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Original Article

Arthroscopic Bankart repair for recurrent shoulder instability: A retrospective study of 86 cases

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ABSTRACT

The purpose of our study was to retrospectively evaluate the outcomes of arthroscopic Bankart repair in 86 patients, who met the inclusion criteria of at least one episode of shoulder dislocation, with a minimum follow-up of one year. Outcome was measured by the use of Western Ontario Shoulder Instability (WOSI) score.

At the end of our study, the recurrence rate was 7%. Young age ($p = 0.016$) and ligamentous laxity ($p = 0.003$) were associated with recurrence.

Arthroscopic Bankart repair is a reliable treatment method, with good clinical outcomes. Patients with younger age or with ligamentous laxity were at the greatest risk of recurrence.

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1. Introduction

The glenohumeral joint is the most frequently dislocated major joint, and most cases involve an anterior dislocation.¹ Recurrence in young patients can be 90%.²

Shoulder dislocation involves a tear of the inferior capsuloligamentous complex and labrum from the anterior inferior glenoid 97% of the time.³ An avulsion of this anterior inferior labrum from the glenoid rim was first described by Perthes⁴ and Bankart⁵ in the early twentieth century. Since then, several open and arthroscopic techniques have been described to address anterior shoulder instability.

Early studies⁶ showed inferior clinical outcomes for arthroscopic techniques using either transglenoid sutures or bioabsorbable tacks compared with open surgery.

However, with the advance of arthroscopic techniques and biomaterials, recurrence rates are similar to those of open surgery in many more recent publications.^{7–9} In addition to these technical advancements, our understanding of the multifactorial etiology of glenohumeral instability and our ability to recognize complex injury patterns with advanced imaging modalities have led to a tailored approach to the patient with recurrent shoulder instability.¹⁰ These arthroscopic procedures address both capsuloligamentous laxity and labral pathologies via a variety of instruments, suture passages, knot-tying techniques, and fixation devices.

Nowadays, arthroscopic shoulder stabilization is considered by many surgeons to be the preferred method of management because it allows a detailed diagnosis of coexistent intra-articular shoulder pathology and is associated with less soft tissue dissection, less postoperative pain, lower

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morbidity, maximal preservation of external rotation, and improved cosmesis.¹¹

Several risk factors have been implicated in the rate of recurrence after stabilization. These include young age, high level of athletic competition, presence of a bony defect in the glenoid or humeral head, number of suture anchors, and ligamentous laxity.^{12–14}

The purpose of our study was to retrospectively evaluate the outcomes of arthroscopic repair of capsulolabral lesions in patients enrolled in our institution's database, with a minimum follow-up of one year.

2. Subjects and methods

Ninety-six patients who underwent surgery with an initial presentation of glenohumeral dislocation were enrolled in our hospital database between May 2009 and June 2013.

Ten patients were excluded due to prior ipsilateral shoulder surgery (five patients), full-thickness rotator cuff tears (four patients), and prior proximal humeral fracture (one patient).

Therefore, 86 patients met the inclusion criteria of at least one episode of anterior subluxation or dislocation of the shoulder treated with arthroscopic Bankart repair using suture anchors, with a minimum follow-up of one year.

All demographic data and characterization of the condition and procedure were collected retrospectively by use of patient case notes and imaging tests (X-ray and/or magnetic resonance).

Outcome was measured by the use of the Western Ontario Shoulder Instability (WOSI) score. The WOSI score, established in Canada in 1998,¹⁵ consists of four domains incorporating self-administered questions using a 100-mm VAS response. The domains include physical symptoms (10 items); sports, recreation, and work (4 items); lifestyle (4 items); and emotions (3 items). The score ranges from 0 to 2.100, with a higher raw score indicating worse function. The raw score can also be calculated into a percentage score.

