Revision Arthroscopic Bankart Repair Versus Arthroscopic Latarjet for Failed Primary Arthroscopic Stabilization With Subcritical Bone Loss

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Background: Limited evidence is available regarding the recommended technique of revision surgery for recurrent shoulder instability. Only 1 previous study has compared the results of soft tissue repair and the Latarjet technique in patients with persistent shoulder instability after primary surgical stabilization.

Purpose/Hypothesis: To evaluate the results of revision surgery in patients with previous surgical stabilization failure and subcritical glenoid bone defects, comparing repeated Bankart repair versus arthroscopic Latarjet technique. The hypothesis was that Latarjet would be superior to soft tissue procedures in terms of objective and subjective functional scores, recurrence rates, and range of movement.

Study Design: Cohort study; Level of evidence, 3.

Methods: Included were 45 patients (mean age, 29.1 ± 8.9 years) with subcritical bone loss (<15% of articular surface) who had undergone revision anterior shoulder instability repair after failed Bankart repair. Of these, 17 patients had arthroscopic Bankart repair and 28 had arthroscopic Latarjet surgery. Patients were evaluated at a minimum of 2 years postoperatively with the Rowe score, Western Ontario Shoulder Instability Index, and Subjective Shoulder Value. Subluxation or dislocation episodes were considered failures.

Results: No statistically significant differences were found between groups in age, sex, sporting activity, preoperative Rowe score, or the presence of hyperlaxity or bony lesions. At revision arthroscopy, 20 shoulders showed a persistent Bankart lesion, 13 a medially healed labrum, and 6 a bony Bankart. In 6 patients, no abnormalities were present that could explain postoperative recurrence. In the Bankart repair group, 7 patients underwent isolated Bankart procedures; in the remaining 10 cases, a capsular shift was added. No significant differences were found between the Bankart and Latarjet groups in outcome scores, recurrence rate (11.8% vs 17.9%, respectively), or postoperative athletic activity level. The mean loss of passive external rotation at 0° and 90° of abduction was similar between groups.

Conclusion: Arthroscopic Latarjet did not lead to superior results compared with repeated Bankart repair in patients with subcritical glenoid bone loss and recurrent anterior shoulder instability after Bankart repair.

Keywords: shoulder instability; anterior; recurrence; revision; arthroscopy; Latarjet; Bankart

Management of persistent shoulder instability after a failed primary stabilization procedure continues to pose a challenge. Revision stabilization surgeries add difficulties not always present during initial procedures. The anatomic features can be severely distorted, and frequently, it is difficult to identify the anatomic lesions to be reconstructed or the precise cause of recurrence. As a result, overall failure rates ranging from 5.5% to 42.7% have been estimated for revision surgical procedures.[4,12,15,22]

Although many treatment alternatives exist for revision shoulder stabilization, limited evidence is available regarding the optimum technique.[1,7,9,10,12,20,25] Although most studies assess revision Bankart repair with or without capsular plication,[15,21] others recommend systematic use of the Latarjet procedure.[21] The presence of a severe glenoid bone defect can be a major reason for recurrence and is regarded as a clear indication for the Latarjet technique for revision of failed Bankart repair. However, there is no consensus on

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the adequate technique to use in cases with subcritical bone defects.[2,8] Few studies have compared the results of revision Bankart repair versus the Latarjet technique in persistent shoulder instability after primary surgical stabilization.[5-7] In a series of 11 patients, similar outcomes were obtained after selective capsular repair and Latarjet procedure.[7] Similar results were reported in a comparison between arthroscopic Bankart repair and open Latarjet.[6] The arthroscopic Latarjet procedure is an alternative treatment. Both techniques, open and arthroscopic Latarjet, have similarly low rates of complications, recurrent instability, and need for revision surgery. Arthroscopic Latarjet procedures are associated with less early postoperative pain but require increased operative time and a learning curve.[16,17,24]

The aim of this study, therefore, was to evaluate results of revision surgery in patients with previous surgical stabilization failure and subcritical glenoid bone defects, comparing repeated Bankart repair with arthroscopic Latarjet technique. It was hypothesized that the Latarjet procedure would be superior to soft tissue repair for treating failed shoulder instability repair. Latarjet was considered superior if any of the outcome measurements used for comparison obtained better results: objective functional and patient-reported outcomes, recurrence rate, and passive external rotation.

