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Arthroscopic Bankart Repair Versus Immobilization for First Episode of Anterior Shoulder Dislocation Before the Age of 25

A Randomized Controlled Trial

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Background: The risk of recurrence after the first episode of anterior shoulder dislocation is high with nonoperative treatment in younger patients.

Purpose/Hypothesis: The aim of this study was to compare the results of arthroscopic Bankart repair and nonoperative treatment for shoulder dislocation in patients younger than 25 years, with a minimum of 2 years of follow-up. The hypothesis was that surgery would decrease the risk of recurrence.

Study design: Randomized controlled trial; Level of evidence, 1.

Methods: We included patients aged between 18 and 25 years after a first episode of anterior shoulder dislocation and divided them into 2 groups. The first group was treated surgically with an arthroscopic Bankart repair within 2 weeks after the dislocation; the second group was treated nonoperatively. Both groups were immobilized for 3 weeks in internal rotation and followed the same physical therapy protocol. Standard radiography and computed tomography were performed immediately after reduction of the dislocation, and follow-up was performed at 3, 6, 12, and 24 months. The primary outcome measure was instability recurrence, defined as another anterior shoulder dislocation requiring closed reduction by another person (the patient was unable to reduce the dislocated joint themselves), a subluxation, or a positive apprehension test. Secondary outcome measures included range of motion, return to sport, and functional scores such as the short version of the Disabilities of the Arm, Shoulder and Hand score the Walch-Duplay score, and the Western Ontario Shoulder Instability Index (WOSI).

Results: A total of 20 patients were included in each group. The mean ± SD age was 21 ± 1.8 years, and there were 33 men (82.5%) and 7 women (17.5%) in the total sample. Recurrence of instability was significantly decreased in the surgical treatment group compared with the nonoperative group (2 [10%] vs 14 [70%], respectively; $P = .0001$). Fewer patients in the surgical treatment group versus the nonoperative group had another episode of dislocation (0 vs 6 [30%], respectively), subluxation (2 [10%] vs 13 [65%], respectively; $P = .003$), or a positive apprehension test (1 [5%] vs 11 [58%], respectively; $P = .0005$). The Walch-Duplay score (88.4 vs 70.3 points; $P = .046$) and WOSI (11.5 vs 17.7 points; $P = .035$) were significantly better in the surgical group versus the nonoperative group after a 2-year follow-up. Level of sport was the same or better in 89% of the surgical treatment group vs 53% of the nonoperative treatment group ($P = .012$). No surgical complication was recorded. We did not find any significant difference in range of motion.

Conclusion: In patients with first-time shoulder dislocations, arthroscopic labral repair (Bankart procedure) reduced the risk of secondary shoulder dislocation and improved functional outcome versus nonoperative treatment after a 2-year follow-up. Surgical treatment after a first episode of shoulder dislocation could be offered as a primary treatment option in a younger population if these results are confirmed by larger studies with a longer follow-up.

Registration: NCT03315819 (ClinicalTrials.gov identifier)

Keywords: first dislocation; shoulder; arthroscopic; Bankart; young

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Anterior shoulder dislocations (ASDs) represent 11% of all traumatic shoulder injuries. After a first episode of ASD, the main risk is recurrence, which has ranged between

13% and 96% in previous studies.[13,33,34,38,40] Recurrence mainly occurs in the first 2 years after the first ASD,[31] and the condition slowly progresses to anterior shoulder instability, affecting quality of life, sport, and professional activities.[28] The younger the patient is at the first ASD, the higher the risk of recurrence. In a study by Lill et al,[26] the recurrence rate after 4 years was 85% in patients who had their first ASD before the age of 30 years and 21% in those who had their first ASD after age 30. In a prospective study of 252 patients by Robinson et al,[31] the recurrence rate after 5 years reached 86.6% in patients aged 15 to 20 years, 73.8% in patients between 21 and 25 years of age, and 46.8% in patients between 26 and 30 years of age. Participation in contact and overhead throwing sports and higher sporting levels also increases the risk of recurrence.[36] Anterior dislocations often injure the anterior and inferior glenoid labrum, described as the Bankart lesion. This lesion was observed arthroscopically in 94% to 100% of patients and caused long-term instability.[12,32]

After the dislocation is reduced, the shoulder is usually immobilized in internal rotation for 3 weeks.[13,24] However, Taylor and Arciero[37] studied a cohort of 53 patients from a military academy, aged ≤24 years, and reported that 90% evolved toward instability. Further, Hovelius et al[14,16] reported that half of their patients younger than 25 years required secondary surgery.

Arthroscopic labral repair (or the Bankart procedure) has become increasingly popular given the development of surgical anchors[29] and the rarity of complications.[1] The high recurrence rate in younger patients could justify offering surgical treatment after the first episode of ASD, but these procedures are usually suggested only after 1 or more recurrences. Previous studies[5,23,39] have shown promising results of arthroscopic treatment after first episodes of ASD in younger patients, but such treatment is not universally recognized.

The main objective of our study was to evaluate the rate of recurrence after arthroscopic Bankart repair versus nonoperative treatment for first ASD in patients between 18 and 25 years of age. The secondary objectives were to evaluate functional scores, range of motion, and return to sport and professional activities in each group. We hypothesized that surgical treatment would decrease recurrence rates, improve functional scores, and improve rates of return to sport after a 2-year follow-up.

METHODS

We conducted a controlled, prospective, randomized trial on patients aged between 18 and 25 years after a first episode of ASD. Patients were randomly assigned to 2 groups: The first was offered arthroscopic Bankart repair, and the second was offered nonoperative treatment with 3 weeks of internal rotation immobilization. The study was conducted after approval was granted by our institutional review board (No. 2013-A01720-45). The inclusion period was between March 2014 and November 2016.