2.1. Surgical technique

At our institution, the arthroscopic Bankart repair is performed usually with an interscalenic nerve block in conjunction with general anesthesia, to better control postoperative pain. The operation is performed in the lateral decubitus position with a traction system. The shoulder was prepared and draped in a sterile manner, and the bony landmarks were marked carefully to maintain orientation throughout the procedure. At first, a standard posterior arthroscopic portal was established and a systematic diagnostic examination of the glenohumeral joint was performed. Two anterior portals were established using outside-in technique with a needle. The anterosuperior portal was made in the rotator interval just inferior to the anterior edge of the acromion, and the anterior midglenoid portal was made just over the superior border of the subscapularis tendon. The Bankart lesion was mobilized from the anterior glenoid surface using a periosteal elevator. The goal is to mobilize the labrum such that it could be shifted superiorly and laterally. After mobilization of the labrum and glenoid preparation, a shuttle suture is passed through the

IGHL and the labrum at the six o'clock position while a first anchor is placed at the five o'clock position, which results in a good capsular shift decreasing the inferior capsular space. The sutures were shuttled and tied arthroscopically with a sliding knot construct. A variable number of anchors is used, varying accordingly with the labral lesion. Some degree of capsulorrhaphy was performed (in conjunction with the labral repair) in every patient based on intraoperative findings. At the final stage, the stability of the repair is tested.

2.2. Rehabilitation protocol

All the patients were rehabilitated according to the same protocol. In the first two postoperative weeks, sling use was maintained continuously, being only removed for pendulum exercises and for elbow and wrist flexion-extension. At this moment, the patients were evaluated by the surgeon and physiatrist. At the third and fourth weeks, the priority is the articular range of motion. Active-assisted range of motion in the plane of the scapula was progressed to 90. After four weeks, the immobilizer was discontinued and active-assisted range of motion was progressed in forward flexion and external rotation. Patients were also taught to do isometric rotator cuff exercises during this period. From weeks six to twelve, gradual strengthening was added. Patients were discharged when able to perform a pain-free daily activity-related program with isokinetic internal and external rotation strength that was at least equal to the unaffected side. Noncontact sports were allowed after two months and contact sports after six months postoperative.

2.3. Statistical analysis

The variables were represented by these pertinent descriptive statistics: mean, standard deviation, median, minimum and maximum values, or absolute and relative frequencies (percentages). Statistical analysis was performed using paired Student's t-test or Mann–Whitney test to compare means, and Fischer's exact test to test for categorical values because of the small sample size. The analysis was performed using SPSS statistical software version 20.0. *p* Values <0.05 were considered statistically significant.

3. Results

86 patients were treated with arthroscopic Bankart repair using suture anchors, with a minimum follow-up of one year. The mean follow-up period was 34 months (range 12–65 months). Seventy-nine percent of the patients were male; the right side was affected in 50% of cases and the dominant side in 63%. The average age at first episode of dislocation was 28.5 years (range 15–72 years). The percentage of patients under 20 years was 24%.

The average interval between the first episode of dislocation and surgery was 4.9 years (range 0–28 years). Forty-eight percent of patients were operated in the first two years after the first dislocation.

Preoperatively, all patients were classified as grade I in the range of ASA Physical Status Classification System. Eighty-four

Table 1 – Distribution of patients according to the number of dislocations.

Number of dislocations	Number of patients	Percentage
1	5	5.8%
2-5	42	48.9%
6-10	18	20.9%
≥11	21	24.4%

percent of patients had a normal body mass index (BMI); twelve percent were overweight and 4% were obese.

Almost half of the patients had between two to five dislocations before the surgical treatment (Table 1).

Sixty-four patients (74%) had a Hill-Sachs lesion, documented either preoperatively in MRI or intraoperatively. Seven patients (8%) had a bony Bankart lesion, and 5 patients (6%) had an associated SLAP lesion.

Over the years, different types of anchors were used, ranging in diameter, material type (absorbable vs nonabsorbable vs all-suture anchors) and manufacturer (Table 2).

The number of anchors placed on each patient varied between two and nine, according to the extent of labral lesion, direction of instability (anterior vs multidirectional), and the type of anchor used (Table 3). Over the years, it is possible to observe a tendency to use more anchors, of a progressively smaller diameter (Tables 2 and 4). The mean duration of surgery was 70 min (range 40–115 min). There were statistically significant differences between patients with different number of presurgery dislocations (Table 5).

On the first postoperative month, the mean abduction was 94° (range 40°–180°) and the mean antepulsion 128° (range 60°–180°). On the third postoperative month, the mean abduction was 142° (range 90°–180°) and the mean antepulsion 167° (range 100°–180°).

The vast majority of patients were evaluated in consultation until six months after surgery and were discharged in the absence of pain complaints or mobility changes. The most common complication was the limitation of external rotation (>20°) in 7 patients (8%).