METHODS

This was a single-center retrospective study of 45 consecutive patients (mean age, 29.1 ± 8.9 years) without critical glenoid bone defects who underwent arthroscopic revision repair for anterior shoulder instability after failed open or arthroscopic Bankart procedure by the senior author (E.C.). Bone defects were considered subcritical if they involved $<15\%$ of the articular glenoid surface, and all patients with critical bone defects involving $>15\%$ of the glenoid were revised with the arthroscopic Latarjet technique. The study was approved by the ethics committee of our institution, and written informed consent was obtained from all patients.

We considered the index surgery to have failed if a patient had postoperative subluxation or dislocation and a positive apprehension sign in abduction and external rotation that interfered with daily or athletic activities. One single senior surgeon performed all procedures (E.C.) included in the study between January 2007 and December 2016.

Inclusion criteria were patients experiencing shoulder instability repair after failed open or arthroscopic Bankart procedure. Only patients with documented subcritical glenoid bone defects involving $<15\%$ of the articular surface were included in the study so as to obtain a homogeneous, comparable cohort of patients. Exclusion criteria were the presence of posterior or multidirectional instability, shoulder instability associated with rotator cuff tear, glenoid bone defects involving $>15\%$ of the articular surface, and revision surgery performed with techniques different from those previously mentioned. We also excluded comorbidities affecting bone healing as well as workers' compensation cases.

Instability direction was suspected based on the patient's description of the event and physical examination. These findings, combined with radiographic images and preoperative examination under anesthesia, allowed us to verify anterior instability. Anterior translation was assessed by applying an anterior force to the shoulder with the arm positioned in 90° of abduction. Posterior translation was examined by applying a posterior force with the arm elevated 90°, in 30° of abduction, and in 90° of internal rotation. Inferior translation was evaluated with the sulcus test. Patients with excessive anterior, inferior, and posterior humeral head translation were considered to have multidirectional instability and therefore excluded. Hyperlaxity diagnosis was based on the Beighton criteria.

All patients had conventional anteroposterior (AP) and Y-view radiographs of the shoulder as well as a magnetic resonance imaging scan. Glenoid defects were measured using specific software in the most lateral sagittal image of the glenoid according to the "radius-diameter ratio" method after the best-fit circle was superimposed to the glenoid.[3] Surgical data, complications, and reoperations were recorded. There were no dropouts, and 2-year data were collected for all patients.

A total of 17 patients (37.8%) underwent arthroscopic revision soft tissue repair (Bankart repair with or without capsular shift), and the remaining 28 (62.2%) patients underwent an arthroscopic Latarjet procedure. The revision technique was selected based on the practice of the senior surgeon, who chose the surgical technique according to current evidence in the literature. Although Bankart revision repair has been classically regarded the procedure of choice for postoperative recurrent anterior shoulder instability, this practice changed in 2012 after publications reported consistent, satisfactory results with the Latarjet procedure in this difficult population.[11,13,21] Therefore, before 2012, patients with recurrent postoperative

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instability were scheduled for revision Bankart repair if the bony Bankart lesion involved <15% of the glenoid articular surface and for Latarjet only if the defect was larger. After 2012, all patients surgically revised for shoulder stabilization were scheduled for arthroscopic Latarjet regardless of the presence or absence of glenoid bone defect.