Inclusion and Exclusion Criteria

Patients between the ages of 18 and 25 were included in this study after a radiologically confirmed ASD. Informed written consent was required. The exclusion criteria were as follows:

- Nontraumatic ASD with joint hyperlaxity, defined as a Beighton score ≥4/9
- A delay between ASD and surgery >15 days
- Associated humeral head fracture
- A contraindication to general anesthesia
- Pregnancy or breast feeding
- Protected adults not able to give consent
- Patient refusal of the follow-up protocol
- A bone defect exceeding 25% of the glenoid surface on computed tomography (CT) scan[4,6,21]
- A humeral avulsion of the glenohumeral ligament (HAGL lesion) found during the arthroscopy.

Randomization and Study Protocol

Closed reduction of the ASD was performed in the emergency department of the hospital. Eligible patients were offered to opt-in for the study in the emergency department or during a consultation in the days after the ASD. The study protocol was explained to the patients (Figure 1), and informed consent was collected. After providing consent, the patients were randomized to 1 of the 2 groups by opening envelopes prepared by the clinical research department, which were opened in a predetermined order. The investigators discovered the treatment group only when the patient was included in the study.

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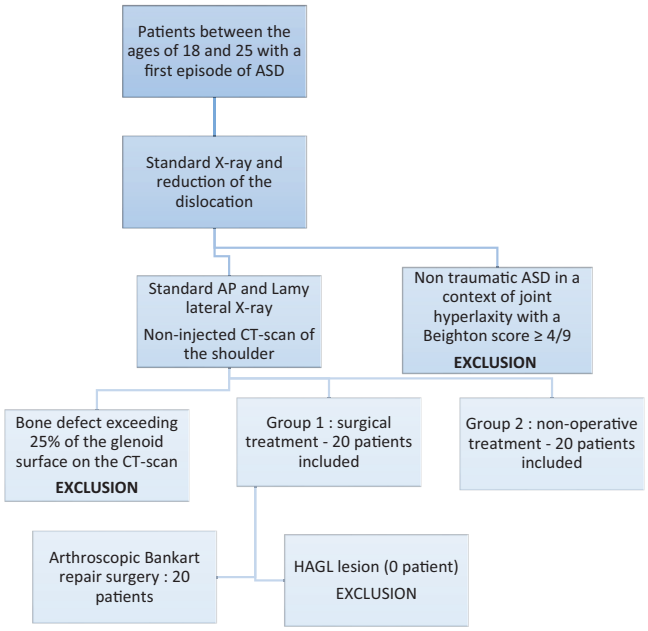

Figure 1. Study protocol. AP, anteroposterior; ASD, anterior shoulder dislocation; CT, computed tomography; HAGL, humeral avulsion of the glenohumeral ligament.

All patients included in the study attended an inclusion consultation where additional data were collected, such as dominant arm, associated lesions, and type and level of sport. All patients received a standard anteroposterior (AP) and Lamy lateral radiograph of the shoulder before and after reduction of the ASD and a CT scan (without contrast injection) after ASD reduction. The CT scan was performed to exclude an associated fracture of the humerus or a glenoid defect exceeding 25% of the glenoid surface. A specialist osteoarticular radiologist reviewed all CT scans and performed the following measurements:

- Bony Bankart measurement: the theoretical area of the inferior glenoid was calculated on a 3-dimensional reconstruction according to Huysmans et al.[17] The bone defect was evaluated by subtracting the area of the avulsed fragment from the theoretical area of the glenoid.
- The risk of engagement of the humeral lesion was determined according to Di Giacomo et al.[9]
- The depth and area of the humeral defect were calculated in the axial and coronal planes according to Cho et al.[8]

Group 1 was the surgical treatment group. Patients underwent arthroscopic Bankart repair surgery. Surgery was to be performed in the 15 days after the first episode of ASD. Internal rotation immobilization was to be followed for the first 3 weeks after the surgery. Physical therapy began at 3 weeks postoperatively and consisted of passive and active mobilization while limiting external rotation to 30° and abduction to 90°. Unlimited range of motion was allowed after 6 weeks. Group 2 was the nonoperative treatment group. Patients were immobilized for 3 weeks after ASD. The physical therapy protocol was the same as for group 1.

Operative Technique

Surgical treatment of patients in group 1 was performed arthroscopically by a specialist shoulder surgeon (C.P., T.V., C.L., C.S.) while patients were under general anesthesia in a beach-chair position. A posterior portal in the soft point was used for visualization and an anterior portal through the rotator interval was used for instrumentaion. The hemarthrosis was evacuated, and a complete assessment of bone and ligamentous injuries was performed. HAGL lesions were identified and repaired if needed. Bankart lesions were repaired with between 2 and 5 arthroscopic anchors (mean, 2.8 anchors; JuggerKnot Biomet) inserted inferior to superior. When found, any superior labral anterior and posterior (SLAP) lesions were repaired with anchors; no tenodesis was performed. Bony Bankart lesions affecting <25% of the glenoid were repaired with the labrum: the bony fragment was reduced and stabilized through labral fixation with anchors adjacent to the fragment, both inferior and superior.

