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SYMPOSIUM: COMPLEX ISSUES IN GLENOHUMERAL INSTABILITY

The Open Latarjet Procedure Is More Reliable in Terms of Shoulder Stability Than Arthroscopic Bankart Repair

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Abstract

Background Arthroscopic Bankart repair and open Latarjet bone block procedure are widely considered mainstays for surgical treatment of recurrent anterior shoulder instability. The choice between these procedures depends mainly on surgeon preference or training rather than published evidence.

Questions/purposes We compared patients with recurrent posttraumatic anterior shoulder instability treated with arthroscopic Bankart or open Latarjet procedure in terms of (1) frequency and timing of recurrent instability, (2) risk factors for recurrent instability, and (3) patient-reported outcomes.

Methods In this retrospective comparative study, we paired 93 patients undergoing open Latarjet procedures with 93 patients undergoing arthroscopic Bankart repairs over the same period for posttraumatic anterior shoulder instability by one of four surgeons at the same center. Both groups were comparable except that patients in the Latarjet group had more glenoid lesions and more instability episodes preoperatively. Minimum followup was 4 years (mean, 6 years; range, 4–10 years). Patients were assessed with a questionnaire, including stability, Rowe score, and return to sports. Recurrent instability was defined as at least one episode of recurrent dislocation or subluxation. Return to sports was evaluated using a 0% to 100% scale that patients completed after recovery from surgery. Various risk factors for recurrent instability were also analyzed.

Results At latest followup, 10% (nine of 93) in the Latarjet group and 22% (20 of 93) in the Bankart group demonstrated recurrent instability ($p = 0.026$; odds ratio, 0.39; 95% CI, 0.17–0.91). Ten recurrences in the Bankart group (50%) occurred after 2 years, compared to only one (11%) in the Latarjet group. Reoperation rate was 6% and 7% in the Bankart and Latarjet groups, respectively. In both groups, patients younger than 20 years had higher recurrence risk ($p = 0.019$). In the Bankart group, independent factors predictive for recurrence were practice of competitive sports and shoulder hyperlaxity (ie, passive external rotation $> 85°$ in the contralateral uninjured shoulder). Although return to sports was not different between groups, the mean Rowe score was higher in the Latarjet group (78 versus 68, $p = 0.018$).

Conclusions Patients who had the open Latarjet procedure had less recurrent instability and better Rowe scores over a mean 6-year followup. We now perform isolated arthroscopic Bankart repair for carefully selected patients, including patients with an Instability Severity Index Score of 3 or less.

Level of Evidence Level III, therapeutic study. See Instructions for Authors for a complete description of levels of evidence.

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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Introduction

It has been shown that, irrespective of the types of patients and lesions, 72% of French shoulder surgeons prefer open

Latarjet bone block procedures for treating traumatic recurrent anterior shoulder instability whereas in a large international survey 90% of shoulder surgeons in other countries preferred arthroscopic Bankart repair [31]. Rates of recurrence after these two techniques vary widely in the literature, ranging from 0% to 30% for arthroscopic Bankart repair [13, 22], with a mean of 9% [18], and from 2% to 14% for the open Latarjet bone block procedure (with two screws and the block in lying down position), with a mean of 7% [1, 10, 12, 15, 17, 24, 32].

Various risk factors for recurrence have been mentioned in the literature for both techniques [8, 12, 16, 26]. There is particular emphasis laid on glenoid and humeral bone lesions, history of instability, age, sex, hyperlaxity, and type or level of sports [2]. These factors are reviewed and identified with instability scores, imaging [20], or arthroscopic diagnosis [11], usually in conjunction with each other to help the decision-making process. Nevertheless, the choice of a technique depends often on the surgeon's training or preferences. In a pilot study [3] comparing 51 patients undergoing arthroscopic Bankart repair to 51 patients undergoing the open Latarjet procedure, we found no differences between the approaches in terms of shoulder stability with the numbers available; however, we were concerned that insufficient followup duration and low statistical power might have contributed to the study's inability to detect a difference between these procedures.