Surgical Technique

Arthroscopy was performed using distraction with the patient in the beach-chair position. Intra-articular lesions were carefully evaluated, visualizing the labrum and the entire joint (anterior and posterior compartments, axillary pouch, and undersurface of the rotator cuff) using posterior and anterosuperior portals. Appropriate procedures were performed to treat all abnormalities. To perform soft tissue repair, the capsulolabral complex was elevated, the glenoid neck was abraded, and the complex was reattached to the anterior glenoid rim using absorbable tricalcium phosphate anchors (Lupine; DePuy Mitek). In the group of patients scheduled for arthroscopic Latarjet, the technique was performed as described by Lafosse and Boyle,[19] and specific instrument sets and screws were used (DePuy Mitek).[16] Postoperative treatment entailed the use of a simple sling for 4 weeks in patients undergoing soft tissue stabilization and for 3 weeks in patients who underwent arthroscopic Latarjet surgery. Afterward, all patients followed the same postoperative protocol. Range of motion (ROM) exercises were prescribed as tolerated, and physical therapy was scheduled 6 weeks after surgery.

Data Collection

Patients had a minimum follow-up of 2 years by an independent examiner who assessed pre- and postoperative Rowe scores.[23] The Western Ontario Shoulder Instability Index (WOSI)[18] and Subjective Shoulder Value (SSV) score[14] were assessed only postoperatively. Glenohumeral ROM was measured to assess external rotation (ER) deficit with the elbow at the side (ER1) and with the arm at 90° of elevation (ER2). A goniometer was used to measure ROM. The level of physical activity was classified into 5 categories: type 0, no sporting activity; type 1, noncontact sports (eg, swimming the breaststroke, rowing, bowling, and running); type 2, nonoverhead sports (eg, cycling, motorcycling, or water skiing); type 3, overhead sports without forced abduction and external rotation (eg, swimming the crawl, weightlifting, golfing, and sailing); or type 4, overhead hitting sports or contact sports with a high risk of falls (eg, basketball, handball, volleyball, tennis, soccer, downhill skiing, rugby, judo, and karate).[8] Those cases with postoperative subluxation or dislocation were considered failures. At final follow-up, standard AP and lateral Y-view radiographs were obtained in patients undergoing soft tissue revision repair, whereas those revised with arthroscopic Latarjet revision surgery were assessed with computed tomography (CT) scan to evaluate the position and degree of healing of the coracoid.

Statistical Analysis

Categorical data are expressed as frequencies and percentages and continuous data as means and standard deviations. Pre- and postoperative data were compared with the Student t test for paired samples and the Mann-Whitney U test for independent samples. Qualitative parameters were compared using the chi-square test or Fisher exact test. Power analysis was performed before data collection. The sample size was estimated considering alpha error (.05), beta error (0.2), and statistical power (0.8), assuming an absolute error of 2 and based on Rowe scores from other studies that had similar results (mean, 79-80; SD, 7.29). Sample size was estimated to be 51 ± 2 patients. Statistical significance was set at $P \leq .05$.

RESULTS

No statistically significant differences were found between groups regarding age, sex, activity level, Rowe score, risk factors for recurrence, the presence of hyperlaxity, or bony lesions (Table 1).

Clinical Results

Patients with revision Bankart repair had longer follow-up. No significant differences ($P > .05$) were found in the Rowe score, WOSI score, or SSV score when we compared Bankart versus Latarjet procedures. The mean loss of passive ER measured at 0° (ER1) and 90° (ER2) of abduction was also similar between procedures (Table 2).

Recurrent instability rate after the arthroscopic revision repair was 15.6% (7/45 patients). In total, 2 patients experienced dislocations and 5 had subluxations. Recurrent instability occurred after a mean interval of 26.2 months (range, 11-84 months). The recurrence rate was 11.8% (2/17 patients) in the arthroscopic Bankart repair group and 17.9% (5/28) in the arthroscopic Latarjet group (Table 2). Differences were not significant. Postoperative CT scan in all cases revised with the Latarjet procedure showed a well-positioned subequatorial graft without signs of osteolysis or nonunion.

Only 3 patients with postoperative instability required further arthroscopic revision surgery, which included a repeated capsular plication, an extra-articular capsular reinforcement performed with hamstrings tendons, and an autologous iliac crest graft. One additional patient in the Latarjet group underwent revision to remove the screws; 4 patients with subluxations did not find their symptoms severe enough to consider revision surgeries. No intra- or postoperative complications occurred in our series.

