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The Bristow-Latarjet procedure for revision of failed arthroscopic Bankart: a retrospective case series of 59 consecutive patients

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Background: Recurrence of anterior instability after arthroscopic Bankart prevents return to sports and remains a surgical challenge. We aim to assess clinical and radiologic outcomes after coracoid bone-block performed either open or under arthroscopy, for the management of failed arthroscopic Bankart

Patients and Methods: Fifty-nine consecutive patients with anterior instability recurrence after arthroscopic Bankart were revised with a Bristow or Latarjet procedure performed either open (25 cases) or under arthroscopy (34 cases). Patients were reviewed for clinical and radiologic examination at a minimum 2-year follow-up. Glenohumeral bony lesions were evaluated preoperatively with computed tomographic scans. Postoperative bone-block position, union, and postinstability arthritis were also evaluated.

Results: The mean follow-up was 89 months (24-193). The epidemiologic analysis showed that patients with failed arthroscopic Bankart were young (age <23 years), 58 (98%) were practicing sports, with contact/forced overhead sports (53%), often in competition (53%), had hyperlaxity (71%), and for the most part of them glenohumeral bone loss (88%). Their mean preoperative Instability Severity Index Score was 5.4 ± 2.2 points. After revision with Bristow-Latarjet procedure, 53 patients (91%) returned to sports, 37 (70%) to their previous sports activity, and 17 (46%) to their previous level. No patient suffered recurrent dislocation. Four patients (7%) had recurrent subluxations, all after open procedure; 8 patients (14.5%) had persistent anterior apprehension. A large and deep Hill-Sachs lesion was a risk factor for persistent anterior apprehension ($P = .002$) and lower level when returned to sports ($P = .04$). Ninety-two percent of bone-blocks were positioned flush with the glenoid anterior rim, with 84% of bone union. At last follow-up, 5% of patients had severe postinstability osteoarthritis (Samilson 4).

Conclusion: The Bristow-Latarjet, performed either open or under arthroscopy, is an efficient procedure to restore shoulder stability and allow returning to sports in patients with failed arthroscopic Bankart and glenoid bone loss. Patients with a large and deep Hill-Sachs lesion had more persistent anterior apprehension and a lower sports level.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: anterior shoulder instability; failure; revision; arthroscopic Bristow-Latarjet; bone block; arthroscopic Bankart

Surgical treatment of anterior glenohumeral instability includes procedures to fix capsulolabral lesions, such as Bankart,[4] and bone reconstruction procedures, such as Bristow or Latarjet,[25,42] recommended in case of associated glenoid bone loss.[17] Arthroscopic Bankart remains the gold standard to treat recurrent anterior shoulder instability in Anglo-Saxon countries.[32] In 2012, it represented 92% of anterior instability surgical treatments in the United States.[12]

Arthroscopic Bankart's failure rate is variable, ranging from 3.4%-35%,[35] and increases with the follow-up.[19] Instability recurrence is the main complication of this

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surgery.[3] Reoperation for iterative shoulder stabilization after arthroscopic Bankart failure is a surgical challenge. The literature reports essentially outcomes of reoperations by iterative Bankart with instability recurrence rates ranging from 6%-43% and with 85% of return to sports.[1,18,24] Independently of associated glenohumeral bone lesions,[23,40] the Bankart procedure reaches its limits in case of irreparable capsulolabral lesions, degenerative lesions, or humeral avulsion of the glenohumeral ligament.[41] Coracoid bone-block procedures for instability recurrence after arthroscopic Bankart are a valuable option. But few studies have specified their indications and results on stability and return to sports.[13,16,18,20,39] The last decade has seen the development and popularization of arthroscopic coracoid bone-block procedures.[7,9,29] To our knowledge, their results for revision have, to date, never been published.

Our objectives were (1) to analyze the epidemiology and causes of previous instability recurrence after failed arthroscopic Bankart, (2) to evaluate the clinical and radiologic results of revision by coracoid bone-block procedure, and (3) to compare the results of coracoid bone-block performed either open or under arthroscopy.

