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Long-term outcomes following isolated arthroscopic Bankart repair: a 9- to 12-year follow-up



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ARTICLE INFO

Keywords:

Anterior shoulder instability
anterior dislocation
arthroscopic Bankart repair
bone loss
recurrent instability
dislocation arthropathy
postoperative arthritis

Level of Evidence: Level IV, Case Series,
Treatment Study

Background: The long-term outcomes following arthroscopic Bankart repair have been rarely reported. Because of its relative novelty, little is known about recurrent instability, postoperative arthritis, and patient satisfaction, particularly for well-established modern procedures. The purpose of the study was to evaluate the long-term outcomes following arthroscopic Bankart repair.

Methods: Patients who underwent isolated arthroscopic Bankart repair from 2003 to 2006 were retrospectively reviewed. Recurrent instability, radiographic, and clinical scores (American Shoulder and Elbow Surgeons [ASES], Simple Shoulder Test [SST], and Rowe scores) were evaluated. Patient factors (ie, age, gender, side, number of instability episodes, contact sports, and bone loss) were analyzed to determine the correlation with outcome measures.

Results: Among the 98 patients (102 shoulders), we were able to contact 50 patients (51 shoulders, mean age 27.0 years, mean follow-up 121.2 months). Significant bone loss in glenoid and humerus was arthroscopically observed in 16 (31.4%) and 28 (54.9%) shoulders, respectively. Sixteen shoulders (31.4%) experienced recurrent instability. Recent radiographs were obtained for 38 shoulders, 14 (36.8%) of which showed moderate to severe arthritis. Clinical outcomes at follow-up were 89.3, 10.8, and 76.0 for ASES, SST, and Rowe scores, respectively. Neither recurrent instability nor arthritis was correlated with any patient factors.

Conclusion: When isolated arthroscopic Bankart repair was used in all patients with shoulder instability regardless of bony defect, postoperative recurrent instability and arthritis rates were unacceptably high. Additional procedures should be chosen after careful consideration of multiple patient factors.

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The long-term outcomes following arthroscopic Bankart repair are diverse and still controversial. Although the increasing popularity of arthroscopic procedures is well documented,³² even the same “arthroscopic Bankart repair” has evolved over time with the development of arthroscopic techniques and technologies.²⁵ Importantly, most published long-term (ie, >10 years) outcomes studies of arthroscopic Bankart repair are from cases performed before the year 2000. These procedures are likely significantly

different (eg, patient positioning, anchor types, number of sutures) in comparison to what is currently being performed.^{1,6,9,12,14,24} In addition, some authors have raised concerns regarding the variability in how a “standard” arthroscopic Bankart repair is performed.⁵ Therefore, there is a need of more long-term data to determine if “modern” arthroscopic Bankart repair techniques with modern implants (eg, high-strength sutures, bioabsorbable anchors) can provide improved results.

The primary goal of instability surgery is the elimination of postoperative recurrent instability. However, recurrent instability rates after arthroscopic Bankart repair vary widely from 9.4% to 35.3%.^{3,6,8,15,23,26,29} Multiple factors have been associated with failure of arthroscopic Bankart repair, including both patient characteristics (eg, patient age, sports activity, hand dominance) and pathologic factors (eg, bone loss).^{2,4,7,13,16,18,22} This has led to the development of other concomitant procedures in addition to

This study was approved by the Conjoint Health and Research Board of the University of Calgary.

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<https://doi.org/10.1016/j.jses.2019.05.002>

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Bankart repair (eg, remplissage,³⁰ posterior labral repair,²⁰ bone grafting,¹⁷ and rotator interval closure²⁸) aimed at improving joint stability.

Therefore, although arthroscopic Bankart repair does play an important role as the primary surgical procedure to restore anatomy for anterior shoulder instability, it is essential to understand the potential limit of arthroscopic Bankart repair itself.

The purpose of the study was to evaluate the long-term outcomes including recurrence rates, clinical outcomes, and the development of arthritis following arthroscopic Bankart repair. We hypothesized that both recurrent instability and postoperative arthritis would be unacceptably high at long-term outcomes.

Materials and methods

Study design

A retrospective chart review with a telephone interview of patients who underwent arthroscopic Bankart repair from September 2003 to December 2006 was performed. Surgeries were all performed by one fellowship-trained shoulder surgeon (I.K.L.), and the patients were followed up by a clinical research associate and fellow. Patients were contacted only if he or she had signed consent for possible later contact for research purposes at the time of surgery. Further consent for undergoing questionnaires and radiographs was obtained orally over the phone followed by a mailed written consent form. Questionnaire forms, a radiograph requisition, along with a returning envelope were also sent out as a package when the patients agreed to participate in the study.