We therefore performed the present study with an a priori power analysis, more patients, and a longer followup duration, which compared patients with recurrent anterior shoulder instability treated with either arthroscopic Bankart repair or the open Latarjet procedure in terms of (1) frequency and timing of recurrent instability, (2) risk factors for recurrent instability, and (3) return to sports.

Patients and Methods

Study Design

We performed a retrospective, paired, comparative study to analyze and compare, at a minimum of 4 years' followup, the results of patients operated on for anterior shoulder stabilization, either with an arthroscopic Bankart repair using suture anchors or an open coracoid transfer, according to Latarjet, with the bone block fixed in the lying position with two screws. We screened all patients operated on for recurrent traumatic anterior instability with the arthroscopic Bankart or open Latarjet procedure between 2002 and 2006 at our center. All patients with other shoulder stabilization procedures, previous surgery, voluntary instability, acute instability (or < two instability episodes), unstable painful shoulder, associated epilepsy, and associated rotator cuff tear were excluded.

The four surgeons who performed the procedures chose which procedure they used in each clinical situation without any restriction. Indications were thus based on their personal experience and knowledge of risk factors of recurrence in the period of inclusion (2002 to 2006). Surgeon 1 performed 30% and 52%, Surgeon 2 performed 45% and 16%, Surgeon 3 17% and 24%, and Surgeon 4 8% and 9% of the Latarjet and Bankart procedures, respectively.

Power Analysis

An a priori power analysis was performed to determine the sample size needed to compare the results of the two procedures. In our pilot study [3], the recurrent rate of shoulder instability was 24% after arthroscopic Bankart repair and 12% after the Latarjet procedure. To identify a relative difference, 80 patients would have to be included in each group (for a power of 80% and a risk of a Type I error of 5%).

Patient Demographics

Ninety-five patients (98 shoulders) matched the inclusion/exclusion criteria in the Latarjet group. Five patients were lost to followup, leaving 90 patients (93 shoulders) available for clinical evaluation. Those 93 shoulders (Latarjet group) were paired by age at surgery and followup to 93 patients among 136 who underwent an arthroscopic Bankart repair over the same period (2003–2005). No patients were lost to followup in the arthroscopic Bankart group. The two groups were statistically comparable except for the number of instability episodes and glenoid bony lesions, which were both higher in the Latarjet group (Table 1). Minimum followup was 4 years (mean, 6 years; range, 4–10 years). The risks and benefits of both procedures were explained to the patients and they were aware that their data could be used for research purposes; written informed consent was obtained from all patients. This study was approved by our local institution review board.

Surgical Technique

Four surgeons performed the procedures in a standardized manner. The coracoid transfer was done according to Latarjet, with two screws and the bone block in the lying down position and via a horizontal split in the subscapularis muscle [23, 33]. The arthroscopic Bankart repair was

Table 1. Patient demographics

Variable	Latarjet group (n = 93)	Bankart group (n = 93)	p value
Dominant involvement	34	46	0.08
Age at the time of first dislocation or subluxation (years)*	21 (10–43)	22 (11–43)	0.32
Age at surgery (years)*	26 (16–46)	26 (14–45)	0.91
Male/female (number of patients)	89/4	85/8	0.23
Hyperlaxity (ER > 85°) (number of patients)	58	51	0.3
Number of dislocations and/or subluxations before surgery*	34 (2–300)	16 (2–100)	0.004
Bankart lesion (number of patients)	84	79	0.27
Hill-Sachs lesion (number of patients)	86	84	0.6
Glenoid lesion (number of patients)	62	45	0.012
Glenoid erosion	14	14	1
Glenoid fracture	33	25	0.21
Glenoid fracture + erosion	15	6	0.037
Sport practice (number of patients)			
No sport	5	2	0.44
Type of sport			
No risk	7	6	1
Contact	44	40	0.56
Overhead	11	15	0.4
High risk/forced overhead	26	30	0.52
Level of sport			
Recreational	42	55	0.06
Competition	35	28	0.28
High level	11	8	0.47

* Values are expressed as mean, with range in parentheses; ER = external rotation.

performed with three minimum anchors in all patients and the temporary outside traction suture technique was systematically used to perform an associated south-north capsular shift [5, 8].

