

# Arthroscopic Versus Open Treatment of Bankart Lesion of the Shoulder: A Prospective Randomized Study

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**Purpose:** The purpose of this study was to compare the results of arthroscopic and open repair of isolated Bankart lesions of the shoulder using metallic suture anchors. **Type of Study:** Prospective randomized clinical study. **Methods:** Sixty patients with traumatic anterior shoulder instability underwent a surgical repair of an isolated Bankart lesion. The patients were divided into 2 groups of 30 patients each. In group 1, an arthroscopic repair was performed, and in group 2, an open procedure was performed. The groups were homogeneous for gender, age, dominance, number of dislocations, time elapsed between first dislocation and surgery, and pathologic findings. In all cases of both groups, the lesion was repaired using metallic suture anchors carrying nonabsorbable braided sutures. Postoperative rehabilitation was the same for the 2 groups. Two years' follow-up evaluation included Constant and Rowe shoulder scores. Statistical analysis of data was performed using an unpaired *t* test (significance for  $P < .05$ ). **Results:** No recurrence of dislocation of the involved shoulder has been reported in either group. Follow-up Constant and Rowe scores of the 2 groups were not significantly different. The only significant difference seen between the 2 groups was for range of motion evaluation with the Constant score. The mean value for group 1 ( $39.6 \pm 0.8$ ) was significantly greater ( $P = .017$ ) than that for group 2 ( $37.8 \pm 2.0$ ). **Conclusions:** Arthroscopic repair with suture anchors is an effective surgical technique for the treatment of an isolated Bankart lesion. Open repair does not offer a significantly better 2-year result in terms of stability, and furthermore, can negatively affect the recovery of full range of motion of the shoulder. **Level of Evidence:** Level I. **Key Words:** Shoulder—Bankart lesion—Suture anchors—Arthroscopic treatment—Open treatment.

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Shoulder instability is one of most controversial joint diseases in terms of diagnosis and treatment. The use of arthroscopy has improved the recognition of pathologic findings in shoulder instability and allowed a better understanding of the etiology of instability and the correlation between symptoms and lesion patterns. Furthermore, the use of the arthroscopic technique allowed developing reparative and reconstructive surgical procedures aimed at a selective

treatment of the injured structures, thus reducing the risk of iatrogenic damage.

Arthroscopic treatment of shoulder instability introduced some advantages compared with open procedure. These include short surgical times, less morbidity, less postoperative pain, reduced hospitalization time, and a decreased risk of complications.<sup>1</sup> Moreover, some studies reported a minor loss of range of motion (ROM) in patients treated arthroscopically compared with those treated using an open procedure.<sup>2-4</sup> However, many authors<sup>3,5-9</sup> have reported some disadvantages of arthroscopic treatment of shoulder instability, especially a high recurrence rate.

Furthermore, arthroscopic stabilization of the shoulder requires the knowledge of complex surgical techniques, with a very steep learning curve, as well as expensive instrumentation. Nevertheless, in recent years, arthroscopic stabilization has become an effective

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**TABLE 1.** *Demographics of the Patient Population*

Variables	Group 1 (Arthroscopic)	Group 2 (Open)
No. of patients	30	30
Gender:		
Male	24	26
Female	6	4
Mean age, yr (range)	24.5 (19-33)	26.8 (21-30)
Dominant arm	22	17
Mean number of episodes of dislocation (range)	3.2 (2-4)	3.0 (2-4)
Mean age at the first dislocation, years (range)	23.7 (18-29)	24.5 (19-29)
Mean time from first dislocation to surgery, months (range)	25.3 (8-52)	20.2 (6-43)
No. of patients involved in overhand activities	17	14

tive treatment option for shoulder instability, and today in many cases can produce similar results to those obtained with an open procedure.<sup>10-12</sup>

After reviewing the literature on surgical treatment of shoulder instability, comparing the results of arthroscopic and open procedures is difficult because of a remarkable variability of study design, patient selection, pathologic findings, surgical technique, and evaluation of results.

The goal of this prospective randomized clinical study was to compare results of the arthroscopic and open treatment for traumatic anterior shoulder instability in a selected group of patients that was homogeneous for history, clinical evidence, and lesion pattern, to evaluate if the surgical technique can affect the outcome of the repair of a Bankart lesion.

