atrophy with respect to contralateral shoulder, or any scar tissue related to past trauma or surgery were simply recognized just by a careful inspection. Active and passive range of motion in all planes were measured and noted for both shoulders in every patient. Generalized ligamentous laxity was kept in mind and checked in every patient. Function and strength of rotator cuff were also tested. Neurovascular examination particularly axillary nerve examination was considered as critically important during clinical assessment. All patients were tested for apprehension, relocation & sulcus tests. Preoperative UCLA and constant Scoring systems were applied.

X-ray antero-posterior and axillary views were done for all patients. All patients underwent a 3-Dimensional CT scan with glenoid en-face view made by humeral head subtraction for measurement of the glenoid defect using Pico method (a best-fit circle surface area based on the contralateral glenoid). MRI done for all patients to assess the soft tissue (eg, labrum, capsule, and rotator cuff) in shoulder dislocation. Laboratory investigations were done including CBC, Coagulation profile, Liver and Kidney function tests,

Hb A1c, Hepatitis C, B virus antibodies, and Urine analysis.

Operative technique:

All the patients were operated under general anesthesia. Patients were placed in the beach-chair position with a back cushion. A preoperative physical examination of the shoulder with the patient under anesthesia was done to confirm the positions and degree of glenohumeral instability. Latarjet procedure was applied.

A standard deltopectoral approach was used, coracoid bone graft was harvested and transferred to the glenoid neck after visualization of the antero-inferior glenoid articular surface thorough horizontal split in subscapularis muscle and vertical capsulotomy. The longitudinal axis of the coracoid graft was positioned supero-inferiorly along the glenoid neck and flush with the articular surface. The optimal position is between the 3- and 5-o'clock positions on the glenoid. Definitive graft fixation was achieved with the placement of two 4.0 mm cannulated screws.

The triple effect achieved by the Latarjet technique includes the "bone block effect" by which glenoid bone loss was restored; the "sling effect", limiting anterior translation in abduction and external rotation; and the "ligament effect" by using the coracoacromial ligament stump to repair the medial capsule.

Post-operative follow up:

The patient was observed generally, the vital signs were checked. Patients received intravenous antibiotics for the first 24 hours. First day radiographs were obtained. Drain was removed at 48 hours. In the outpatient clinic, wound condition was followed up and sutures were removed after 15 days from operation. Then during the first 3 months, the patients were examined regularly every 2 weeks. Then during the next 3 months, the patients were regularly examined every month till the end of 6 months. We did assessment for all patients clinically, radiologically and according to UCLA and Constant scores.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test. Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean \pm SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

RESULTS

Table 1 shows that the average age of the studied group was (24.3±4.2) ranging from 18 to 35 years, with the majority of them (77.8%) in the age group from 18-25 years. Regarding sex, most of them (88.9%) were males, and only (11.1%) were females.

Table (1): Demographic characteristics of the studied group.

Demographic data	The studied group	
	No=(18)	%
Age (years) Mean ± SD Median (Range)	24.3±4.2 24 (18-34)	
Age (years) 18-25 years 25-30 years 30-35 years	14 2 2	77.8% 11.1% 11.1%
Sex Male Female	16 2	88.9% 11.1%

Table 2 shows that the average glenoid bone loss by CT among the studied group was (24.1±2.3) % ranging from 20% to 27%.

Table (2): The Glenoid bone loss by CT among the studied group.

The Glenoid bone loss	The studied group	
	No=(18)	%
The GBL (percentage) Mean ± SD Median (Range)	24.1±2.3 25 (20-27)	

All cases (100.0%) showed postoperative union and most of them (17 cases, 94.4%) had bony union and only one case (5.6%) had a fibrous union as shown as table 3.

Table (3): The radiological outcome was assessed by the union type and union rate among the studied group.

The union data	The studied group	
	No=(18)	%
Union Un-union	18 0.0	100.0% 0.0%
The type of union Bony union Fibrous union	17 1	94.4% 5.6%

Table 4 shows that only one case (5.6%) had a constant score with a good outcome with a constant score of 80 while the other (17) cases (94.4%) had excellent outcomes of more than 90 with 123.0% percentage of improvement postoperatively with a highly statistically significant increase (improvement) in the constant score from (48.1±6.2) ranging from 40 to 60 to become (91.4±3.7) ranging from 80 to 95 (p-value<0.001).

Table (4): Comparing pre- and post-operative functional outcomes and constant scores among the studied group.