Data Collection

After inclusion, follow-up was conducted at 3, 6, 12, and 24 months. The investigator (A.H.) searched for evidence of recurrent instability, such as the following:

- A second episode of ASD requiring closed reduction by a third person (the patient was unable to reduce the dislocated joint themselves)
- Subluxation episodes characterized as painful events with a sensation of blockage or dislocation that would recede after self-reduction techniques
- A positive apprehension test in abduction and external rotation

Durations and levels of return to work and return to sport were recorded. On physical examination, range of motion was noted and compared with the noninjured limb. Three functional scores were evaluated: the short version of the Disabilities of the Arm, Shoulder and Hand score (QuickDASH),[3] the Walch-Duplay score, and the Western Ontario Shoulder Instability Index (WOSI).[22]

Evaluation Criteria

The main evaluation criterion was the occurrence of another episode of shoulder instability in the 2-year follow-up period. Secondary evaluation criteria included the following:

- Functional scores: QuickDASH, Walch-Duplay, and WOSI
- Range of motion: flexion, abduction, internal rotation, external rotation, and horizontal external rotation
- Return to sport and level of sport
- Return to professional activities
- Overall patient satisfaction

Statistical Analysis

The calculated number of patients needed in each group was 20 considering a 5% type I error and a 20% power

TABLE 1
Demographic Data and Injury Details According to Treatment Groups[a]

	Nonoperative Treatment Group (n = 20)	Surgical Treatment Group (n = 20)	*P* Value
Sex, male/female, n	18/2	15/5	.41
Age, y[b]	21.3, 21.5 [20-22.5]	21.5, 22 [20.5-22.5]	.63
Body mass index[b]	23.3, 22.2 [20.5-25.5]	24.0, 22.7 [20.9-25.3]	.68
Dominant arm, right/left, n	16/4	17/3	≥.99
Injury of dominant arm, dominant/nondominant, n	8/12	9/11	.71
Employment status, n			.73
Unemployed or student	15	13	
Sedentary occupation	0	2	
Light manual labor	4	3	
Heavy manual labor	1	2	
Work injury, n (%)	3 (15)	3 (15)	NA
Associated lesions, n (%)			NA
None	18 (90)	19 (95)	
Leg fracture	0	1 (5)	
Scapula fracture	2 (10)	0	
Level of participation in sports, n (%)			.32
None	2 (10)	5 (25)	
Recreational	14 (70)	9 (45)	
Competition	4 (20)	6 (30)	
Risk level of the sport practiced according to the Walch-Duplay score, n (%)			NA
No sport	2 (10)	5 (25)	
Without risk	1 (5)	1 (5)	
Limited risk	9 (45)	2 (10)	
Medium risk	8 (40)	5 (25)	
High risk	0	7 (35)	

[a]NA, not applicable.
[b]Values are given as mean, median [interquartile range].

(type II error) with 20% lost to follow-up after 2 years (PASS 2008 [NCSS Statistical Software], Freedman technique). Previous studies have estimated that the recurrence rate after 2 years is 35% with nonoperative treatment[18,26,41] and 10% with operative treatment. Results are expressed as mean ± SD, median, and interquartile range for continuous variables and as frequencies and percentages for categorical variables. The normality of distribution was assessed graphically and using the Shapiro-Wilk test. Group data comparison with numeric variables was performed with Mann-Whitney *U* test, and qualitative variables were compared between groups through chi-square tests (Fisher exact test was used when the expected cell frequency was <5). Statistical testing was conducted at the 2-tailed α level of .05. Data were analyzed using SAS software (Version 9.3; SAS Institute Inc). The analysis was in the intent to treat; the patients lost to follow-up were considered as stable for the main evaluation criterion.

RESULTS

Patients

A total of 40 patients were included, 20 in each group. Demographic characteristics, level of sport, employment status, and data concerning the ASD are detailed in Table 1. After the 2-year follow-up, 2 patients could not be evaluated: 1 patient in the nonoperative treatment group refused the follow-up consultation despite apparent signs of recurring instability, and 1 patient in the surgical treatment group was unreachable. Surgical exploration revealed 5 SLAP lesions (25%), of which 4 lesions were type II and 1 lesion was type IV, 4 partial supraspinatus tendon tears and 1 partial subscapularis tear that did not require surgical repair. No HAGL lesion was found.

Complications and Recurring Instability

In the surgical treatment group, no perioperative or postoperative complication was noted. One adhesive capsulitis was diagnosed 3 months postoperatively; the evolution was satisfactory with medical treatment and physical therapy after 18 months. No complication was noted in the nonoperative treatment group.

After 2 years of follow-up, 16 patients had another episode of shoulder instability, 14 (70%) in the nonoperative treatment group and 2 (10%) in the operative treatment group; this difference was statistically significant ($P < .0001$). Of the 14 patients in the nonoperative treatment group, 13 described subluxations and 6 had complete dislocations requiring reduction by a third person (the patient

TABLE 2
Functional Scores at 2 Years[a]

	Surgical Treatment Group	Nonoperative Treatment Group	Difference	*P* Value
QuickDASH	6.5 ± 10.6 (0 to 31.8) 2.3 [0 to 6.8]	11.2 ± 13 (0 to 38.6) 3.3 [0 to 20.4]	4.7	.200
WOSI	11.5 ± 18.6 (0 to 62.1) 2.6 [0.9 to 11.4]	17.7 ± 18.4 (0.6 to 68) 8.40 [5.4 to 35.6]	6.2	**.035**
A: physical symptoms	10 ± 16.4 (0 to 53.8)	15.1 ± 15.7 (0 to 58.1)	5.1	**.025**
B: sports, recreation, work	13.7 ± 23 (0 to 76.5)	20.9 ± 28.2 (0 to 100)	7.2	.168
C: lifestyle	13.7 ± 21.7 (0 to 75.5)	14.6 ± 15.3 (0 to 50)	0.9	.232
D: emotions	11.2 ± 19.9 (0 to 64.3)	27.6 ± 25.5 (0 to 81.6)	16.4	**.005**
Walch-Duplay score	88.4 ± 19.3 (15 to 100) 90 [85 to 100]	70.3 ± 30.7 (5 to 100) 85 [50 to 90]	18.1	**.046**
A: sport or activity	20.3 ± 7.16 (15 to 25)	16.3 ± 9.5 (10 to 25)	4	.175
B: stability	21.8 ± 11.6 (–25 to 25)	10 ± 17.8 (–25 to 25)	11.8	**.002**
C: mobility	21.3 ± 5 (15 to 25)	20.5 ± 6.8 (15 to 25)	0.8	.917
D: pain	25	23.4 ± 3.7 (15 to 25)	1.6	.080

