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Outcomes of Latarjet Procedure Versus Bankart Repair With Remplissage in Recurrent Anterior Shoulder Dislocation with Bipolar Bony Defects

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Abstract

Background: Recurrent anterior instability may be associated with a high incidence of humeral and/or glenoid bone lesions reaching between 90% and 95% of the patients. Studies have shown that in case of failure to address significant bony lesions either on the glenoid side, humeral side or both sides (bipolar lesions), poor outcomes would be obtained after Bankart repair.

Materials and methods: A randomized clinical trial study was conducted on fifty patients with recurrent anterior shoulder dislocation and bipolar bony lesions. The patients were divided randomly into 2 groups using a simple randomization: group 1 was treated by arthroscopic Remplissage with a Bankart repair (RB) and group 2 was treated by open Latarjet procedure. All patients enrolled in this study were examined thoroughly for their pre and postoperative range of motion and shoulder stability. All patients were assessed pre and postoperatively according to Rowe, and Walch-Duplay scores.

Results: The Remplissage Bankart group (RB) included 16 males (64%) and 9 females (36%) with a mean age of 22.6 years old (range 19-28 years old). The patients in both groups showed significant improvement of Rowe, and Walch-Duplay scores at the final follow up.

Conclusion: both Remplissage and Latarjet procedures are safe and reliable and provide satisfactory outcomes. However, the Remplissage group had a significant decrease in the external rotation range of motion rather than in the Latarjet group.

Keywords: Anterior shoulder dislocation; Remplissage; Latarjet; Bipolar lesion; Glenohumeral ligament; Glenoid bone lesions; Bankart repair

Introduction

Recurrent shoulder dislocation occurs commonly in young active individuals [1]. Most of them cause damage of the anteroinferior labrum and glenohumeral ligament [2,3]. Bankart repair was described in 1923 to treat these conditions and it showed good results throughout the years in selected patients [2,4].

Recurrent anterior instability may be associated with a high incidence of humeral and/or glenoid bone lesions reaching between 90% and 95% of the patients [5-7]. Posterolateral impaction fracture of the humeral head (Hill–Sachs lesion) is a common finding associated with anterior shoulder dislocation [8]. In addition to the pathognomonic Bankart lesion, a Hill–Sachs lesion is present in approximately 47 % of first-time anterior glenohumeral dislocations and up to 90 % of recurrent cases [9,10]. Hill-Sachs defects

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differ in size and orientation, producing variable effects on subsequent shoulder instability. Some research suggests that, when a lesion represents more than 20% of the diameter of the humeral head, the arc of motion available before the lesion engages the anterior glenoid rim in abduction and external rotation is reduced, facilitating an anterior dislocation [11]. The term engaging Hill–Sachs lesion was used by Burkhart and De Beer to describe the leverage of the humeral head from the glenoid rim in the presence of a large bony defect. They concluded that the recurrence rate of patients with "inverted pear" glenoid was 67% when they only underwent a Bankart repair [12]. Studies have shown that in case of failure to address significant bony lesions either on the glenoid side, humeral side or both sides (bipolar lesions), poor outcomes would be obtained after Bankart repair [13,14].

The remplissage procedure and Latarjet coracoid transfer, are two procedures aimed at limiting defect engagement and subsequent dislocation [15]. The remplissage procedure, initially described by Purchase et al. [15], involves an arthroscopic posterior capsulodesis and infraspinatus tenodesis into the Hill-Sachs defect [15]. This converts the intraarticular defect into an extra articular defect and prevents engagement through a soft tissue bumper effect [16]. Despite evidence showing that remplissage can increase stability and reduce the recurrence of anterior glenohumeral dislocations, there is a controversy in literature regarding its effect on glenohumeral range of motion [17]. Similarly, the Latarjet procedure, more commonly used in the reconstruction of glenoid-sided bone loss, has been proposed as a treatment for engaging Hill-Sachs defects [18,19]. Transfer of the coracoid process to the anteroinferior glenoid rim extends the glenoid arc length, providing not only additional bony support but also a restrictive soft tissue sling effect that resists anterior translation of the humeral head [20]. By increasing the glenoid arc length, and subsequently the distance of the reconstructed anterior glenoid rim, greater external rotation and anterior translation are required before a defect can engage, thus reducing the frequency of glenohumeral dislocation [21,22]. The two methods rely on two different concepts for the management of such cases and little evidence exists to support one procedure over the other.