## METHODS

For the present study, the patients were selected with the following inclusion criteria: (1) clinical history of anterior shoulder instability as a result of a traumatic event, (2) absence of some symptoms or surgery to the injured shoulder before the first episode of traumatic dislocation, (3) no more than 4 episodes of anterior shoulder dislocation, (4) no clinical evidence of multidirectional instability, and (5) loss of substance of the humeral head (Hill-Sachs lesion) not exceeding 30%, documented by an imaging study (plain radiographs or computed tomography).

In all cases, shoulder arthroscopy was performed, during which the following lesion patterns were confirmed: (1) Bankart lesion of the anterior glenoid labrum, (2) absence of other capsular and tendon injuries, and (3) absence of glenoid fractures (bony Bankart lesion) or divots. Immediately after diagnostic arthroscopy, the patients underwent surgical treat-

ment. To obtain a sample of 60 cases, from January 1998 to July 1999, we selected 104 patients who had the preoperative inclusion criteria.

After diagnostic arthroscopy, 44 patients were excluded because of the presence of one or more of the following pathologic conditions: gross elongation or absence of the anteroinferior glenohumeral ligament (31 cases), labrum detachment extended to the inferior part of the glenoid (9 cases), anterior labrum periosteal sleeve avulsion lesion (7 cases), rotator interval tear (11 cases), tear or elongation of the middle glenohumeral ligament (15 cases), SLAP lesion (12 cases), glenoid bone defect (7 cases), and rotator cuff tear (4 cases). The 60 patients selected for the study were divided into 2 groups of 30 cases each. An arthroscopic repair was performed in group 1, and an open repair in group 2. For selecting the surgical procedure, a blinded randomization was performed using the SPSS 8.0 software (SPSS, Chicago, IL). The code of the procedure (1, arthroscopy; 2, open) to perform was revealed to surgeons only when the enlistment was confirmed after diagnostic arthroscopy. All the patients had signed an informed consent for the study. Demographic data for the 2 groups are reported in Table 1.

## Surgical Treatment

For group 1, after arthroscopic examination of the involved shoulder in lateral decubitus was performed, the damaged anterior labrum was debrided and completely mobilized from the glenoid neck using a shaver and an arthroscopic elevator inserted into the joint from an anterior midglenoid portal. A 4-mm round burr was then used through the same portal to abrade the anterior border of the glenoid neck. The repair of the glenoid labrum was performed according

**TABLE 2.** Follow-up Results (Mean  $\pm$  SD) According to Constant Score

	Pain	Function	ROM	Strength	Absolute Score	Relative Score (%)	Improvement in Points
Arthroscopic							
Mean	13.5	18.9	39.6	17.5	89.5	97.1	23
SD	2.42	1.10	0.84	1.72	4.25	3.81	5.89
Open							
Mean	13.5	17.6	37.8	17.8	86.7	94.1	20.2
SD	2.42	2.01	1.99	1.69	6.07	7.37	8.22
<i>P</i>	1.000	.090	.017	.698	.248	.28	.39

to the SCOI technique described by Snyder,<sup>13</sup> and using 3 metal threaded suture anchors (mini-Revo; Linvatec, Largo, FL) loaded with a No. 1 braided nonabsorbable suture.

For group 2, after diagnostic arthroscopy in lateral decubitus, the patient was placed in a beach-chair position and the shoulder was re-draped. Open repair was performed using a deltopectoral approach. The subscapularis tendon was isolated and longitudinally sectioned approximately 1 cm from its humeral insertion. The glenohumeral capsule was opened from the lateral side, and the subscapularis and the capsule were retracted medially. Then, the anterior labrum was debrided and mobilized from the anterior glenoid rim, and the glenoid neck was abraded using a burr or a curette. For labrum repair, we used 3 mini-Revo suture anchors. The sutures were passed and tied over the labrum following the technique described by Matzen et al.<sup>14</sup> The capsule and the subscapularis tendon were sutured using a side-to-side repair without any horizontal or vertical shift; the superficial layers were then closed. No drainage was used.

### Postoperative Treatment

All patients in both groups underwent the same postoperative regimen. A sling with a 20° angle of forward flexion and 30° angle of abduction was used for 6 weeks. After the first 3 weeks, all patients began passive and assisted active motion exercises with T-bar for the recovery of ROM. Initially no external rotation was allowed. Subsequently, isometric, then isotonic muscle strengthening exercises were performed for the recovery of muscle strength. After 3 months, all patients underwent an advanced muscle strengthening and capsular stretching exercise program. The return to sport activity was allowed after 6 months.