Clinical Result	Preoperative Mean ± SD Median (Range)	Postoperative Mean ± SD Median (Range)	Paired t-test	p-value
Flexion	146.1±9.9 145 (130-165)	167.1±5.5 165 (160-175)	7.7	0.001**
Abduction	143.3±5.7 145 (135-155)	164.9±3.8 162 (160-170)	13.7	0.001**
Internal rotation	55.5±4.5 55 (45-60)	70.5±3.4 70 (65-75)	13.1	0.001**
External rotation	44.7±3.2 45 (40-50)	79.8±4.1 80 (70-85)	35.3	0.001**
Constant	48.1±6.2 45 (40-60)	91.4±3.7 90 (80-95)	28.6	0.001**
Percentage of improvement	123% (63%-220%)			

**Statistically highly significantly different

Table 5 shows that only one case (5.6%) had a ULCA score with a fair outcome (unsatisfactory) with a ULCA score of 26 while the other (17) cases (94.4%) had excellent outcomes more than 27 with 93.6% percentage of improvement postoperatively with a highly statistically significant increase (improvement) in the ULCA score from (14.6±2.9) ranging from 10 to 20 to become (31.3±1.8) ranging from 26 to 34 (p-value<0.001).

Table (5): Comparing pre and post-operative UCLA scores among the studied group.

Total score	Preoperative	Postoperative	Paired t-test	p-value
	Mean ± SD Median (Range)	Mean ± SD Median (Range)		
UCLA	14.6±2.9 15 (10-20)	31.3±1.8 31 (26-34)	24.7	0.001**
Percentage of improvement	93.6% (50-137%)			

**Statistically highly significantly different.

Table 6 shows that most of the studied group (16 cases, 88.8%) didn't have any postoperative complications, one case had a hematoma (5.6%) and one case had a superficial infection (5.6%).

Table (6): Postoperative complications among the studied group.

Postoperative complications	The studied group	
	No= (18)	%
Hematoma	1	5.6%
Superficial infection	1	5.6%
No	16	88.8%

Table 7 shows that there was a statistically significant higher postoperative constant score among patients who didn't have any complications than patients with complications. Regarding sex, presence of sulcus, and sports activity, there was no statistically significant association with the constant score.

Table (7): Relation between Post-operative constant score with patients' sex, presence of sulcus, and sports activity among the studied group.

Variables	Post-operative constant score Mean ± SD	Test	
		T	p-value
Sex			
Male (no.=16)	91.3±3.8	0.4	0.6
Female(no.=2)	92.5±3.9		
Sulcus			
Positive(no.=5)	90.0±6.1	0.9	0.3
Negative(no.=13)	91.9±2.5		
Sport activity			
Mild(no.=12)	90.8±4.2	0.87	0.3
Heavy(no.=6)	92.5±2.7		
Postoperative complications			
Yes (no.=2)	85.0±7.1	3.1	0.006*
No(no.=16)	92.2±2.6		

*Statistically significantly different.

DISCUSSION

As regard the age, the average age of the studied group was (24.3±4.2) ranging from 18 to 35 years, with the majority of them (77.8%) in the age group from 18-25 years. That was in close to the results of **Chillemi et al.** ⁽⁶⁾ who followed 40 patients underwent an open Latarjet procedure. All the patients were available for follow-up at an average of 25.6 years. However, **Ernstbrunner et al.** ⁽⁷⁾ evaluate a total of 39 consecutive patients (40 shoulders) with a mean age of 48 years old.

Regarding sex in our study, most of them (88.9%) were males, and only (11.1%) were females. The result was nearly agreed with **Varacallo et al.** ⁽⁸⁾ who reported that 72% of shoulder dislocations occurred in men, the highest incidence rate (80.5 per 100000 person-years) occurred in male patients aged 16 to 20 years, the highest incidence rate in female patients occurred in women aged 61 to 70 years. Also, **Thon et al.** ⁽⁹⁾ reported a total of 53 patients, including 10 shoulders in 9 patients with a seizure disorder (88.9% male; mean age, 29.2 years [range, 20-37]), and 44 shoulders in 44 non- seizure disorder patients (86.4% male; mean age, 30.3 years [range, 18-52]).

Regarding the glenoid bone loss, the average glenoid bone loss by CT among the studied group was (24.1±2.3) ranging from 20 to 27. **McHale et al.** ⁽¹⁰⁾ demonstrated that Coracoid transfer, particularly the Latarjet procedure, has become the treatment of choice for recurrent anterior shoulder dislocation with loss of 20% to 30% of the glenoid surface area and may also be considered for the primary treatment of recurrent instability in the high-risk contact athlete, even in the setting of limited osseous deficiency.