[a]Scores are expressed as mean ± SD (minimum-maximum); overall scores are additionally presented as median [interquartile range]. Boldface indicates statistical significance. QuickDASH, short version of the Disabilities of the Arm, Shoulder and Hand score; WOSI, Western Ontario Shoulder Instability Index.

TABLE 3
Differences in Mobility Compared With Contralateral Side[a]

Treatment Group	Anterior Elevation	Abduction	Extension	External Rotation 1[b]	External Rotation 2[c]	Internal Rotation[d]
Surgical	–0.5 ± 2.3	0.5 ± 2.3	3.2 ± 8.2	–1.05 ± 6.7	0.5 ± 5.2	19
Nonoperative	2.1 ± 7.1	5.8 ± 11.7	2.1 ± 7.9	3.7 ± 7	3.1 ± 8.2	19
P value	.092	.136	.713	**.024**	.261	NA

[a]Values are expressed in degrees as mean ± SD unless otherwise noted. No relevant difference was found between groups. Boldface indicates statistical significance. NA, not applicable.
[b]External Rotation (ER) 1: ER at 0° of abduction.
[c]External Rotation 2: ER at 90° of abduction.
[d]Internal rotation is expressed as number of patients with internal rotation better than T7 vertebra.

was unable to reduce the dislocated joint themselves); the last patient had a positive apprehension test. Fewer patients in the surgical treatment group versus the nonoperative group had another episode of dislocation (0 vs 6 [30%], respectively), subluxation (2 [10%] vs 13 [65%], respectively; $P = .003$), or a positive apprehension test (1 [5%] vs 11 [58%], respectively; $P = .0005$). In the surgical treatment group, 2 patients experienced subluxations; 1 patient had a single episode of subluxation without any other symptom or apprehension, and the other patient described many episodes of subluxation and a strong apprehension during the second year of follow-up, which led to revision surgery with a coracoid process transfer (Latarjet procedure).

After the 2-year follow-up period, 5 of 40 patients (12.5%) had required primary or secondary shoulder stabilization surgery: 1 patient from the operative treatment group (5%) and 4 patients from the nonoperative treatment group (20%). Of the 4 patients from the nonoperative treatment group, 2 patients underwent an arthroscopic Bankart repair and 2 patients underwent coracoid process transfer (Latarjet procedure); all 4 had recurring complete shoulder dislocations.

Functional Scores and Range of Motion

After the 2-year follow-up, the WOSI score was significantly better in the surgical treatment group than in the nonoperative treatment group (11.5 ± 18.6 vs 17.7 ± 18.4, respectively; $P = .035$). In each domain, the scores were better in the surgical treatment group; the difference was statistically significant in domains A (physical symptoms) and D (emotional impact).

The Walch-Duplay score was better in the surgical treatment group versus the nonoperative group (88.4 ± 19.3 vs 70.3 ± 30.7, respectively; $P = .046$). Scores in each domain were superior in the surgical treatment group; only the difference in domain B (stability) was statistically significant ($P = .002$).

The QuickDASH score was slightly better in the surgical treatment group (6.5 ± 10.6; range, 0-31.8) than in the nonoperative treatment group (11.2 ± 13; range, 0-38.6), but the difference was not significant (Table 2).

In both groups, there was no relevant difference in range of motion compared with the opposite side after 2 years of follow-up (Table 3).

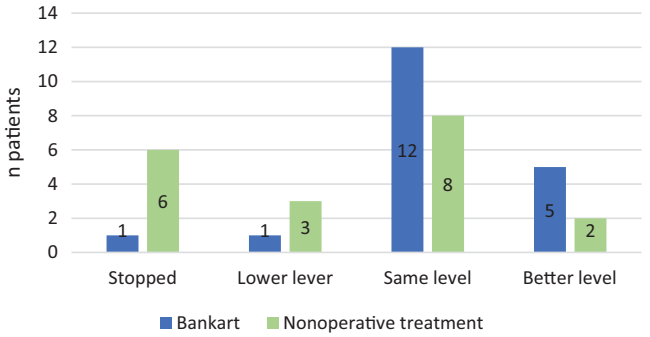

Figure 2. Return to physical activities at 2 years in both groups.

Return to Sport and Professional Activities

After 2 years, 95% of patients of the surgical treatment group had returned to sport, whereas 68% of patients in the nonoperative treatment group had returned. Level of sport was the same or higher in 89% of the surgical treatment group versus 53% of the nonoperative treatment group (P = .012) (Figure 2).

After 2 years, all patients in both groups declared a professional activity. At the beginning of the study, 12 patients (30%) declared a professional activity, 7 in the operative treatment group and 5 in the nonoperative treatment group. For 6 patients, the initial shoulder dislocation occurred at work, 3 in each group. In the surgical treatment group, the average leave of absence from work lasted 137 days (range, 0-120 days). Patients for whom the initial dislocation occurred at work took a leave of 290 days on average (range, 0-720 days) versus 30 days for the other patients. One patient stopped his professional activity for 90 days due to an associated leg fracture, and the patient with a 720-day leave had developed adhesive capsulitis.