### Evaluation of Results

Evaluation of results at follow-up examination was performed using the scoring system of Constant and

Murley<sup>15</sup> and a modified Rowe grading system for the assessment of activity level.<sup>16</sup> Based on the Constant score, the absolute score, the relative score (in comparison with the contralateral side and expressed in percentages), and improvement in points was calculated for each patient.

Statistical analysis of data was performed with SPSS 10.1.3 software. The results of the 2 groups of patients were compared for each parameter of the 2 scoring systems using an unpaired *t* test. Differences were considered significant for values of *P* < .05.

## RESULTS

We did not see any intraoperative or postoperative complications. The follow-up time was 2 years for all patients. No recurrence of dislocation of the involved shoulder was reported in either group. Comparison of results obtained with the Constant score (Table 2) did not show any significant differences between the 2 groups relative to the mean values for pain, function, and strength. Conversely, the mean value for ROM in group 1 was significantly greater than in group 2. The differences in mean values for absolute total score, relative total score, and improvement in points between the 2 groups were not significant, although they were greater in group 1.

Analysis of results according to the Rowe score (Table 3) showed that the mean values for function

**TABLE 3.** Follow-up Results (Mean  $\pm$  SD) According to Rowe Score

	Function	Pain	Stability	ROM	Total
Arthroscopic					
Mean	45.5	8.5	27	10	91
SD	7.25	2.42	6.32	0.00	15.06
Open					
Mean	41.0	8.5	28.5	8.5	86.5
SD	7.75	2.42	4.74	2.42	12.92
<i>P</i>	.196	1.000	.556	.065	.482

and ROM of group 1 were greater than those of group 2, but the differences were not significant. The mean value for pain was the same in the 2 groups, and the mean value for stability was greater in group 2 than in group 1, although the difference was not significant. The mean value for total result was greater in group 1 than in group 2, but the difference was not significant.

## DISCUSSION

Many studies<sup>3,5,17-26</sup> have reported the results of arthroscopic stabilization of the shoulder, describing different repair and reconstruction techniques. Each of these arthroscopic procedures has shown efficiency in addressing shoulder instability, but with failure and unsatisfactory result rates that were nearly always greater than those reported for the open treatment. Some outcome studies<sup>27-31</sup> have shown that many of the arthroscopic techniques used for treating the unstable shoulder have a limited adequacy because of the remarkable variability of the type of pathology associated with shoulder instability.

Because the arthroscopic procedure was performed for a selective and anatomic repair of the injured tissues, hypothesizing that only one procedure can be adequate for each pattern of shoulder instability is difficult. Therefore, the outcome of arthroscopic stabilization of the shoulder could be affected by some variables such as gender, age, dominance, number of dislocations, direction and severity of the pathological laxity, lesion pattern, surgical technique, rehabilitation program, and duration of follow-up time. Particularly, for comparing outcomes of arthroscopic with open treatments for shoulder instability, the 2 groups of patients must be as homogeneous as possible for all the aforementioned variables. Only in this manner could a significant comparison be achieved on the effectiveness of the 2 treatment methods.

In the present prospective, randomized study, we compared 2 groups of patients, controlling the homogeneity of independent variables such as lesion mechanism (traumatic), number of dislocations, direction of instability, lesion pattern, surgical technique, postoperative treatment, and duration of follow-up evaluation. Analysis of demographic data showed that the 2 groups of patients were homogeneous for gender, mean age, age at the first dislocation, timing between first dislocation and surgery, and involvement in overhead activities. This allowed verifying if the surgical technique, either arthroscopic or open, can affect the result of Bankart repair with metal suture anchors. To minimize observation bias, all patients considered

for the study underwent a preoperative diagnostic arthroscopy to match inclusion criteria. At arthroscopy, 44 patients were excluded from the study because of the presence of accompanying lesions, so 104 patients were initially considered for the study to obtain a definitive sample of 60 cases.