Patients were included if they met the following inclusion criteria: (1) primary arthroscopic isolated Bankart repair for recurrent anterior shoulder instability, (2) willing to participate in the study, (3) suture anchor technique was used, and (4) either with or without concomitant superior labrum anterior and posterior (SLAP). The exclusion criteria included (1) patients with multidirectional instability (eg, without clear trauma episode, with concomitant capsular plication); (2) main complaint was pain rather than instability; (3) concomitant posterior instability repair; (4) with preoperative radiographic evidence of moderate to severe dislocation arthropathy according to the Samilson and Prieto classification system²⁷; and (5) workers compensation board or litigation involved.

Surgical procedure

Surgeries were all performed arthroscopically in a lateral decubitus position under general anesthesia. After diagnostic arthroscopy through standard posterior portal, standard anterior and anterosuperolateral portals were routinely established and used as working portal and viewing portal, respectively. After thorough detachment of anteroinferior capsulolabral complex from the glenoid, 3–4 double-loaded (No. 2 FiberWire) bioabsorbable PLDLA anchors (Bio-Suturetak; Arthrex, Naples, FL, USA) were inserted through the anteroinferior glenohumeral portal. Anchors were inserted starting inferiorly at the 5:30 position and proceeding superiorly to the superior extent of the Bankart lesion. Suture passage and anchor insertion was optimized to shift the anteroinferior glenohumeral labrum and ligamentous complex superiorly to the anterior glenoid rim. The superior labrum was also repaired using a similar suture anchor–based technique when clinical signs of a symptomatic SLAP lesion were present (ie, positive O'Brien's test, positive dynamic labral shear test) and if instability of the superior labrum was present at arthroscopy (ie, increased sulcus, unstable biceps insertion, exposed sublaxal footprint).

Postoperative protocol

Postoperatively, the arm was immobilized in a sling for 4 weeks followed by range-of-motion exercises of the operated shoulder. Rotator cuff strengthening was initiated at 2 months and patients were allowed to return to regular activities between 3 and 6 months postoperatively. Return to sports, including contact and collision sports, was allowed 6–9 months postoperatively.

Outcome measures

The primary outcome was recurrent instability, including both subluxation and dislocation. Secondary outcomes included radiographic glenohumeral arthritis, American Shoulder and Elbow Surgeons score (ASES), Simple Shoulder Test (SST), and Rowe score. All of the outcome measures except radiographic arthritis were obtained from questionnaires and telephone interviews. Standard anteroposterior shoulder radiographs were obtained at the latest follow-up (>9 years postoperatively) and were reviewed by the 2 independent shoulder fellows (Y.O. and M.J.C.). The degree of glenohumeral arthritis was graded using the Samilson and Prieto system.²⁷ Any discrepancies were resolved by consensus with input by the senior author. Patient factors (ie, age at initial injury, age at surgery, gender, affected side, number of preoperative instability episodes, collision/contact sports, glenoid bone loss, and humeral bone loss) were all collected from the patient charts and operating records and analyzed to determine the correlation with postoperative recurrent instability, radiographic arthritis, and outcome scores. Glenoid bone loss was routinely measured intraoperatively using the bear spot as a landmark of the center of the glenoid.⁴ A bone loss of 25% or more in the estimated glenoid width was deemed a significant glenoid bone loss. Hill-Sachs lesion was also intraoperatively evaluated but rather subjectively described (eg, none, mild, moderate, severe) because of lack of definite measuring tool at the time of surgery. Moderate to severe lesions were deemed significant humeral bone loss and typically included deep lesions involving greater than 15% of the humeral articular surface.

Statistical analysis

Analysis included a Student *t* test for numerical measures and a Fisher exact test for binary or categorical measures. Multiple logistic regression analysis with the stepwise method was also performed to assess correlations between all the patient factors and the outcome measures. The differences and correlations were deemed statistically significant when *P* value was <.05. All statistical analyses were performed in consultation with the coauthor (S.Y.), who has experience in medical statistics, using the SPSS Statistics software, version 24 (IBM Corp, Armonk, NY, USA).