At the end of our study, the overall recurrence rate was 7.0% (6 patients). However, if we exclude patients with ligamentous laxity (two recurrences in five patients), the recurrence rate is

Table 2 – Distribution of the different types of anchors, over the years (number of patients).

	2009	2010	2011	2012	2013	Total
JuggerKnot 1.5 mm, Biomet	0	1	18	26	7	52
Bioplug 3.5 mm, Storz	2	8	4	0	0	14
Mini-Revo 2.7 mm, Linvatec	4	3	2	0	0	9
PEEK anchor 2.4 mm, Biomet	0	0	8	1	0	9
X-al 3.0 mm, Stryker	2	0	0	0	0	2
Total	8	12	32	27	7	86

Table 3 – Number of anchors placed in each patient.

No. of anchors	No. of patients	Percent
2	4	4.7%
3	30	34.9%
4	27	31.4%
5	18	20.9%
6	5	5.8%
7	1	1.2%
9	1	1.2%
Total	86	100%

Table 4 – Number of placed anchors, across the years (mean ± standard deviation).

Year	No. of anchors	No. of patients
2009	2.8 ± 0.46	8
2010	3.1 ± 0.52	12
2011	3.8 ± 1.03	32
2012	4.7 ± 1.30	27
2013	4.6 ± 1.27	7

Table 5 – Difference between variables, categorized according to the number of dislocations (mean ± standard deviation).

No. dislocations	Duration of surgery (min)	No. of anchors	Interval 1st episode/surgery (years)
1	69 ± 5	3.5 ± 1.3	1.5 ± 1.3
2-5	64 ± 14	3.9 ± 1.3	3.6 ± 4.7
6-10	73 ± 19	3.7 ± 0.8	7.0 ± 8.0
>11	83 ± 15	4.1 ± 1.1	6.3 ± 4.9
p	0.009	0.723	0.033

4.9% (four cases in a population of 81 patients). Two patients underwent a second surgical procedure, while the other four were treated through rehabilitation processes (Table 6).

Young age ($p = 0.016$) and ligamentous laxity ($p = 0.003$) were associated with recurrence after anterior stabilization. All the other factors, like gender ($p = 0.601$), BMI ($p = 0.157$), number of episodes of dislocation ($p = 0.454$), number of anchors ($p = 0.917$), length of time until surgery ($p = 0.845$), or presence of an associated lesion [Hill-Sachs ($p = 0.643$), bony Bankart ($p = 1.0$), or SLAP lesion ($p = 1.0$)] did not influence the recurrence rate.

In patients without episodes of recurrence, the score WOSI was calculated. The mean value was 9.0 points (range 0–67 points).

4. Discussion

Arthroscopic shoulder stabilization for recurrent glenohumeral instability has evolved considerably over the past two decades. Advantages of an all-arthroscopic technique are numerous, ranging from preservation of the subscapularis to the ability to address a multitude of concomitant pathologies.

Table 6 – Characterization of patients with dislocation recurrence.

Patient ID	Age at 1st dislocation	Number of dislocations	Direction of instability	Associated lesions	No. implants	Recurrence time	Reoperation
F, 15y	14	2–5	Multidirectional	None	3	36 Months	No
M, 16y	14	2–5	Anterior	HS	5	19 Months	Yes
M, 26y	26	6–10	Anterior	HS	5	3 Months	No
M, 21y	19	2–5	Anterior	HS	4	24 Months	No
M, 42y	41	2–5	Anterior	HS	4	15 Months	No
F, 18y	16	6–10	Multidirectional	None	4	3 Months	Yes

HS – Hill-Sachs lesion.

In addition, arthroscopic stabilization can potentially provide more favorable range of motion and early return to full-functional activity in high-demand patients.¹⁰

However, not always was the arthroscopic treatment considered an ideal solution in the approach of shoulder instability, mainly because of the high failure rate that was reported in early studies.^{8,16} However, in a metaanalysis published in 2009, Brophy and Marx⁷ found that arthroscopic surgery using suture anchor fixation has redislocation rates similar to those of open surgery (6.4% and 8.2%, respectively).