We excluded from the study all the patients with rotator interval tears, SLAP lesions, rotator cuff tears, and bone defects of the glenoid, because they required a more complex repair and because these lesions could affect the pattern of instability. The damage to the anteroinferior capsule was difficult to assess, because some extent of capsular ligament injury is almost always present after a traumatic dislocation.<sup>32,33</sup> Gartsman et al.<sup>34</sup> reported on 53 cases affected by anteroinferior shoulder instability and treated arthroscopically. They noted a tear of the anteroinferior glenohumeral ligament in most cases. For this reason, we excluded from the study all shoulders that required a complex repair or reconstruction of the anteroinferior ligament-labrum complex, such as ALPSA lesions, evident attenuation or absence of the anteroinferior glenohumeral ligament, and labral lesions extended to the inferior part of the glenoid. We still hypothesized a selection bias because of an underestimation of the ligament elongation that could require a certain amount of tensioning of the anteroinferior capsule. However, none of the cases included in the study required a significant capsular advancement or shift during surgery to restore adequate tension. Furthermore, to minimize selection bias, we assigned patients to 1 of the 2 treatment groups (arthroscopic or open) by means of a preoperative blinded randomization. Surgery was then performed according to the randomization program only when the diagnostic arthroscopy allowed the confirmation of definitive enlistment.

The results were analyzed using 2 different evaluation forms. The Constant and Murley scoring system was chosen because it allows a functional assessment of the shoulder for pain, activities, and ROM. The modified Rowe grading system was considered adequate for the evaluation of our patients because more than 50% of them practiced overhead activities. Although we did not record the activity level of the patients before injury or surgery, the modified Rowe grading system allowed us to obtain important information to assess return to the prior level of activity.

The outcome evaluation did not show significant differences between the 2 groups for any variable except ROM, which had a significantly greater mean value in the arthroscopic group according to the Con-

stant and Murley scoring system. At evaluation with the modified Rowe grading system, we did not see a significant difference in ROM between the 2 groups. However, the mean value for the arthroscopic group (10 points) was higher than for the open group (8.5 points), and the difference approximated significance ( $P = .065$ ). Therefore, we suggest that the discrepancy in ROM evaluation between the scoring systems was purely statistical and probably because of the difference in maximum score assigned to the variable (40 points in the Constant and Murley scoring system and 10 points in the modified Rowe grading system).

A weakness of our study was the absence of an absolute measurement of ROM. However, we preferred to obtain a functional and subjective assessment of motion because of the difficulty of achieving a valid and accurate measurement of shoulder motion. Particularly, external rotation is difficult to measure accurately because of the absence of a clear neutral plane and its variation with the position of the shoulder. Furthermore, we considered the ability of the patient to use the shoulder for activities to be more important than the actual ROM.<sup>35</sup> We did not see any recurrence of dislocation in either group at a 2-year follow-up examination. These data differ from the results reported in other studies<sup>7-9,36-38</sup> on the comparison between arthroscopic and open treatment of shoulder instability, in which a higher recurrence rate in the arthroscopically treated patients has been seen. However, many of these studies had some discrepancies in patient selection and surgical technique.

Guanche et al.<sup>7</sup> performed a retrospective study on 27 patients with a Bankart lesion treated by means of an arthroscopic (15 cases) and open (12 cases) repair. At a follow-up time ranging between 17 and 42 months, they saw that a positive apprehension test was significantly more frequent in the arthroscopic group (40%) than in the open group (8%). Moreover, recurrence rate was significantly higher in the arthroscopic group (33%) than in the open one (8%). However, although in the open group, the lesion had been repaired with suture anchors, the arthroscopic repair had been performed using transglenoid sutures in 10 cases and anchors in 5 cases. Although the authors affirmed that the technique used for arthroscopic Bankart repair did not significantly affect the results, recurrence rate was higher in the cases treated with transglenoid sutures (40%) than in the cases treated with anchors (20%). Therefore, the difference between the 2 arthroscopic groups was possibly not significant because of the small number of cases.

Geiger et al.<sup>8</sup> reported a prospective study on 34

patients with an anterior shoulder instability that were treated arthroscopically (16 cases) or open (18 cases). At follow-up evaluation, they showed a significantly higher rate of good to excellent results in the open group (83%) than in the arthroscopic one (50%). However, the authors noted that capsular laxity could be better estimated during an open procedure. Therefore, it could be hypothesized that in some of the arthroscopic cases, the lesion pattern of the shoulder had been underestimated and the 2 groups were not homogeneous for pathology.

Steinbeck and Jerosch<sup>36</sup> published a prospective study on 60 patients affected by traumatic anterior shoulder instability and treated using an arthroscopic (30 cases) or open (30 cases) procedure. At a follow-up time ranging between 24 and 60 months, they reported a mean Rowe score of 90.6 points for the open group and 83.1 points for the arthroscopic group. Recurrence rate was 6% in the open group and 17% in the arthroscopic one. However, the repair of the glenoid labrum had been performed using suture anchors in the open group and transglenoid sutures in the arthroscopic group.