Radiological Findings

CT characteristics of the bone lesions are reported in Table 4. The limited number of patients did not allow a statistical analysis of the effects of the Hill-Sachs lesion on instability in each group. However, we did not notice any difference between stable and unstable patients in either group. In the surgical treatment group, no patient with a bony Bankart lesion reported instability; in the nonoperative group, only 1 patient with a bony Bankart lesion described subluxation episodes.

Of the 6 patients in the surgical treatment group whose Hill-Sachs lesion was considered "off-track," only 1 patient (25%) had recurring instability presenting as a single subluxation. In the nonoperative treatment group, an off-track lesion that engaged with the glenoid did seem to affect shoulder stability and functional scores after 2 years (Figure 3). The 6 patients in the nonoperative treatment group with an off-track lesion evolved toward shoulder instability (4 patients with recurring dislocation and 2 patients with subluxations).

TABLE 4
Characteristics of Bone Lesions in Both Groups on Computed Tomography Scan[a]

	Surgical Treatment Group	Nonoperative Treatment Group
Hill-Sachs lesion, n (%)	20 (100)	20 (100)
Depth, axial image, mm	7.8 ± 2.6	5.9 ± 1.4
Width, axial image, mm	14.4 ± 4.3	13.1 ± 4.1
Width, coronal image, mm	16.6 ± 4.3	13.6 ± 4.1
Hill-Sachs angle, 3-dimensional reconstruction image, deg	27.8 ± 9.7	28.1 ± 8.3
Bony Bankart, n (%)	4 (20)	1 (5)
Engaging Hill-Sachs lesion off-track, n (%)	6 (30)	6 (30)

[a]Values are expressed as mean ± SD unless otherwise noted.

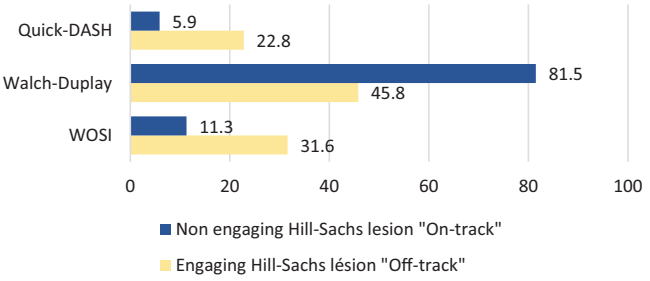

Figure 3. Influence of the engaging nature of the Hill-Sachs lesion on the functional scores in the nonoperative group. QuickDASH, short version of the Disabilities of the Arm, Shoulder and Hand score; WOSI, Western Ontario Shoulder Instability Index.

Patient Satisfaction

Patients were asked, "After this first dislocation, would you agree to have (another) surgery now that you know the outcome?" In the surgical treatment group, 17 of 20 patients (85%) answered yes. In the nonoperative treatment group, 7 of 20 patients (35%) would have agreed to a surgical treatment, 8 patients (40%) had no opinion, and 4 patients (20%) would not have surgical treatment (1 patient was lost to follow-up and did not respond).

DISCUSSION

This study shows that in patients younger than 25 years, arthroscopic Bankart repair after the first episode of ASD significantly reduced the risk of recurrent instability compared with immobilization after a 2-year follow-up. These patients also had better functional scores and a quicker return to an equivalent or higher level of sport. Operated patients did not have more complications and regained range of motion similar to their opposite shoulder. These results are in favor of the surgical treatment. The study design was methodologically robust with strong oversight

TABLE 5
Studies Comparing Capsulolabral Reinsertion Versus Nonoperative Treatment After an Initial Anterior Shoulder Dislocation[a]

Lead Author (Year)	Study Design	Patient Groups	Patient Age, y	Main Evaluation Criterion	Cases of Surgery/ Immobilization, n	Follow-up, mo	Results on % of Occurence of Main Evaluation Criterion	Scores: Surgery/ Immobilization
Arciero[2] (1994)	Prospective, not randomized	Arthroscopic Bankart repair vs 1 month of immobilization	18-24	Dislocation Subluxation Apprehension	21/15	32	Surgery: 14% Immobilization: 80%	
Bottoni[5] (2002)	Prospective, randomized	Arthroscopic Bankart repair vs 1 month of immobilization	18-26	Dislocation Subluxation Apprehension limiting activities	10/14	36	Surgery: 11% Immobilization: 75%	SANE Insalata
Kirkley[23] (2005)	Prospective, randomized	Arthroscopic Bankart repair vs 3 weeks of immobilization	≤30	Dislocation	16/15	75	Surgery: 19% Immobilization: 60%	DASH: 4.2/5.9 WOSI: 13.7/25.2 ASES
Jakobsen[19] (2007)	Prospective, randomized	Open bankart repair vs 1 week of immobilization	15-39	Dislocation	37/39	24	Surgery: 3% Immobilization: 56%	Oxford Constant
Urhing[39] (2014)	Prospective, not randomized	Arthroscopic Bankart repair vs 3 weeks of immobilization	≤30	Dislocation Subluxation	14/17	19-25	Surgery: 0% Immobilization: 77%	DASH: 1.4/5.3 WD: 92.9/59.4 Rowe SST
Gigis[10] (2014)	Prospective, not randomized	Arthroscopic Bankart repair vs 3 weeks of immobilization	≤18	Dislocation	43/29	36	Surgery: 13% Immobilization: 70%	Rowe
Current study (2021)	Prospective, randomized	Arthroscopic Bankart repair vs 3 weeks of immobilization	18-25	Dislocation Subluxation Apprehension	20/20	24	Surgery: 10% Immobilization: 70%	DASH: 6.5/11.2 WD: 88.4/70.3 WOSI: 11.5/17.7

[a]ASES, American Shoulder and Elbow Surgeons; DASH, Disabilities of the Arm, Shoulder and Hand score; SANE, Single Assessment Numeric Evaluation; SST, Simple Shoulder Test; WD, Walch-Duplay score; WOSI, Western Ontario Shoulder Instability Index.

from the institutional review board that regularly audited the quality of collected data.