Initial Surgery

Patients in our series underwent a conventional Bankart repair with or without capsular plication as initial

TABLE 1
Comparison of Demographic Characteristics and Risk Factors Between Groups[a]

Variable	All Patients (N = 45)	Arthroscopic Bankart (n = 17)	Arthroscopic Latarjet (n = 28)	*P* Value
Demographic characteristics				
Sex, male	39 (84.8)	16 (94.1)	23 (82.1)	.385
Age, y	29.1 ± 8.9	29.6 ± 8.6	28.7 ± 9.3	.573
Activity level[b]	2.9 ± 1.4	3.3 ± 1	2.6 ± 1.5	.329
Hyperlaxity	32 (71.1)	12 (70.6)	20 (71.4)	>.99
Bone defects				
Bony Bankart (<15%)				.618
No		10 (58.8)	13 (46.4)	
Yes		7 (41.2)	15 (53.6)	
Hill-Sachs				.144
No		3 (17.6)	1 (3.6)	
Yes		14 (82.4)	27 (96.4)	
Primary procedure				.463
Arthroscopic surgery	34 (75.5)	11 (64.7)	23 (82.1)	
Bankart repair	28 (62.2)	10 (58.8)	18 (64.3)	
Bankart and capsular plication	16 (35.5)	6 (35.3)	10 (35.7)	
Bankart and Putti-Platt	1 (2.2)	1 (5.9)	0 (0)	
Original surgery at our center				.841
No	26 (57.7)	9 (52.9)	17 (60.7)	
Yes	19 (42.2)	8 (47.1)	11 (39.3)	
Follow-up, mo		96.5 ± 58.2	24.0 ± 37.5	<.001
Arthroscopic revision surgery, n				.463
Bankart repair		6	0	
Bankart and capsular plication		11	0	
Latarjet		0	28	
Preoperative Rowe score	43.2 ± 12.8	42.9 ± 16.9	43.4 ± 10	.522

[a]Data are reported as mean ± SD or n (%).
[b]Activity level classifications: type 0, no sporting activity; type 1, noncontact sports; type 2, nonoverhead sports; type 3, overhead sports without forced abduction and external rotation; type 4, overhead hitting sports or contact sports with a high risk of falls.

TABLE 2
Clinical Outcomes[a]

Variable	Arthroscopic Bankart (n = 17)	Arthroscopic Latarjet (n = 28)	*P* Value
Rowe score	79.6 ± 21.7	83.8 ± 18.6	.506
WOSI score	771.8 ± 441.7	763.9 ± 466.7	.948
SSV score	67.5 ± 18.6	75 ± 16.2	.383
Activity level	2.3 ± 1.5	2.2 ± 1.8	.373
External rotation deficit, deg			
ER1	17.3 ± 11.5	18.2 ± 17.3	.624
ER2	15.4 ± 11.1	12.5 ± 13	.143
Recurrence, n (%)			>.99
No	14 (82.4)	23 (82.1)	
Yes	2 (11.8)	5 (17.9)	

[a]Data are reported as mean ± SD unless otherwise indicated. ER1, external rotation deficit with the elbow at side; ER2, external rotation deficit with the arm at 90° of elevation; SSV, Subjective Shoulder Value; WOSI, Western Ontario Shoulder Instability Index.

treatment for their instabilities. One patient had undergone a combined open Bankart and Putti-Platt procedure.

Revision Surgery and Possible Causes of Primary Procedure Failure

A total of 12 (26.7%) patients reported recurrent instability related to a traumatic episode. With regard to the abnormalities found at revision surgery that might explain the reasons for failure, 20 patients (44.4%) showed a persistent Bankart lesion, 13 (28.9%) a labrum healed in a medial position on the glenoid neck, and 6 (13.3%) a subcritical bony Bankart lesion. In 5 patients (11.1%), there were no abnormalities that could explain the recurrence, and the labrum was anatomically healed.

Concerning revision surgery, 17 (37.8%) patients underwent arthroscopic revision with soft tissue repair, which again entailed a Bankart procedure and capsular shift (Table 2). Arthroscopic Latarjet with no additional procedures was the chosen procedure to treat the remaining 28 (62.2%) patients.