Roberts et al.,<sup>9</sup> in a retrospective study on 56 Australian football players, used 3 different techniques for treating traumatic anterior shoulder instability: arthroscopic transglenoid sutures, arthroscopic repair with absorbable tacks, and open Bankart repair with capsular shift. At a mean 29.4-month follow-up, they saw a recurrence rate of 70% in the transglenoid suture group, 38% in the absorbable tack group, and 30% in the open group. The authors concluded that the arthroscopic treatment is not efficient when a plastic deformation of the anterior capsule is present. The limitation of this study is that patients were evaluated retrospectively, and, therefore, whether the lesion pattern was homogeneous in all the patients is not clear. Furthermore, the repair technique was quite different in the 3 groups.

Karlsson et al.<sup>37</sup> reported on 117 cases of Bankart repair (66 arthroscopic and 53 open). Follow-up Rowe and Constant score evaluations did not show significant differences between the 2 groups, but the recurrence rate was higher in the arthroscopic group (15%) than in the open one (10%). However, the repair technique was different for the 2 groups (absorbable tacks for arthroscopic treatment and suture anchors for open treatment). Similarly, Sperber et al.<sup>38</sup> performed a multicenter prospective randomized study on 56 patients affected by a Bankart lesion, who underwent an arthroscopic (30 cases) or open (26 cases) treatment. They saw a higher recur-

rence rate in the arthroscopic group (23%) than in the open group (12%). However, in this study, the arthroscopic repair was performed with absorbable tacks and the open repair was performed with suture anchors.

From analysis of the aforementioned studies, we could hypothesize that the differences between arthroscopic and open treatment of traumatic anterior shoulder instability, regarding recurrence of instability, can be caused by a selection bias. In our study, we reviewed the patients at a short-term follow-up (24 months), and this could explain the absence of recurrence seen in both groups. However, some authors<sup>10,11</sup> compared arthroscopic and open treatment of isolated Bankart lesion, using the same fixation technique for the glenoid labrum. They did not see significant differences between the 2 procedures for recurrence and residual laxity, at longer follow-up times.

Jorgensen et al.<sup>10</sup> reported a prospective study on 41 patients who were homogeneous for lesion pattern (isolated Bankart lesion). An arthroscopic repair had been performed in 21 cases and an open repair in 20 cases. The repair of the glenoid labrum had been performed using suture anchors in both groups. At a mean 36-month follow-up evaluation, they did not note any significant difference between the 2 groups for recurrence, residual laxity, and ROM.

Kim et al.<sup>11</sup> reported on 89 patients affected by traumatic anterior shoulder instability and treated arthroscopically (59 cases) or with open procedure (30 cases). Repair was performed with suture anchors in both groups. At follow-up evaluation, they saw that the percentage of good to excellent results was higher in the arthroscopic group (91.5%) than in the open group (86.6%). University of California Los Angeles (UCLA) and Rowe mean scores were significantly higher in the arthroscopic group. However, this study was retrospective, and the follow-up time was remarkably greater in the open group (41-60 months) than in the arthroscopic group (26-42 months).

Cole et al.<sup>12</sup> performed a prospective study on 59 patients with traumatic anterior shoulder instability and treated with an arthroscopic (37 cases) or open (22 cases) repair. The selection of the surgical procedure was based on pathology. Isolated Bankart lesions were repaired arthroscopically with absorbable tacks, and anteroinferior instability was addressed using an open capsular shift. At a 54-month mean follow-up evaluation, no significant difference was found between the 2 groups of patients for recurrence rate and percentage of unsatisfactory results. The 2 groups did not differ for age, dominance, lesion mechanism, time elapsed

between first dislocation and surgery, and duration of follow-up time. The authors concluded that refining selection criteria on the basis of pathologic findings at surgery for recurrent traumatic shoulder instability, rather than treating all patients with a single reconstruction technique, should reduce the failure rates after arthroscopic stabilization.

We agree with the above conclusion and, on the basis of the results of our study, we believe that arthroscopic repair with suture anchors is an effective surgical technique for the treatment of an isolated Bankart lesion. Open repair does not offer a significantly better result in terms of stability, and what is more, can negatively affect the recovery of full ROM of the shoulder. Because the arthroscopic procedure has some advantages with respect to open procedure regarding duration of surgery, morbidity, postoperative pain, time of hospitalization, and risk of complications,<sup>1</sup> it can be affirmed that arthroscopic repair of a Bankart lesion is more cost-effective than the open procedure.

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