The purpose of this study is to compare the clinical outcome of arthroscopic remplissage versus open Latarjet procedures in cases of recurrent shoulder dislocation with bipolar bony lesions.

Materials and Methods

Between February 2020 and July 2022, a randomized clinical trial study was conducted on fifty patients with recurrent anterior shoulder dislocation and bipolar bony lesions. The study was presented to the research Ethics Committee of our institute and approved. Informed consent was taken from the patients. The patients were divided randomly into 2 groups using a simple randomization: group 1 was treated by arthroscopic Remplissage with a Bankart repair (RB) and group 2 was treated by open Latarjet procedure. Each group included 25 patients. All cases were followed up for at least 2 years. The inclusion criteria were more than 2 episodes of anterior dislocation, patients less than 35 years old, and significant bone loss: Hill-Sacks over 15% of the head circumference (using the residual articular arc and percentage of articular arc bone loss) and glenoid bone defect less than 20% of the glenoid diameter as measured by a CT (using the best-fit circle surface area method). Exclusion criteria were glenoid bone loss greater than 20% of the glenoid diameter, previous shoulder surgery, associated cuff tear, and multidirectional instability.

A preoperative CT scan and MRI of the affected shoulder were done for all patients to assess the size of the Hill-Sacks lesion and the anterior glenoid bone loss. All patients enrolled in this study were examined thoroughly for their pre and postoperative range of motion and shoulder stability. All patients were assessed pre and postoperatively according to Rowe, and Walch-Duplay scores.

Surgical Technique for arthroscopic Remplissage with Bankart repair:

The procedure is performed with the patient in a beach chair position under general anaesthesia and Interscalene block. A standard posterior portal was done for glenohumeral inspection and visualization of the Bankart lesion and The Hill-Sacks lesion. An anterior portal was done and the scope was switched to that portal. A posterolateral portal was created using a spinal needle directed perpendicular to the Hill-Sacks lesion that was abraded with a burr through that portal. One or two 5mm rotator cuff anchors (corkscrew, Arthrex, FL, USA) were placed in the Hill-Sacks according to its size and penetrating graspers were used to retrieve the sutures through the infraspinatus tendon in a mattress fashion without tying the knots.

The scope is switched back to the posterior portal to repair the Bankart lesion with 2 or 3 all suture anchors (1.8 FiberTak, Arthrex, FL, USA). The sutures are passed through the labrum in a mattress way and the knots are tied.

After that, the scope is switched to the anterior portal to tie the knots and fill the Hill-Sacks with the infraspinatus tendon.

Surgical Technique for open Latarjet:

All patients were operated in a low beach chair position under general anesthesia. A 5cm skin incision is made, starting at the tip of the coracoid process and extending inferiorly. The delto-pectoral interval is located and the cephalic vein is identified and retracted laterally with the deltoid muscle. A self-retaining retractor is then placed between the pectoralis

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major and the deltoid, exposing the conjoint tendon and the coracoid process. The pectoralis minor muscle and the coracoacromial ligament were detached from the coracoid process with the electrocautery. A coracoid osteotomy was done at its base using a curved osteotome followed by decortication of the inferior aspect of the coracoid process with an oscillating saw till a bleeding surface to enhance the bony union.

Two holes were drilled in the coracoid with a 3.2 drill bit. The subscapularis muscle was split in line with its fibers between the upper two third and lower third. Then the capsule was opened longitudinally exposing the glenoid neck which was prepared by removing the labrum and capsule and decortication to create a bleeding surface. Then, the coracoid was fixed to the anterior glenoid bone, flush with the articular cartilage using two 3.5 mm titanium fully threaded screws.