In 2006, Robinson et al[31] published guidelines to increase the statistical power of studies comparing operative and nonoperative treatment after primary ASD. The current study followed these guidelines concerning patient age, randomization, intention-to-treat analysis, 2-year follow-up, evaluation of recurrent instability (not only recurrence of dislocation), use of functional scores, and evaluation of complications.

Calculation of the number of patients in each group accounted for 8 patients lost to follow-up to reach an 80% statistical power with a 5% type I error. Despite a younger and therefore more mobile study population, only 2 patients were lost to follow-up in our study.

The currently recommended treatment after a first episode of ASD is 3 weeks of immobilization in internal rotation, but the risk of recurrent dislocation is high, reaching 90% in some studies.[20] Taylor and Arciero[37] reported 90% recurrence in a study of 53 patients younger than 24 years. Hovelius et al[15] found a 57% recurrence rate for 229 patients who had primary ASD, were between 12 and 40 years of age, and had a 25-year follow-up. To reduce the risk of recurrence, some authors recommend immobilization in external rotation. In a series of 98 patients younger than 30 years, Itoi et al[18] found a 32% risk of recurrence in patients immobilized in external rotation versus 60% for those immobilized in internal rotation. However, a meta-analysis by Whelan et al[41] did not find any difference between these 2 types of immobilization in terms of recurrence rate, shoulder function, and treatment observance.

After the first ASD, humeral head displacement frequently avulses the labrum. Incorrect healing is partly responsible for the risk of recurrence, as the labrum is a passive stabilizer of the shoulder.[25,37] With every recurrence episode, additional lesions to the glenoid cavity and capsular distention increase the risk of instability.[11,12] After the first ASD, the plastic distension of the joint capsule and the acuteness of the labral lesions offer a better environment for the healing of the labral repair than in chronic lesions.[39]

Several authors have underscored the necessity for arthroscopic repair after the first ASD, particularly in athletic patients. In a randomized trial, Wintzell et al[42] showed that arthroscopic lavage of the hemarthrosis decreased capsular tension and allowed the labrum to heal in the anatomic position. In the surgical treatment group, the risk of recurrence (13% vs 43%), functional scores, and the apprehension test were better after a 1-year follow-up.

Other studies have shown better results with arthroscopic repair versus arthroscopic lavage. Robinson's[30] study of 88 patients with a 2-year follow-up showed an 82% reduction in the risk of recurrence and better functional scores. More recently, in a meta-analysis by Chahal et al,[7] arthroscopic repair was superior to lavage and nonoperative treatment in 228 patients with a 2-year follow-up.

Several studies have compared arthroscopic Bankart repair with nonoperative treatment after a first episode of ASD.[2,5,10,19,39] In 1994, Arciero et al[2] compared both treatments in military cadets of the US army, for whom athletic results are necessary for graduation. The investigators observed 80% recurrence in the nonoperative treatment group versus 14% in the surgical treatment group. In

2009, Owens et al[27] found better functional scores and an acceptable recurrence rate (14% recurrent dislocations and 21% subluxations, for a total of 35%) in a study that entailed a 12-year follow-up. Other studies confirming these findings regarding recurrence rate after primary ASD are presented in Table 5. Our results are similar to those of previous studies. In the nonoperative treatment group, 14 patients (70%) did not have a second shoulder dislocation, suggesting they would have undergone unnecessary surgery, but the absence of dislocation does not necessarily mean the shoulder is fully functional. Like Bottoni et al[5] and Kirkley et al,[23] we considered that secondary dislocation is not the only sign of recurrent instability and we took into account apprehension and subluxations, because they can affect social and professional well-being in younger patients.

In our study, all functional scores results were superior in the operative treatment group. These differences were statistically significant in the WOSI and Walch-Duplay scores, because they are more specific for shoulder instability than the QuickDASH score. It is difficult to compare the results of functional scores between studies, because there are many scores and they are used differently (Rowe, Walch-Duplay, WOSI, DASH, Insalata, Single Assessment Numeric Evaluation, American Shoulder and Elbow Surgeons, Simple Shoulder Test, etc). In our study, the difference for the WOSI score was small but significant after 2 years (P = .035). The difference was 11.5% in the study by Kirkley et al[23] and 11% at 2 years in Robinson's[30] study, all in favor of arthroscopic repair.

Surgical treatment does seem to make return to sport easier. After 2 years, 95% of patients in the surgical treatment group had returned to sport; among them, 89% returned to their previous level, whereas in the nonoperative treatment group, only 53% returned to their previous level of sport. Although some patients return to sport between instability episodes, the level of participation is often inferior,[36] as our results confirm; 47% of patients in the nonoperative treatment group had stopped sport or returned to sport at a lower level than before the inclusion.

The main risk factor for recurrence is contact or forced overhead sports. In our study, 7 patients in the surgical treatment group practiced a high-risk sport (group 4 of the Walch-Duplay score). After 2 years, all had returned to sport (3 at a competitive level and 4 at a recreational level), and none had recurrent instability.

Surgical treatment did not cause any range of motion loss, particularly external rotation, as in previous studies.[5,8,23,25,39,42] Arthroscopic Bankart repair retightened the capsule and the labrum, restoring shoulder stability without limiting range of motion.