Modern suture anchor devices combined with a trend away from transglenoid sutures and metallic staples have been responsible for a great deal of success in more recent studies. In addition to these technical advancements, our understanding of the multifactorial etiology of glenohumeral instability and our ability to recognize complex injury patterns with advanced imaging modalities have led to a tailored approach to the patient with recurrent shoulder instability.

Actually, three principles currently define the “modern” arthroscopic approach: the use of multiple suture anchors (more than three), a proximal shift of the anterior capsule and capsular plication to address capsular laxity, and treatment of associated intra-articular pathologies (rotator interval lesions, SLAP tears, and capsular rents).¹⁰

With modern techniques and anchors, recurrent instability occurs in approximately 7% of patients (ranging from 4% to 17%),⁸ and 90% of patients return to their preinjury level of sports participation.⁷ The results obtained in our study are similar to those published in the most recent studies, with an overall recurrence rate of 7%.

In our patients, young age and ligamentous laxity were associated with recurrence after anterior stabilization. Voos et al.¹⁷ stated that, in the treatment of anterior instability, identification of risk factors for recurrence allows for appropriate patient counseling and consideration of open stabilization. He found that patients under age 25, with ligamentous laxity, and with a large (>250 mm³) Hill-Sachs lesion, were at the greatest risk of recurrence. Boileau et al.¹⁸ demonstrated that the presence of a Hill-Sachs lesion, anterior or inferior glenohumeral laxity, and the use of fewer than four anchors were independent risk factors for failed arthroscopic Bankart repair. The instability severity index score was later developed by the same research group to predict the risk of failure after arthroscopic stabilization.¹⁹ Independent prognostic factors were age at the time of surgery, type and degree of sport participation, shoulder hyperlaxity, presence of a Hill-Sachs lesion, and loss of glenoid contour.

The number of anchors was not a significant risk factor in our patients, but we found that, over the years, there has been a change in the type and number of anchors used. Recently, there is a tendency to use a larger number of smaller diameter anchors. Theoretically, the use of multiple sutures and anchor sites increase the number of attachment points and allows a better distribution of loading. Concerns have been raised regarding anchor material,²⁰ with cystic enlargement around anchors of varying materials. With multiple anchors, fracture has been reported through the anchor sites.²¹ In addition, larger anchors could theoretically increase the likelihood of fracture by the need for drilling large holes closer together in the relatively small anterior glenoid. Smaller suture anchors could allow for multiple points of fixation in the glenoid with more bone between each anchor site, potentially decreasing the risk of glenoid fracture. Optimally, suture anchors for labral repairs should provide sufficient resistance to motion, such that native tissue is allowed to repair and normal joint function is restored while not increasing fracture risk of the anchoring bone. Properties of suture anchors, including material, suture configuration, size, and technique are frequently updated.^{22,23}

The subjective and objective measures used to assess surgical outcome and success are very heterogeneous. Recurrence of instability falls along a wide spectrum, since apprehension in provocative positions to subluxations and dislocations. Using the dislocation rate alone as the sole measure of success is unwise. To appropriately evaluate postoperative instability, a study can report outcomes of true dislocations (humeral head articular surface not articulating with articular face of glenoid), subluxations (shoulder “popped out and back in”), and apprehension, where only fear of dislocation/subluxation is felt with provocative physical examination maneuvers.²⁴ In the patients who did not have a new episode of dislocation, we calculated the WOSI score, a reliable and valid disease-specific patient-reported quality-of-life outcome measure, which assesses the impact of glenohumeral instability.¹⁵ It is a visual analog score made up of 21 questions subdivided into four domains: physical symptoms, sports/recreation/work, lifestyle, and emotions.

The loss of external rotation is the most common limitation on motion after instability surgery. In our study, it occurred in 8% of patients. Shibano et al.²⁵ found that loss of external rotation increased by about 4° when the amount of imbrication of AIGHL was increased by 1 mm.

Limitations of our study were its retrospective nature, the small number of patients, and the short follow-up time.

Current literature suggests that the recurrence rate after Bankart repairs increases with postoperative years.²⁴

In conclusion, our study showed that arthroscopic Bankart repair with the use of suture anchors is a reliable treatment method, with good clinical outcomes, excellent postoperative shoulder motion, and low recurrence rates. Patients with younger age or with ligamentous laxity were at the greatest risk of recurrence.

Author contributions

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Conflicts of interest

The authors have none to declare.

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