Postoperative care

All patients were placed in a sling for 4 weeks and were seen at 2, 6, and 12 weeks postoperatively. Postoperative radiographs were done immediately postoperatively for both groups and at 2 months to assess graft integrity and scews position for the Latarjet group. Passive range of motion started at 2 weeks and progressed to active range of motion after 6 weeks. The patients were allowed to resume sport after 3 months. The patients were followed up for at least 2 years. At the final visit, the ranges of motion were recorded and the functional outcomes were assessed using Rowe and Walch-Duplay scores.

Statistical analysis

Statistical analysis includes results that are expressed as the mean and the standard deviation. Pre and postoperative clinical scores were compared using different tests. $P < 0.05$ was considered to be statistically significant.

Results

The Remplissage Bankart group (RB) included 16 males (64%) and 9 females (36%) with a mean age of 22.6 years old (range 19-28 years old). The mean number of dislocations was 6.95 (range 4-12 dislocations). Out of 25 patients 5 only were athletes (20%). The mean duration of follow up was 27.1 months. The Latarjet group included 14 males (56%) and 11 females (44%) with average age of 24.2 years old (range 18-30 years old). The mean number of dislocation in this group was also 7.33 dislocations (range 5-12 dislocations). In this group, 6 patients (24%) were athletes. The mean follow-up duration was 27.6 months. All patients in both groups reported history of trauma that resulted in the first dislocation that necessitated reduction under general anaesthesia (Table 1).

The patients in both groups showed significant improvement of Rowe, and Walch-Duplay scores at the final follow up. The mean Rowe score in the Remplissage Bankart group (RB) improved from 48.2±12.3 points preoperatively to a mean of 91.0±7.9 points postoperatively (p=0.0013*). The Walch-Duplay score in the same group also improved from a mean of 42.6±7.2 points preoperatively to a mean of 88.9±8.03 points postoperatively (p=0.001*). In the Latarjet group, the mean preoperative Rowe, and Walch-Duplay scores improved from 44.3±9.2, and 40.1±6.92 points respectively to a postoperative mean of 92.7±12.3 and 91.3±11.7 points respectively (p=0.0001*, p=0.0001*). The 2 groups showed no significant difference at the final

Table 1: Comparison between the two studied groups regarding basic data.

	Group I "Bankart repair" "n=25"	Group II "Open latarject" "n=25"	p
Age	19-28	18-30	
Range	22.6±6.2	24.2±4.23	0.211
Mean±S.D.			
Age of first intability episodes			
Range	16-25	17-26	
Mean±S.D.	20.1±4.01	20.98±5.11	0.521
No of episodes	45995	45996	
Range	6.95±3.25	7.33±3.85	0.411
Mean±S.D.			
Sex	16 (64.0%)	14 (56.0%)	
Male	9 (36.0%)	11 (44.0%)	0.365
Female			
Duration of follow up	25-30	25-31	
Range	27.1±2.16	27.6±2.14	
Mean±S.D.			0.654

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follow up as regards the Rowe score, The Walch- Duplay score and the internal rotation range of motion (Table 2). However, the patients with the Remplissage Bankart group showed significant external rotation deficit as the mean loss of external rotation of the operated shoulder at last follow-up versus baseline was about 10.1^0 with the elbow at the side (ERs) (p=0.006*) and about 13.1^0 with the elbow at 90^0 of abduction (ERab) (p=0.002*). The patients in the Latarjet group had also postoperative external rotation deficit but this was not significant (p=0.211, p=0.698). Furthermore, at the final follow up the Remplissage Bankart group showed a significant mean external rotation deficit in abduction and adduction when compared with the Latarjet group (p=0.032*, p=0.002*) (Table 2,3). In both groups, there was no postoperative wound infection, haematoma, or neurovascular complication. The patients were satisfied with the procedures and resumed their activities.

Table 2: Comparison between pre and post operative functional outcome in the two groups at the end of follow up.