Postoperative Management

The postoperative regime was the same for both groups. Patients' arms were immobilized in a brace in internal rotation for 4 weeks. Pendulum exercises were performed several times per day, beginning on the first postoperative day. Rehabilitation with a physiotherapist began on the 30th postoperative day and consisted of passive and pain-free progressive recovery of mobility. No active exercises or work with weight or pulleys was allowed until full recovery of passive mobility. Return to sports was allowed after 6 months.

Outcomes Assessment

Recurrence of instability was defined as at least one episode of anterior dislocation or subluxation. A subluxation was defined by the subjective motion of exit of the humeral head: partial and transitional loss of contact of the articular surfaces that can be reduced spontaneously or without any help and not by shoulder manipulation (according to Blazina and Satzman [4]). If it was necessary to manipulate the shoulder (by the patient or someone else), it was termed a dislocation. Persistent anterior apprehension was defined as the "fear that the humeral head would come out of joint with the arm placed in the throwing position (abduction-external rotation)" [4].

All patients were assessed by one observer, independent of the operating surgeons (CB), with a questionnaire that included stability, satisfaction, Subjective Shoulder Value (SSV) [35], return to sports, and Rowe score [29]. Satisfaction was rated as very satisfied, satisfied, or dissatisfied, or very dissatisfied. We appreciated that the SSV was useful to assess activities of daily living but not specifically sport practice; we therefore asked the patients to rank their operated shoulder between 0% and 100% specifically for the practice of sports. We called the score the SSV Sport, though it has not been validated for this purpose. For the mobility item on the Rowe score, patients were asked about their mobility, with three different possible answers: normal, slightly limited, or very limited. Patients completed the questionnaire themselves during a clinical assessment (30 of the Bankart group and 22 of the Latarjet group) or by mail (21 and 29 patients, respectively). Results for the remaining 42 patients in each group were obtained by telephone interview.

We also evaluated the association between postoperative recurrence and various preoperative and intraoperative factors (Table 1).

Statistical Analysis

Measurements are expressed as the mean and range. The D'Agostino-Pearson test was used to analyze data distribution. Normally distributed data were compared by using the paired t-test, and nonnormally distributed data were compared by using the Mann-Whitney U test. The chi-square test was used to compare categorical data. If any cell contained three numbers or fewer, we used the Fisher

Table 2. Recurrence of instability and revision

Variable	Latarjet group (n = 93)	Bankart group (n = 93)	p value
Followup (months)*	72 (50–118)	72 (50–100)	0.76
Recurrence (number of patients)	9 (10%)	20 (22%)	0.026
Subluxation/dislocation (number of patients)	2/7	7/13	0.67
Number of recurrences*	5.1 (1–21)	3.5 (1–21)	0.52
1 recurrence/> 1 recurrence (number of patients)	1/8	7/13	0.37
Revision (number of patients)	7	6	0.77

* Values are expressed as mean, with range in parentheses.

exact test. A multivariate analysis was performed to assess the association between postoperative recurrence and the factors studied. The significance level was set at a p value of less than 0.05. We performed statistical analyses using StatView® 5.0 (SAS Institute, Inc, Cary, NC, USA).