DISCUSSION

The most relevant finding of this study was that arthroscopic Latarjet did not obtain superior results compared with repeated arthroscopic Bankart repair in patients with

recurrent anterior shoulder instability after Bankart repair and subcritical glenoid bone loss.

There is no consensus on how severe the bone defect should be to recommend these techniques. In an anatomic study, Yamamoto et al[26] demonstrated that shoulders with glenoid defects of at least 16% of the articular surface could not be stabilized efficiently with soft tissue techniques. Furthermore, Calvo et al,[8] in a clinical investigation, made clear that bone defects involving >15% of the glenoid dramatically increased the risk of recurrence after Bankart repair. Considering this statement, we evaluated results of revision surgery in only patients with subcritical bone defects involving <15% of the articular glenoid surface, as there is no clear consensus on which procedure should be performed.

Friedman et al,[13] in a systematic review of the literature, evaluated the results of anterior revision stabilization surgeries and reported a recurrence rate of 14.7% after repeated Bankart repair. We found a recurrence rate similar to results reported in the literature.

In contrast, in a retrospective case series of 49 patients with failed previous soft tissue stabilizations treated with open Latarjet technique, Schmid et al[24] reported encouraging results. No shoulder was redislocated, no revision surgeries were needed, subluxations occurred in only 2 patients, and 5 patients reported slight, unspecified shoulder symptoms. Drawing on these data, the authors concluded that the Latarjet procedure was effective for treating recurrent glenohumeral instability after a previous repair. To our knowledge, there is only 1 published study comparing the results of Bankart repair versus Latarjet in revision surgery.[6] The current study is the first to report comparative results of arthroscopic soft tissue repair and arthroscopic Latarjet in 2 groups operated by a single surgeon experienced in arthroscopic Latarjet technique. Furthermore, we did not find statistically significant differences in the functional status of the index shoulder between both groups, as demonstrated by the baseline Rowe score.

The finding that the number of patients who underwent open techniques was higher in the soft tissue revision repair group could be explained simply by the fact that those patients underwent primary surgery in previous years, when arthroscopic surgery was not as common as when those patients revised with arthroscopic Latarjet were operated for the first time. We believe that this condition does not limit the validity of our conclusions.

Interestingly, no significant differences were found in any of the functional evaluation systems assessed or in the recurrence rate. Bonnevialle et al[6] reported similar satisfactory outcomes in a series of 11 patients after selective capsulolabral repair and open Latarjet procedures; there were no recurrences, patients had good outcomes, and they returned their presurgical athletic activities. However, Bonnevialle et al compared 2 different groups of patients, because the revision technique was selected preoperatively based on the evaluation of bony lesions on imaging studies. In our study, we compared results of both techniques carried out by the same surgeon in 2 cohorts of patients who were homogeneous in terms of age, sex, activity level, and glenoid bone defects.

This study has several drawbacks. First, it is a retrospective investigation of a limited series of patients, which might influence the conclusions drawn. However, postoperative shoulder instability is rare, even in high-volume institutions, and other series reported in the literature have the same issue. Second, patients were not randomized to receive soft tissue or bone block revision surgery, and treatment groups were determined based on scientific recommendations reported in the literature. Inclusion in either of the 2 groups was based on the date of surgery and not on the characteristics of the patient and injury, furnishing 2 similar cohorts of patients operated by the same surgeon. Third, Hill-Sachs defects were not measured despite the fact that they can influence patient outcome. However, it has been recently demonstrated that the Latarjet procedure can restore glenoid track.[19] Fourth, although both groups were compared using validated scales and external rotation measurements, no data were available for either group regarding baseline functional status and shoulder ROM before revision surgery. We assumed that the 2 groups of patients were comparable in terms of baseline functional status and shoulder ROM because the majority of patients underwent arthroscopic surgery based on previous reports of shoulder mobility in the literature after arthroscopic soft tissue stabilization.

CONCLUSION

Arthroscopic Latarjet did not obtain superior results compared with repeated arthroscopic Bankart repair in patients with subcritical glenoid bone loss as measured by objective functional scores, patient-reported outcomes, external rotation lag, and recurrence rates.

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