Patients and methods

Patient selection

We performed a retrospective single-center cohort study including all patients who presented anterior instability recurrence after arthroscopic Bankart repair and treated with a Bristow-Latarjet procedure. All patients had at least 1 glenohumeral instability event occurrence (subluxation/dislocation) or persistent anteroinferior apprehension preventing return to sports, after primary shoulder stabilization by arthroscopic Bankart procedure.[6] Patients were revised with a Bristow[8,9,11,25] or a Latarjet[7,21,29-31,42] coracoid bone-block procedure performed either open or under arthroscopy. Clinical and radiologic evaluation with a minimum 24-month follow-up was performed by 2 observers who had not participated in the surgery.

We excluded patients reoperated after arthroscopic Bankart for other reasons than anterior instability recurrence (pain, stiffness, rotator cuff lesions) and patients with posterior or multidirectional instability or voluntary instability.

Because the senior operator had begun performing coracoid bone-block procedures under arthroscopy in 2007, this is a historical cohort study.

Clinical evaluation

Clinical data collected included occurrence of a new instability event (dislocation/subluxation), measurement of joint amplitudes, pain (visual analog scale), satisfaction (disappointed, moderately satisfied, satisfied, very satisfied), Western Ontario Shoulder Instability Index score (self-assessment score of quality of life),[28,33] the overall Subjective Shoulder Value (SSV)[22,45] and the SSV for sport, and the Rowe[36] and Walch-Duplay[43] scores. These data were compared to preoperative data. Patients were asked if they had been able to return to their previous sports and their current level. The type of sport was classified according to the Walch classification.[43]

Radiologic and arthroscopic evaluations

Two observers assessed all radiologic data. The glenoid and humeral bone lesions were evaluated by combined analysis of preoperative radiographs and computed tomographic (CT) scans. Glenoid bone loss quantification was performed on 3-dimensional CT reconstructions using the method described by Sugaya.[40]

The severity of Hill-Sachs lesions was also assessed under arthroscopy for all patients according to the Calandra classification[15]: small or grade 1—articular notch with cartilaginous abrasion; medium or grade 2—joint notch with subchondral bone involvement; large or grade 3—large osteochondral bone loss.

Radio-clinical data combination permitted to establish the Instability Severity Index score.[3]

Glenohumeral instability osteoarthritis severity was evaluated according to the Samilson and Prieto classification[38] modified by Walch.[44] Osteoarthritis was considered present in case of glenohumeral joint narrowing (ie, Samilson 4).

Bone-block positioning was assessed on CT scans in the axial plane and the sagittal plane "en face view" of the glenoid.[11] The ideal bone-block position was defined as subequatorial and flush with the anterior edge of the glenoid.[2,26,42] The presence of a <5-mm radiolucent line defined bone-block nonunion. A >5-mm radiolucent line defined bone-block migration.[27]

Statistical methods

Quantitative data were expressed as mean ± standard deviation. Comparisons of qualitative categorical variables between independent groups were done using the χ^2 test and Fisher exact test. Comparisons of quantitative variables were done using the Mann-Whitney test for unpaired variables and the Wilcoxon test for paired variables. The significance level was set at $P < .05$. Statistical analysis was performed with EasyMedStat (v3.5, www.easymedstat.com, France).

Results

Cohort

Between September 2000 and October 2015, a total of 60 patients revised with a Bristow-Latarjet procedure for failed arthroscopic Bankart met the inclusion criteria. One patient was lost to follow-up, leaving 59 patients for final analysis: 45 patients were examined physically and their shoulder radiographed, and 14 patients were interviewed by phone call and e-mail survey. Twenty-five patients had an open coracoid bone-block and 34 an arthroscopic bone-block (Fig. 1).

Before arthroscopic Bankart, 58 patients (98%) practiced a sport. Thirty-one (53%) patients practiced a contact/

overhead sport. Thirty-one patients (53%) practiced their sport in competition. The mean Instability Severity Index score was 5.4 ± 2.2 (Table I).