Results

Frequency and Timing of Recurrent Instability

At latest followup, 22% (20 of 93) in the Bankart group and 10% (nine of 93) in the Latarjet group had recurrent anterior shoulder instability (p = 0.026; odds ratio, 0.39; 95% CI, 0.17–0.91) (Table 2). One-half of the Bankart group recurrences occurred after 2 years (and continued to decline slowly), while the Latarjet group remained stable over time (Fig. 1). Twenty percent of patients without recurrent instability in both groups had persistent subjective anterior apprehension (Fig. 2). The number of complications was not different between groups: six patients (6%) in the Bankart group and seven (7%) in the Latarjet group were revised. All six patients in the Bankart group and two patients in the Latarjet group were revised for recurrence of instability (Table 2). Interestingly, every patient who underwent a new stabilization surgery was revised with the alternative procedure: the Latarjet procedure for the failures of the Bankart group and vice versa. While the two patients in the Latarjet group were revised successfully for recurrence of instability, one of the six reoperated patients in the Bankart group had a new traumatic dislocation but refused a rerevision procedure; the other five patients were stable. We did not exclude the eight patients revised for instability from the analyses even though they scored the worst values for SSV, pain, mobility, and sport practice, and all of these patients were not satisfied (Table 3). The five remaining patients in the

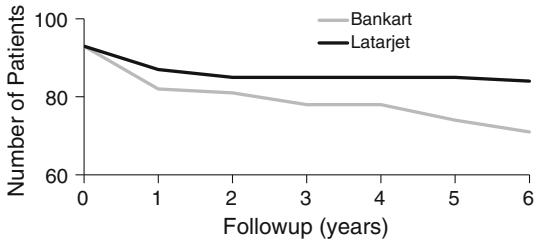

Fig. 1 A graph shows time of first recurrence after surgery for the two groups.

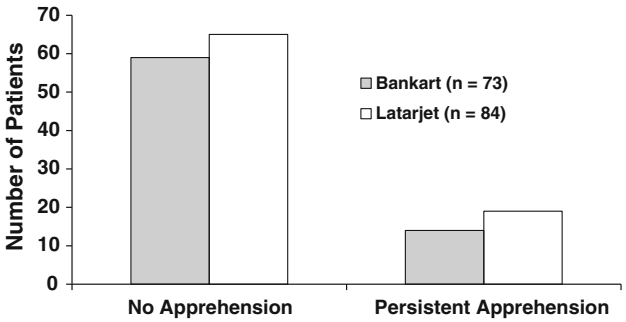

Fig. 2 A graph shows the apprehension among patients without recurrence in the two groups.

Table 3. Subjective results

Variable	Latarjet group (n = 93)	Bankart group (n = 93)	p value
Very satisfied + satisfied (number of patients)	85 (91%)	82 (88%)	0.47
SSV (%)*	90 (30–100)	87 (10–100)	0.41
SSV Sport (%)*	83 (0–100)	71 (0–100)	0.003

* Values are expressed as mean, with range in parentheses; SSV = Subjective Shoulder Value; SSV Sport = Subjective Shoulder Value for sport practice.

Latarjet group were reoperated on for reasons other than recurrence of instability: one patient for evacuation of an acute hematoma, one for infection, and three patients for screw removal for pain.

Risk Factors for Recurrent Instability

Considering the whole cohort, regardless of the procedure performed, patients younger than 20 years at surgery were found to be at higher risk of recurrence (p = 0.019). After multivariate analysis, two independent factors were found to be predictors of recurrent instability in the arthroscopic Bankart group: competition or high-level sport practice (p = 0.002) and hyperlaxity (passive external rotation of contralateral shoulder in adduction > 85°) (p = 0.008). No independent risk factor was found in the Latarjet group after multivariate analysis.

Table 4. Results for sport level

Level	Number of patients		
	Before instability	Preoperative	Postoperative
Latarjet group (n = 93)			
No sport	5	24	8
Recreational	42	52	54
Competition	35	13	23
High level	11	4	8
Bankart group (n = 93)			
No sport	2	27	16
Recreational	55	44	55
Competition	28	18	16
High level	8	4	6

Table 5. Rowe score

Variable	Possible score (points)	Latarjet group (n = 93)	Bankart group (n = 93)	p value
Item (number of patients)				
Stability	30	65	59	0.35
	15	19	14	0.34
	0	9	20	0.026
Function/ sport	50	53	59	0.37
	35	18	12	0.23
	20	15	9	0.19
	0	7	13	0.16
Pain	10	58	52	0.37
	5	31	38	0.29
	0	4	3	1
Mobility	Normal 10	56	49	0.3
	Slightly limited 5	35	37	0.55
	Very limited 0	2	7	0.17
Rowe score (points)*		78 (10–100)	68 (5–100)	0.018
Rowe level (number of patients)	Excellent (90–100)	48	34	0.038
	Good (75–89)	16	18	0.7
	Fair (40–74)	18	25	0.22
	Poor (0–39)	11	16	0.3

* Values are expressed as mean, with range in parentheses.