Results

Study demographics

Among the 98 patients (102 shoulders) who underwent arthroscopic Bankart repair during the study period, 50 patients were able to be contacted and agreed to participate in the study (51 shoulders, mean age 27.0 years [15–48] at surgery, mean follow-up 121.2 months [108–144]). Initial injury had occurred at a mean age of 21.7 years (12–47), and approximately one-third of the patients experienced more than 5 recurrent instability episodes whereas the rest reported 5 episodes or fewer. Twenty-three shoulders (45.1%) were dominant side, and 22 patients (43.1%) were involved in collision or contact sports. Significant glenoid bone loss and humeral bone loss were arthroscopically observed in 16 shoulders

Table I
Patient demographics

Characteristic	
Male-female	44:7
Age at initial injury, yr, mean (range)	21.7 (12-47)
Age at surgery, yr, mean (range)	27.0 (15-48)
Dominant side injury	23 (45.1)
Instability episodes, ≥5	17 (33.3)
Collision/contact athlete	22 (43.1)
Glenoid bone loss, ≥25%	16 (31.4)
Humeral bone loss	28 (54.9)
Bipolar lesion	11 (21.6)

Values are n (%) unless otherwise noted.

(31.4%) and 28 shoulders (54.9%), respectively. Bipolar lesions existed in 11 shoulders (21.6%). Demographics of the patients are summarized in [Table I](#).

Recurrent instability

Postoperative recurrent instability was reported for 16 shoulders (31.4%), of which 9 shoulders (17.6%) experienced at least 1 complete dislocation ([Table II](#)). Recurrent instability episodes were reported to occur more than 3 years after the index surgery in 8 of the 16 shoulders ([Table II](#)). Among those who experienced recurrent instability, 7 shoulders (13.7%) underwent revision surgeries, all of which were performed more than 3 years after the index surgery ([Table II](#)). When significant bone loss was present in glenoid, humerus, and both glenoid and humerus, the recurrence rate was 25.0%, 35.7%, and 27.3%, respectively.

Radiographic arthritis

Follow-up radiographs were available for 38 shoulders, of which 14 shoulders (36.8%) showed moderate to severe arthritis (2 severe and 12 moderate).

Clinical outcomes scores

Clinical scores at follow-up were 89.3, 10.8, and 76.0 for ASES, SST, and Rowe, respectively ([Table III](#)). Rowe score was significantly inferior among the patients with postoperative recurrent instability compared to those with no recurrence (55.0 vs. 85.8, $P < .001$), whereas ASES and SST demonstrated only similar trends ([Table III](#)). The presence of postoperative radiographic arthritis did not have an impact on any of the clinical outcome scores ([Table III](#)).

Complications

No major complications were reported. No revision surgery was performed except for the cases with recurrent instability.

Correlations between patient factors and outcome measures

Multiple logistic regression analysis revealed no correlations between any of the patient factors and the outcome measures. Neither recurrent instability nor postoperative arthritis was correlated with any patient factors, including glenoid/humeral bone loss.

Although not statistically significant, patients who were 20 years old or younger at surgery were more likely to experience postoperative recurrent instability compared to those who were older (7 of 14 [50%] vs. 9 of 37 [24.3%], $P = .099$). However, these younger patients with postoperative recurrence tended not to undergo revision surgery in comparison to the older patients with

Table II
Postoperative recurrent instability

Recurrent instability	Instability type		Postoperative time		Revision surgery	
	Subluxation	Dislocation	<3 yr	>3 yr	No	Yes
n = 16 (31.4%)	7	9	8	8	9	7

recurrence (1 of 7 [14.3%] vs. 6 of 9 [66.7%], $P = .06$). In contrast, patients who were 18 years or younger at initial injury tended to develop less arthritis than those who experienced initial instability in their later ages (4 of 19 [21.1%] vs. 10 of 19 [52.6%], $P = .091$).

Discussion

This long-term study demonstrated a high postoperative recurrent instability rate and thus a high revision rate following arthroscopic isolated Bankart repair in patients with recurrent anterior shoulder instability. During the study period, all surgeries were performed by the fellowship-trained surgeon (I.K.L.) using a suture anchor–based arthroscopic Bankart repair technique, in the lateral decubitus position. However, it is important to note that in this series of patients there was no preoperative patient selection and that all patients regardless of degree of pathology underwent an arthroscopic isolated Bankart repair. Because of our high incidence of other concomitant pathologies (eg, glenoid bone loss, humeral bone loss), these results imply that an isolated Bankart repair alone does not solve the complex of pathologies (eg, ligamentous laxity, glenoid bone loss, humeral bone loss) that may be associated with patients with recurrent anterior shoulder instability. Although other adjunctive procedures (eg, remplissage procedure³⁰ and arthroscopic subscapularis augmentation¹⁹) have since been developed to treat concomitant pathology, it is still unclear what the indications of each adjunctive procedure are or their relative outcomes.