Previous arthroscopic Bankart was performed in our department for 39 patients (66%) and in other centers for 20 patients (34%). After Bankart repair, 34 patients (58%) had sustained recurrent subluxations and 25 (42%) recurrent dislocations preventing return to sports. Recurrence of anterior instability was secondary to a clear trauma for 41 patients (69%). Mean time to recurrence of instability after arthroscopic Bankart was 18 ± 17 months. Sixty percent of our patients suffered instability recurrence in the year following the Bankart repair.

Mean age at revision surgery was 27 ± 7.4 years. Mean follow-up after bone-block procedure was 89 ± 49 months for the whole series; 130 ± 42 months for open bone-block procedures; and 60 ± 29 months for arthroscopic ones.

Glenohumeral bony lesions before revision

Fifty-one patients (86%) had a Hill-Sachs lesion. According to the Calandra classification, the humeral bony defect was medium or large for 43 patients (73%). The incidence of glenoid bony lesions before revision was 88%, with a mean bone loss estimated at 18.5% (9%-37%) (Table II).

Complications and revisions

No intra- or postoperative open or arthroscopic complications were observed. No patient in the series presented neurologic lesions or infectious complications secondary to open or arthroscopic procedures. No patient required revision surgery.

Results on stability

At last follow-up, 4 patients (7%) had a recurrence of anterior instability. All occurred after open bone-block procedure. For 3 patients, they were early recurrences occurring in the year following the bone-block procedure. The instability recurrence occurred in a road traffic accident 10 years postoperative for the fourth patient. Three patients suffered a single episode of subluxation and reproducible subluxations for the fourth one. Recurrence was secondary to trauma for 2 patients. No patient suffered recurrent dislocation.

Additionally, 8 (2 open and 6 arthroscopic bone-block procedures) other patients (14.5%) had persistent anterior apprehension in the throwing position (abduction-external rotation) although they never had recurrence of shoulder dislocation or subluxation.

Results on mobility

The bilateral comparison of shoulder mobility before the bone-block procedure showed there was already a significant decrease in range of motion on the operated side mainly in external rotation. No significant increase in loss of mobility was found after revision except for internal rotation (Table III).

Global functional results

Functional results at last follow-up, summarized in Table IV, showed a significant postoperative function gain while reducing the shoulder pain. In terms of functional results, there was no difference between arthroscopic and open bone-block procedures.

Subjective results

Ninety-five percent of patients reported being satisfied or very satisfied at the last follow-up. Three of 4 patients who suffered instability recurrence were disappointed.

Return to sport

Return to sports was possible for 91% (53/58) of the patients. Seventy percent (37/53) of them returned to their previous discipline, and 46% (17/37) to the same level. Eleven of 31 patients (35%) practicing their sport in competition were able to resume at a high level.

The 8 patients (14.5%) who kept positive anterior apprehension returned to sports. Six have returned to the same sport but only 1 to his previous level. In terms of return to sport, there was no difference between arthroscopic and open bone-block procedures.

Predictors of poor clinical outcomes

A large and deep Hill-Sachs lesion (Calandra 3) was a risk factor of persistent anterior apprehension ($P = .002$) and of a return to a lower sport level ($P = .04$).

Radiologic results

Coracoid bone-block position

The analysis of 38 postoperative CT scans showed that the bone-blocks were positioned subequatorially in 87% (33/38) of the cases and flush with the anterior rim of the glenoid in 92% (35/38) of the cases (Table V).

Coracoid bone-block union

Imaging to assess bone-block union with the glenoid was available for 53 patients. Forty-five bone-blocks (85%) were healed (Table VI).