Patient-reported Outcomes

Satisfaction and mean SSV were not different between groups, but the mean SSV Sport was higher in the Latarjet group (83% versus 71%; range, 0%–100% for both, p = 0.003) (Table 3). No differences between groups were found regarding return to sports and type or level of sports before instability (Table 4); 63% of patients in the Bankart group versus 72% in the Latarjet group (p = 0.21) returned to the same sport at the same level as before instability. The mean Rowe score was higher in the Latarjet group (78 versus 68, p = 0.018) (Table 5). Less than 60% of patients in both groups reported having normal mobility of their operated shoulder (Table 5).

Discussion

Arthroscopic Bankart repair and the open Latarjet bone block procedure are widely considered mainstays for surgical treatment of recurrent anterior shoulder instability. The choice between these two procedures depends mainly on the surgeons' preference or training rather than on published evidence. We therefore compared the procedures and found in this paired controlled study that, at a mean followup of 6 years, there was a higher percentage of recurrent instability after arthroscopic Bankart repair as compared to the open Latarjet procedure. Younger patients were more likely to develop recurrent instability, and in general, the patient-reported outcomes favored the Latarjet procedure.

This study has some limitations. First, the study is retrospective and not randomized. Second, it is only based on subjective data, without clinical or radiographic evaluation, and ½ of the data were collected by telephone interview. The observer was not blinded to treatment allocation, which is a potential source of bias. However, the outcome assessment was done at a minimum of 4 years' followup with a minimum number of patients lost, which is difficult in this active and mobile population. Another limitation is that initially the two groups were paired only for age at surgery and followup, leaving all other variables possibly different. This limitation is owing to the comparative design of this study. Trying to control biases the best we could, we analyzed these data (epidemiology and lesions) and found that both groups were very similar, except for the numbers of glenoid lesions and instability episodes before surgery, which were higher in the Latarjet group (Table 1). This reflects the fact that the coracoid transfer procedures were performed for the worst cases of instability (those more at risk). Despite this, the rate of recurrence was still lower after the open Latarjet procedure in this study. Thus, this difference between groups reinforces our conclusion. Another limitation is that there is a natural trend for performing open Latarjet procedures in France, which could lead to more familiarity with this technique as opposed to arthroscopic Bankart repair. In our center, however, more Bankart procedures have been performed during this period than Latarjet procedures, and our center has long been a pioneer for arthroscopic surgery (with arthroscopic Bankart repair with anchors performed since 1996), so we do not believe there was any lack of

technical expertise or less familiarity with the Bankart procedure at our center. Finally, our tool for evaluating return to sports has not been validated, and so the findings on that point must be interpreted in light of that fact.