In our study, off-track Hill-Sachs lesions seemed to affect functional scores and recurrent instability after 2 years in the nonoperative treatment group. Of 6 patients with off-track lesions, all had another episode of instability during the 2-year follow-up. Furthermore, all of the functional scores in these patients were inferior to the scores of patients with on-track lesions, although no statistical tests could be performed. However, the glenoid track concept is subject to caution because interobserver reproducibility is weak, according to Schneider et al.[35] It would be interesting to study the effect of Hill-Sachs lesion on a larger population to confirm these results.

The calculated number of patients in each group, 20, allowed us to answer the main objective; however, the limited number of patients did not allow us to study the effects of radiological findings on functional scores or the risk of recurrence. For the same reasons, it would have been interesting to study the effects of SLAP lesions on clinical results.

The 2-year follow-up could be considered short but is the period during which the risk of recurrence is the highest. Robinson et al[31] found that 86.7% of recurrent instability episodes occurred during the first 2 years. It will be important to continue to follow these patients to confirm the durability of our findings and the risk of secondary osteoarthritis.

CONCLUSION

This study showed that arthroscopic Bankart repair after the first episode of ASD offers better results than nonoperative treatment in terms of risk of recurrence and functional results while preserving range of motion. In light of these results, arthroscopic Bankart repair could be offered as a primary treatment after the first episode of ASD in patients younger than 25 years. A longer follow-up will be necessary to confirm the durability of these findings.

REFERENCES

1. Ahmed I, Ashton F, Robinson CM. Arthroscopic Bankart repair and capsular shift for recurrent anterior shoulder instability. *J Bone Joint Surg Am*. 2012;94(14):1308.
2. Arciero RA, Wheeler JH, Ryan JB, McBride JT. Arthroscopic Bankart repair versus nonoperative treatment for acute, initial anterior shoulder dislocations. *Am J Sports Med*. 1994;22(5):589-594.
3. Beaton DE, Wright JG, Katz JN; Upper Extremity Collaborative Group. Development of the QuickDASH: comparison of three item-reduction approaches. *J Bone Joint Surg Am*. 2005;87(5):1038-1046.
4. Boileau P, Villalba M, Héry JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. *J Bone Joint Surg Am*. 2006;88(8):1755-1763.
5. Bottoni CR, Wilckens JH, DeBerardino TM, et al. A prospective, randomized evaluation of arthroscopic stabilization versus nonoperative treatment in patients with acute, traumatic, first-time shoulder dislocations. *Am J Sports Med*. 2002;30(4):576-580.
6. Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: significance of the inverted-pear glenoid and the humeral engaging Hill-Sachs lesion. *Arthroscopy*. 2000;16(7):677-694.
7. Chahal J, Marks PH, Macdonald PB, et al. Anatomic Bankart repair compared with nonoperative treatment and/or arthroscopic lavage for first-time traumatic shoulder dislocation. *Arthroscopy*. 2012;28(4):565-575.
8. Cho SH, Cho NS, Rhee YG. Preoperative analysis of the Hill-Sachs lesion in anterior shoulder instability: how to predict engagement of the lesion. *Am J Sports Med*. 2011;39(11):2389-2395.
9. Di Giacomo G, Itoi E, Burkhart SS. Evolving concept of bipolar bone loss and the Hill-Sachs lesion: from ''engaging/non-engaging'' lesion to ''on-track/off-track'' lesion. *Arthroscopy*. 2014;30(1):90-98.