	Group I "Remplissage Bankart repair" "n=25"		P value	Group II "Open Latarject" "n=25"		P value
	Pre operative	Post operative		Pre operative	Post operative	
Functional scores						
Rowe score	48.2±12.3	91.0±7.9	0.0013*	44.3±9.2	92.7±12.3	0.0001*
Walch-Duplay score	42.6±7.2	88.9±8.03	0.001*	40.1±6.92	91.3±11.7	0.0001*
Motion measurements						
ERs	56.1±4.98	46.9±5.3	0.006*	59.2±6.21	54.1±6.1	0.211
ERab	73.2±8.2	60.1±7.3	0.002*	73.2±7.98	68.6±8.01	0.698
IR	76.8±7.25	76.2±7.42	0.426	75.2±6.98	74.2±7.1	0.33

Table 3: Comparison of the final outcome at the end of follow up between the two studied groups.

	Group I "Bankart repair" "n=25"	Group II "Open latarject" "n=25"	P value
Functional scores			
Rowe score	91.0±7.9	92.7±12.3	0.499
Walch-Duplay score	88.9±8.03	91.3±11.7	0.525
Motion measurements			
ERs	46.9±5.3	54.1±6.1	0.032*
ERab	60.1±7.3	68.6±8.01	0.002*
IR	76.2±7.42	74.2±7.1	0.852

Discussion

Bipolar bone defect in recurrent anterior shoulder dislocation may be present in more than 90% of patients and thus may have an effect on the recurrence of shoulder instability [5-7]. It is clear that soft tissue assessment is important in cases of shoulder instability but also bone loss should be taken into consideration as the amount of bone loss affect both surgical decision making and the outcomes [23]. Previously bone loss of the humeral and glenoid sides was assessed separately but studies (describing the glenoid track, on track, off track lesions and the concept of bipolar bone defect) have shown the interplay between these elements and their role in recurrent instability. Burkhart and De Beer in 2000 were the first to describe the importance of bipolar bone loss when they found failure of isolated arthroscopic Bankart repair of engaging Hill-Sacks in a pear shaped glenoid [12].

Yang et al. [24] in their study showed that both Remplissage and Latarjet procedures had no significant difference in treating recurrent anterior shoulder dislocation with bipolar bone defects in 189 patients [24]. However, the internal rotation was significantly less in the remplissage group than in the Latarjet group and they attributed this to the possibility of rotator cuff tenodesis. They also found that recurrence rate in the Remplissage group was significantly higher with glenoid bone loss greater than 15% and in contact athletes [24].

Degen et al. [25]. in a cadaveric biomechanical study using a surgically created 25% Hill-Sacks lesion but with intact glenoid bone compared Latarjet with Remplissage in 8 cadavers. They found that both procedures were effective in reducing the rate of dislocation. However, the rotational range of motion in abduction was significantly less in the Latarjet group [25].

Cho et al. [26] conducted a comparative study on 72

patients with an engaging Hill-Sacks and glenoid bone loss less than 25%. They concluded that both procedures were safe and reliable. However, the external rotation range of motion was significantly reduced in both groups postoperatively [26].

In our study, both groups showed significant improvement of both the Rowe and Walch-Duplay scores. Both techniques provided excellent outcomes and no one procedure could be preferred over the other like in the other studies. However, we found that the external rotation was reduced postoperatively in both groups but significantly more in the Remplissage group which coincides with many studies [27,28]. As regards the internal rotation, it was minimally reduced post operatively in both groups but without any significant difference. We had no recurrence rate in our study and this could be attributed to the small sample size and also to the fact that the contact athletes in our study decided to discontinue their sport.

There are some limitations to this study. First the number of studied patients is small and a larger number would give more data. Second, the follow up period is short and a long-term follow-up is better needed in the future. Third, the graft healing and its effect on shoulder stability is better to be studied in the future. Fourth, it would be better to study other variables in more details like size of the Hill-Sacks and glenoid bone loss and the effect of different types of sports.

In conclusion, for recurrent anterior shoulder dislocation with bipolar bony defect, both Remplissage and Latarjet procedures are safe and reliable and provide satisfactory outcomes. However, the Remplissage group had a significant decrease in the external rotation range of motion rather than in the Latarjet group.

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