The fact that the open Latarjet procedure was more reliable in terms of shoulder stability than the arthroscopic Bankart procedure is not surprising, but to our knowledge, this study is the first to highlight a difference in reliability between these two procedures. Weaver and Derkash [34], comparing 17 open Bankart and 64 Bristow-Latarjet procedures, also found a higher rate of recurrent instability for the Bankart procedure (35%) as compared to the Bristow-Latarjet procedure (19%), but this difference was not significant with the numbers available ($p = 0.32$). They also found a slightly higher reoperation rate for the Bankart procedure (12% versus 8%, $p = 0.29$); interestingly, the Bankart patients were reoperated on for internal rotation contractures. Vander Maren et al. [32], in their series of 17 open Bankart and 33 Latarjet bone block procedures, also concluded that the functional results were slightly better after bone blocks. Hovelius et al. [19] retrospectively compared two groups of consecutive patients who had open Bankart procedures (with suture anchors) and open Bristow-Latarjet procedures with a mean followup of 17 years. They concluded that the bone block procedure was superior in terms of recurrence rate, patient satisfaction, Western Ontario Shoulder Instability Index, DASH scores, and mobility in external rotation. It is noteworthy that they had no dropout of patients in their followup. However, both groups were operated on in two different centers by different surgeons with lack of standardization of the procedures. Furthermore, there was no data collected on soft tissue and bony lesions in either group. It is, however, worth noting that all these studies compared open Bankart procedures as opposed to arthroscopic Bankart procedures in this study with Latarjet procedures. Taking into account our long-term followup (mean 6 years) and our strict definition of a recurrent instability, our recurrence rates after the arthroscopic Bankart and Latarjet procedures are comparable to those reported in the literature [1, 10, 12, 15, 18, 24, 32]. Many studies in the literature underestimate the recurrence rate of instability since they have too short followup and do not take into account the postoperative subluxations of the shoulder. In this study, postoperative subluxations, even isolated, were considered as true recurrence (Table 2). We also found that shoulders remained stable after the Latarjet procedure over time whereas stability declined as time passed after arthroscopic Bankart repair (Fig. 1). Failures predominantly occurred in the first 2 years after the open Latarjet procedure, while they continued to occur late after arthroscopic Bankart repair: about ½ of the recurrences after arthroscopic Bankart repair occurred after 2 years. Though the morbidity was not different between the two procedures (6% reoperation rate for the arthroscopic Bankart group and 7% for the open Latarjet group), the morbidity of arthroscopic Bankart repair was only due to recurrence of instability, whereas the main morbidity of the Latarjet procedure was related to either metalwork (screws) or the open approach (infection and hematoma).

For both procedures, young patients (younger than 20 years at the time of surgery) had a higher risk of recurrence of instability. Interestingly, this study confirmed some of our previous findings: low age (younger than 20 years) at the time of surgery, competitive sport practice, and hyperlaxity are risk factors for recurrence of instability after arthroscopic Bankart repair [2]. These three risk factors have been integrated in the Instability Severity Index Score that we described and have used since 2007 to screen patients before deciding on the type of surgical treatment for recurrent anterior dislocations [2]. In addition to the above in our current practice, we now request imaging studies with three-dimensional CT scans [10, 14, 20, 30] to look for glenoid or humeral bony lesions. Therefore, our indications are now well adapted to the demographic data and anatomic lesions [7]. Furthermore, new stabilizing procedures have been described since 2005: arthroscopic Hill-Sachs remplissage [21, 28], capsular shift and open bone block [15], and arthroscopic Bankart and bone block simultaneously [6, 9]. These techniques aim to repair different lesions at the same time. This "a la carte" approach may lead to lower recurrence rates and less residual apprehension in the near future.

Although the satisfaction rates were not different between groups, our data suggest that shoulder function was better after the open Latarjet procedure than after arthroscopic Bankart repair (better Rowe score and SSV Sport). Return to sports for both procedures was comparable; however, the SSV Sport was better in the Latarjet group. We have introduced this new parameter, which, in our opinion, refines the outcomes regarding return to sport practice. The reliability of this new tool however needs to be confirmed by specific studies as it has not yet been validated. The results concerning return to sports are similar to those reported in the literature [17, 24, 25, 27]. Concerning apprehension, we found that, regardless of the procedure performed; about 20% of shoulders had persistent anterior apprehension (Fig. 2).

In conclusion, we found the open Latarjet procedure to be more reliable in terms of shoulder stability than arthroscopic Bankart repair. At a mean followup of 6 years, this series of paired matched patients revealed (1) the percentage of recurrence of arthroscopic Bankart repair was twice that of the open Latarjet procedure; (2) the results of the Latarjet procedure remained stable over time, while those of the arthroscopic Bankart procedure

continued to decline as time passed; (3) regardless of the procedure, 20% of shoulders had persistent apprehension, and young patients (younger than 20 years at the time of surgery) had a higher risk of recurrence of instability; and (4) the number of revision surgeries associated with the two procedures appeared similar.

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