Glenohumeral osteoarthritis

Before coracoid bone-block procedure, imaging showed that 11 patients (20%) had mild osteoarthritis lesions (Samilson 1 and 2). One patient had severe osteoarthritis with joint narrowing (Samilson 4) before revision. At last follow-up, the incidence of osteoarthritis lesions in all Samilson stages increased from 20% to 55% ($P = .0002$), but only 3 patients had severe osteoarthritis (Samilson 4). Two of the 3 had a too lateral bone-block

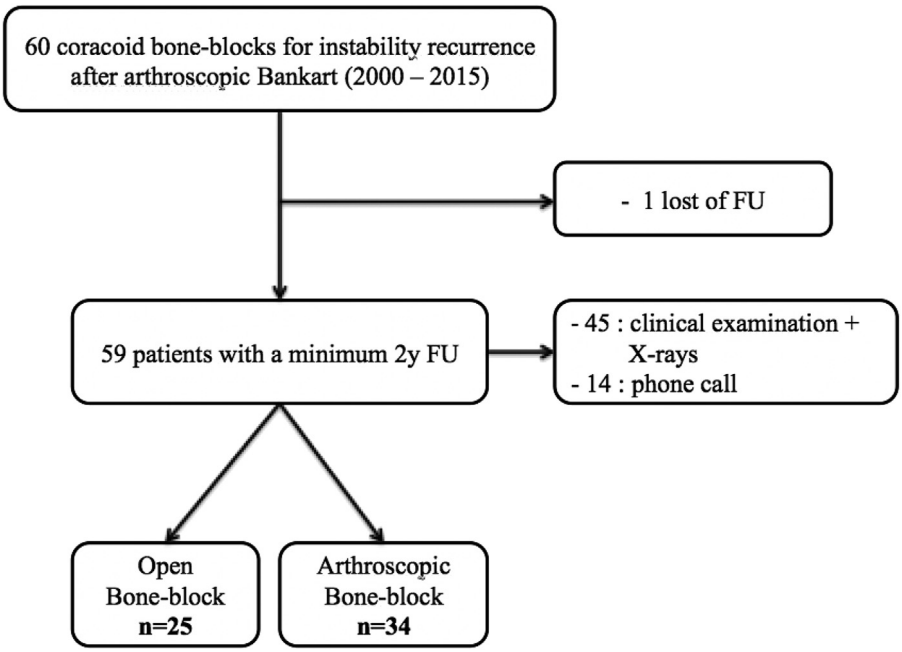

Figure 1 Selection of patients for study construction. *FU*, follow-up.

Table I Epidemiologic data

Preoperative clinical data	Cohort (N = 59)
Men/women, n	51/8
Age at arthroscopic Bankart repair, yr, mean ± SD	23 ± 5.9
Sport	58 (98)
Contact/overhead sport	31 (53)
Competitive	31 (53)
Hyperlaxity	42 (71)
ISI score (-/10), mean ± SD	5.4 ± 2.2

SD, standard deviation; *ISI*, Instability Severity Index score.
Unless otherwise noted, values are n (%).

Table II Glenohumeral bony lesions severity before bone-block

Humeral bone loss	Before bone-block (N = 59)
Hill-Sachs lesion	51 (86)
Small (Calandra 1)	8 (16)
Medium (Calandra 2)	21 (41)
Large (Calandra 3)	22 (43)
Glenoid bone loss	
Patients with bone loss	52 (88)
Percentage defect, mean ± SD	18.5 ± 7

Unless otherwise noted, values are n (%).

positioning. The third already had severe osteoarthritis before revision (Figs. 2 and 3).

No correlation was found between radiologic severity of instability osteoarthritis and functional results.

Discussion

The main finding of the present study is that coracoid bone-block performed either open or under arthroscopy is an efficient procedure to revise patients with a failed arthroscopic Bankart with recurrence of anterior instability and severe glenoid bone loss. At a mean follow-up of 7.4 years, 91% of the patients were able to return to sports practice, 70% to the same discipline, and 46% could perform at their previous level. No patient had a recurrence of dislocation, but 4 patients (7%) had a recurrence of subluxation, with a single episode for 3 of them occurring in the first year following the revision. The presence of a large and deep Hill-Sachs lesion was associated with persistent anterior apprehension and a lower level of sport practice. The rate of bone-block positioning and healing was not significantly different for patients operated open or under arthroscopy.