10. Gigis I, Heikenfeld R, Kapinas A, Listringhaus R, Godolias G. Arthroscopic versus conservative treatment of first anterior dislocation of the shoulder in adolescents. *J Pediatr Orthop*. 2014;34(4):421-425.
11. Griffith JF, Antonio GE, Tong CWC, Ming CK. Anterior shoulder dislocation: quantification of glenoid bone loss with CT. *AJR Am J Roentgenol*. 2003;180(5):1423-1430.
12. Gutierrez V, Monckeberg JE, Pinedo M, Radice F. Arthroscopically determined degree of injury after shoulder dislocation relates to recurrence rate. *Clin Orthop Relat Res*. 2012;470(4):961-964.
13. Henry JH, Genung JA. Natural history of glenohumeral dislocation—revisited. *Am J Sports Med*. 1982;10(3):135-137.
14. Hovelius L, Augustini BG, Fredin H, Johansson O, Norlin R, Thorling J. Primary anterior dislocation of the shoulder in young patients: a ten-year prospective study. *J Bone Joint Surg Am*. 1996;78(11):1677-1684.
15. Hovelius L, Olofsson A, Sandström B, et al. Nonoperative treatment of primary anterior shoulder dislocation in patients forty years of age and younger: a prospective twenty-five-year follow-up. *J Bone Joint Surg Am*. 2008;90(5):945-952.
16. Hovelius L, Rahme H. Primary anterior dislocation of the shoulder: long-term prognosis at the age of 40 years or younger. *Knee Surg Sports Traumatol Arthrosc*. 2016;24(2):330-342.
17. Huysmans PE, Haen PS, Kidd M, Dhert WJ, Willems JW. The shape of the inferior part of the glenoid: a cadaveric study. *J Shoulder Elbow Surg*. 2006;15(6):759-763.
18. Itoi E, Hatakeyama Y, Sato T, et al. Immobilization in external rotation after shoulder dislocation reduces the risk of recurrence: a randomized controlled trial. *J Bone Joint Surg Am*. 2007;89(10):2124-2131.
19. Jakobsen BW, Johannsen HV, Suder P, Søjbjerg JO. Primary repair versus conservative treatment of first-time traumatic anterior dislocation of the shoulder: a randomized study with 10-year follow-up. *Arthroscopy*. 2007;23(2):118-123.
20. Khiami F, Gérometta A, Loriaut P. Management of recent first-time anterior shoulder dislocations. *Orthop Traumatol Surg Res*. 2015;101(1)(suppl):S51-S57.
21. Kim SH, Ha KI, Cho YB, Ryu BD, Oh I. Arthroscopic anterior stabilization of the shoulder: two to six-year follow-up. *J Bone Joint Surg Am*. 2003;85(8):1511-1518.
22. Kirkley A, Griffin S, McLintock H, Ng L. The development and evaluation of a disease-specific quality of life measurement tool for shoulder instability. The Western Ontario Shoulder Instability Index (WOSI). *Am J Sports Med*. 1998;26(6):764-772.
23. Kirkley A, Werstine R, Ratjek A, Griffin S. Prospective randomized clinical trial comparing the effectiveness of immediate arthroscopic stabilization versus immobilization and rehabilitation in first traumatic anterior dislocations of the shoulder: long-term evaluation. *Arthroscopy*. 2005;21(1):55-63.
24. Kiviluoto O, Pasila M, Jaroma H, Sundholm A. Immobilization after primary dislocation of the shoulder. *Acta Orthop Scand*. 1980;51(6):915-919.
25. Larrain MV, Botto GJ, Montenegro HJ, Mauas DM. Arthroscopic repair of acute traumatic anterior shoulder dislocation in young athletes. *Arthroscopy*. 2001;17(4):373-377.
26. Lill H, Verheyden P, Korner J, Hepp P, Josten C. Konservative Behandlung nach traumatischer Schultererstluxation? [Conservative treatment after first traumatic shoulder dislocation?] *Chirurg*. 1998;69(11):1230-1237.
27. Owens BD, DeBerardino TM, Nelson BJ, et al. Long-term follow-up of acute arthroscopic Bankart repair for initial anterior shoulder dislocations in young athletes. *Am J Sports Med*. 2009;37(4):669-673.
28. Owens BD, Duffey ML, Nelson BJ, DeBerardino TM, Taylor DC, Mountcastle SB. The incidence and characteristics of shoulder instability at the United States Military Academy. *Am J Sports Med*. 2007;35(7):1168-1173.
29. Petrera M, Patella V, Patella S, Theodoropoulos J. A meta-analysis of open versus arthroscopic Bankart repair using suture anchors. *Knee Surg Sports Traumatol Arthrosc*. 2010;18(12):1742-1747.
30. Robinson CM. Primary arthroscopic stabilization for a first-time anterior dislocation of the shoulder: a randomized, double-blind trial. *J Bone Joint Surg Am*. 2008;90(4):708.
31. Robinson CM, Howes J, Murdoch H, Will E, Graham C. Functional outcome and risk of recurrent instability after primary traumatic anterior shoulder dislocation in young patients. *J Bone Joint Surg Am*. 2006;88(11):2326-2336.
32. Rowe CR, Patel D, Southmayd WW. The Bankart procedure: a long-term end-result study. *J Bone Joint Surg Am*. 1978;60(1):1-16.
33. Rowe CR, Sakellarides HT. Factors related to recurrences of anterior dislocations of the shoulder. *Clin Orthop*. 1961;20:40-48.
34. Saragaglia D, Picard F, Le Bredonchel T, Moncenis C, Sardo M, Tourne Y. Les instabilités antérieures aiguës de l'épaule: résultats à court et moyen terme du traitement orthopédique [Acute anterior instability of the shoulder: short- and mid-term outcome after conservative treatment]. *Rev Chir Orthop Reparatrice Appar Mot*. 2001;87(3):215-220.
35. Schneider AK, Hoy GA, Ek ET, et al. Interobserver and intraobserver variability of glenoid track measurements. *J Shoulder Elbow Surg*. 2017;26(4):573-579.
36. Simonet WT, Cofield RH. Prognosis in anterior shoulder dislocation. *Am J Sports Med*. 1984;12(1):19-24.
37. Taylor DC, Arciero RA. Pathologic changes associated with shoulder dislocations: arthroscopic and physical examination findings in first-time, traumatic anterior dislocations. *Am J Sports Med*. 1997;25(3):306-311.
38. te Slaa RL, Brand R, Marti RK. A prospective arthroscopic study of acute first-time anterior shoulder dislocation in the young: a five-year follow-up study. *J Shoulder Elbow Surg*. 2003;12(6):529-534.
39. Uhring J, Rey PB, Rochet S, Obert L. Interest of emergency arthroscopic stabilization in primary shoulder dislocation in young athletes. *Orthop Traumatol Surg Res*. 2014;100(8) (suppl):S401-S408.
40. Wheeler JH, Ryan JB, Arciero RA, Molinari RN. Arthroscopic versus nonoperative treatment of acute shoulder dislocations in young athletes. *Arthroscopy*. 1989;5(3):213-217.
41. Whelan DB, Kletke SN, Schemitsch G, Chahal J. Immobilization in external rotation versus internal rotation after primary anterior shoulder dislocation: a meta-analysis of randomized controlled trials. *Am J Sports Med*. 2016;44(2):521-532.
42. Wintzell G, Haglund-Akerlind Y, Ekelund A, Sandström B, Hovelius L, Larsson S. Arthroscopic lavage reduced the recurrence rate following primary anterior shoulder dislocation: a randomised multicentre study with 1-year follow-up. *Knee Surg Sports Traumatol Arthrosc*. 1999;7(3):192-196.