Regarding the union in the radiological outcome, (100.0%) showed postoperative union and most of them (17 cases, 94.4%) had bony union and only one case (5.6%) had a fibrous union. In a systematic review by **Griesser et al.** ⁽¹¹⁾ an analysis of 45 studies (1904 shoulders) demonstrated 174 cases of nonunion or fibrous union, an overall nonunion rate of 9.1%. The undersurface of the coracoid graft should be decorticated as well as the anterior inferior glenoid rim to a flat surface; in addition, the two screws should be placed parallel to the glenoid face to minimize the risk of nonunion of the graft.

Regarding the result, there was a highly statistically significant increase (improvement) in all examined items (p-value<0.001) where; Flexion was improved from (146.1±9.9) ranging from 130 to 165 to become (167.1±5.5) ranging from 160 to 175. Abduction was improved from (143.3±5.7) ranging from 135 to 155 to become (164.9±3.8) ranging from 160 to 170. Internal rotation was improved from (55.5±4.5) ranging from 45 to 60 to become (70.5±3.4) ranging from 65 to 75. External rotation was improved from (44.7±3.2) ranging from 40 to 50 to become (79.8±4.1) ranging from 70 to 85.

The result was agreed with results attained by **Yang et al.** ⁽¹²⁾ who reported that the range of motion (ROM) and the shoulder functional evaluation (visual analogue scale [P< 0.001], American shoulder and elbow surgeon's score [P< 0.001], and UCLA score [P< 0.001]) in patients who underwent Bristow-Latarjet procedures were significantly improved. However, **Moroder et al.** ⁽¹³⁾ reported that Strength and range of motion showed no significant differences except for diminished internal rotation capacity in the Latarjet group at every follow-up time point (P < .05). Although the causes therefore remain speculative, a possible explanation is the L shaped tenotomy of the subscapularis in Latarjet.

In our study, only one case (5.6%) had a constant score with a good outcome with a constant score of 80 while the other (17) cases (94.4%) had excellent outcomes of more than 90 with 123.0 % improvement postoperatively with a highly statistically significant increase (improvement) in the constant score from (48.1±6.2) ranging from 40 to 60 to become (91.4±3.7) ranging from 80 to 95 (p-value<0.001). that was close to **Zhu et al.** ⁽¹⁴⁾ who reported that Constant-Murley score was significantly improved to 95.6±5.6 (P=0.008) after surgery.

According to the current study, only one case (5.6%) had a ULCA score with a fair outcome (unsatisfactory) with a ULCA score of 26 while the other (17) cases (94.4%) had excellent outcomes more than 27 with 93.6% percent of improvement postoperatively with a highly statistically significant increase (improvement) in the ULCA score from (14.6±2.9) ranging from 10 to 20 to become (31.3±1.8) ranging from 26 to 34 (p-value<0.001). **Li and Jiang** ⁽¹⁵⁾, reported that UCLA score (p = 0.014) and Constant score (p = 0.046) were significantly better in Twenty-five shoulders of 25 patients who were available for a mean follow-up of 31.6 months after open Latarjet procedure.

Regarding the complications, most of the studied group (16 cases, 88.8%) didn't have any postoperative complications, one case had a hematoma (5.6%) treated by ligation of cephalic vein and one case had a superficial infection (5.6%) need only antibiotics and dressing. **Kumar et al.** ⁽¹⁶⁾ also reported hematoma in one patient treated by reincision and good hemostasis and ligation of the cephalic vein. **Malahias et al.** ⁽¹⁷⁾ reported Two out of the nine studies (22.2%) reported in total four postoperative cases of infection (four patients out of 231, rate 1.7).

In our study, regarding sex, presence of sulcus, and sports activity, there was no statistically significant association with the constant score. **Goodrich et al.** ⁽¹⁸⁾ did not identify a significant difference between males and females in rates of apprehension "Relative risk (RR) = 0.68; 95% Confidence interval (CI) = 0.37, 1.27; P = .2300" or return to sport "Relative risk (RR) = 0.98; 95% Confidence interval (CI) = 0.81, 1.18; Evolution of

heterogeneity (I^2) = 0%; $P = .8110$ ” for arthroscopic Bankart repair or open Latarjet procedure.

CONCLUSION

It could be concluded that the open Latarjet procedure has confirmed to be an effective and efficient procedure for shoulder stabilization.

We recommend further studies taking large sample size and performing multicentric studies so we can generalize the data.

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