At last follow-up, 3 patients had severe osteoarthritis with glenohumeral joint narrowing (Samilson 4). The bone-block was too lateral in 2, and the third one already had severe osteoarthritis before revision.

Risk factors for failure of isolated Bankart repair have been extensively studied.[3] In our series, patients were young (52% aged <20 years), competitive athletes (53%),

Table III Pre- and post-bone-block shoulders' mobility

Mobility	Operated shoulder, degrees, mean ± SD	Contralateral shoulder, degrees, mean ± SD	Gap	*P* value
Before bone-block				
AFE	175 ± 8	179 ± 3	−4 ± 7	<.050
ER1	64 ± 19	78 ± 13	−14 ± 15	<.001
IR1	9.1 ±1.3	9.7 ± 0.8	−0.6 ± 1.0	<.050
Last follow-up				
AFE	172 ± 10	178 ± 5	−6 ± 10	<.050
ER1	63 ± 19	78 ± 12	−15 ± 15	<.001
IR1	8.5 ± 1.3	9.8 ± 0.6	−1.3 ± 1.3	<.001

AFE, active forward elevation; *ER1*, external rotation 1; *IR1*, internal rotation 1; *SD*, standard deviation.

Table IV Functional results before and after coracoid bone-block procedure

Functional results	Before bone-block, mean ± SD (N = 59)	After bone-block, mean ± SD (N = 59)	*P* value
Rowe (-/100)	17 ± 11	73 ± 25	.001
Walch-Duplay (-/100)	11 ± 18	68 ± 25	.001
VAS pain (-/10)	2.7 ± 2.6	1.3 ± 2.1	.001
SSV, %	54 ± 21	86 ± 17	.001
WOSI (-/2100)	—	434 ± 59	—

VAS, visual analog scale; *SSV*, Subjective Shoulder Value; *WOSI*, Western Ontario Shoulder Instability Index; *SD*, standard deviation.

Table V Immediate postoperative coracoid bone-block position

Bone-block position (CT scans)	All series, n (%) (n = 38)	Open, n (%) (n = 9)	Arthroscopic, n (%) (n = 29)
Vertical plan			
Subequatorial	33 (87)	9 (100)	24 (83)
Equatorial (>25% bone-block over the equator)	3 (8)	0	3 (10)
Supraequatorial (>50% bone-block over the equator)	2 (5)	0	2 (7)
Horizontal plan			
Flush	35 (92)	8 (89)	27 (93)
Lateral (overhanging)	3 (8)	1	2
Medial	0	0	0

Table VI Coracoid bone-block union status

Bone-block union status	All series, n (%) (n = 53)	Open, n (%) (n = 23)	Arthroscopic, n (%) (n = 30)
Union	45 (85)	20 (87)	25 (83)
Nonunion			
Fibrosis union	4 (8)	2	2
Migration	2	1	1
Fracture	2	0	2

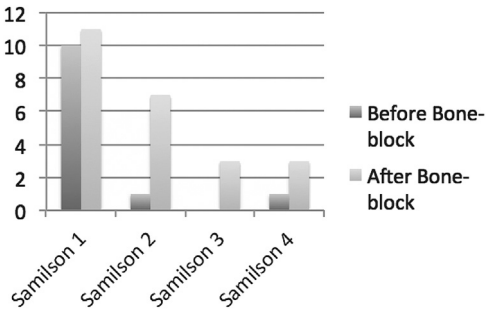

Figure 2 Incidence and severity of osteoarthritis before and after bone-block revision.

practicing contact or overhead sports (53%), and had shoulder hyperlaxity (71%) or bone lesions on the glenoid (88%) and humeral (86%) sides.[17] The high incidence and severity of glenoid bone loss before revision of failed arthroscopic bone-block confirmed the rationale for performing coracoid bone-block to treat these instability recurrences. The coracoid graft filled the bone defect.

Figure 3 Arthroscopic Bankart revision by arthroscopic coracoid bone-block. (**A**) Before revision: no osteoarthritis. (**B**) Postoperative computed tomographic scan: no overhanging bone-block. (**C**) No osteoarthritis after 8 years of follow-up.

Table VII Comparison to literature results

Author, year	n	Follow-up, mo	Instability recurrence, n (%)	Walch-Duplay score	SSV, %	Osteoarthritis (Samilson 4), %
Bonnevialle et al[13] (2013)	6	40	0	70	77	0
Dézaly et al[16] (2011)	27	21	3 (11)	84	—	0
Schmid et al[39] (2012)	49	38	2 (4)	—	79	4
Flinkkilä et al[19] (2015)	49	50	7 (14)	—	85	—
Elamo et al[18] (2020)	18	42	0	—	90	—
Our series	59	89	4 (7)	68	86	5

Our results are in agreement with the literature, where only 5 studies[13,16,18,20,39] analyzed the revisions of Bankart failures by coracoid bone-block (Table VII).

Our recurrence rate of instability (7%) is comparable to that reported for primary bone-block procedure at mid- and long-term follow-up.[25,47] Our recurrence rate remained lower than those published after Bankart revision by iterative Bankart (6%-43%).[1,18,24]

Our return to sport rate (91%) is also higher than those published after revision by iterative Bankart (85%).[1]

In this study, the presence of a large Hill-Sachs lesion (Calandra 3) was associated with a higher rate of persistent anterior apprehension and a lower level of return to sports. In the literature, the presence of a large and deep Hill-Sachs lesion is, for some authors,[10,34,46] an indication to perform an arthroscopic capsulotenodesis of the infraspinatus in the humeral bone defect. Our current attitude for these patients is to perform a combined Hill-Sachs remplissage associated with a coracoid bone-block under arthroscopy.[37] Further studies will be needed to evaluate whether this additional

procedure allows better return to sports and removes anterior apprehension.

With a mean follow-up of 7.4 years, 5% (3/59) of the series had severe osteoarthritis lesions (Samilson 4). The 35% progression of radiologic lesions of all Samilson stages is in line with what Buscayret et al reported,[14] showing that regardless of optimal graft positioning, progression of osteoarthritis was correlated with the length of follow-up. However, severity of osteoarthritis lesions was not correlated with functional outcomes in our series.

No significant difference in functional results and return to sport rate was observed between the open and arthroscopic procedures. Only the recurrence rate by instability event was significantly higher with the open procedure as our 4 recurrences all occurred after open coracoid bone-block procedure. We could argue that the follow-up between the open and the arthroscopic procedures is different (60 vs. 130 months); however, 3 of 4 recurrences of instability occurred in the first year after open bone-block. This is in agreement with the results of Bessière et al,[5] whose failures of primary open bone-block had all occurred within 24 months after surgery.

Our study presents the usual weaknesses of any retrospective study. The size of the series was not sufficient to show significant differences between open and arthroscopic procedures in terms of functional results. The shorter follow-up of the patients operated under arthroscopy compared to open procedure is a potential bias to analyze the impact of the procedure choice on the progression of osteoarthritis. To our knowledge, this is the largest series with the longest follow-up of revision of failed arthroscopic Bankart with Bristow-Latarjet procedure. Our study is the first to report the results of arthroscopic bone-block procedure in the treatment of instability recurrence after failed arthroscopic Bankart.

Conclusion

Both open Latarjet and arthroscopic Bristow are efficient revision procedures to restore shoulder stability and to allow return to sports activities in patients with a failed arthroscopic Bankart and severe glenoid bone loss. Patients with a large and deep Hill-Sachs lesion had more persistent anterior apprehension and a lower level of sport practice. Coracoid bone-block procedures were not found to be associated with severe osteoarthritis.

Disclaimer

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