As expected, patients with postoperative recurrent instability demonstrated inferior clinical outcome scores, regardless of subsequent revision surgeries. Interestingly, although the Rowe score demonstrated statistically significant difference, other 2 scores (ie, ASES, SST) did not reach a significant level. This may be due to the nature of each scoring system, where Rowe score was specifically developed for instability while the others are more general shoulder function scores.²⁹

Among the risk factors evaluated in this study, younger patients at surgery had a trend of having a higher recurrence rate, while other major factors, such as bone loss and sports activities, did not show a correlation. This is consistent with a previous prospective randomized trial conducted at our institution where regardless of surgical procedure, patients younger than 25 years had a higher recurrence rate.²¹ The reason why younger patients with postoperative recurrence tended not to undergo revision surgery and why those who were younger at initial injury tended to develop less arthritis in our series is unclear. One possible explanation is that in older patients, an unstable shoulder may lead to the development of more arthritis when compared to younger individuals leading to additional symptoms (eg, pain) other than instability, making it more difficult for patients to tolerate their unstable shoulder condition.

In contrast, a number of previous reports have demonstrated significant correlations between certain factors (eg, collision sports and bone loss) and recurrence rate.^{2,4,31} Why we were unable to find significant differences is unclear but may be related to the small number of patients, the patients lost to follow-up, or the retrospective nature of the current study. However, collectively, it

Table III
Clinical outcome measures

	All (n = 51)	Recurrent instability			Radiographic arthritis		
		No (n = 35)	Yes (n = 16)	P value (χ^2)	No (n = 24)	Yes (n = 14)	P value (χ^2)
ASES	89.3 ± 12.9	91.8 ± 12.4	84.1 ± 12.8	.074	87.7 ± 15.0	90.4 ± 11.6	.579
SST	10.8 ± 1.8	11.2 ± 1.6	10.0 ± 2.0	.066	10.3 ± 2.4	11.2 ± 0.9	.131
Rowe	76.0 ± 23.0	85.8 ± 16.0	55.0 ± 22.1	<.001	72.5 ± 20.9	81.2 ± 24.9	.311

Data are presented as mean ± standard deviation.

ASES, American Shoulder and Elbow Surgeons; SST, Simple Shoulder Test.

does suggest that there are a spectrum of patient factors and pathologies (eg, age, gender, bone loss, number of preoperative instability episodes and contact/collision athletes) that must be considered preoperatively, and concomitant augmentation-type procedures (eg, remplissage, posterior labral repair, and rotator interval closure) in addition to a Bankart repair, or an alternative procedure (ie, Latarjet reconstruction) may be chosen depending on the risk of postoperative recurrence of each individual. Although it is controversial which or when a specific procedure should be performed, the results of the current study do suggest that arthroscopic isolated Bankart repair itself should not be routinely used in this spectrum of patients.

The rate of postoperative arthritis was also significantly high in this long-term study (36.8%) and is a concern considering the young patient population. Although presumably the minimally invasive nature of shoulder arthroscopy should minimize the risk of arthritis progression, the rate of arthritis was still significantly high after arthroscopic Bankart repair. Indeed the rate of arthritis was similar to reports of arthritis following open Bankart repair (29.8%–58.4%).²⁶ This may suggest that the risk of arthritic progression is likely related to the extent and severity of the primary disease itself and not necessarily to the surgical intervention itself. Indeed, in a study of patients following primary anterior shoulder dislocation, Hovelius et al concluded that joint arthropathy was associated with shoulder dislocation and that operative repairs are not the cause of the arthropathy.¹¹ Interestingly, in our study, older patients at initial injury had a trend of developing greater degrees of postoperative radiographic arthritis. However, the presence of arthritis did not seem to have a significant impact even on this long-term outcome, because no difference in any of the three outcome scores was detected between the patients with and without arthritis. Cumulatively, the nature and the long-term impact of dislocation arthropathy and postoperative arthritis are still unclear, and further follow-up of these patients' recurrent anterior shoulder instability is necessary.

Although both the high recurrence and arthritis rates appear surprising, these results are consistent with previous reports.²⁶ For example, Aboalata et al has recently published a similar case series with long-term outcomes (at a mean follow-up of 13 years) following arthroscopic Bankart Repair.¹ The authors reported overall a “redislocation” rate of 18.2% and a rate of “severe” dislocation arthropathy of 12% postoperatively.

Recently, Hohmann et al reported a systematic review and meta-analysis to compare the outcomes between open vs. arthroscopic surgical treatment for anterior shoulder dislocation over the last 2 decades.¹⁰ Although the outcomes were comparable between the open and arthroscopic procedures, there was a 2 times higher risk of recurrence after arthroscopic than open surgery during the earlier decade of 1995 to 2004.¹⁰ They suggested that a possible explanation for this discrepancy may be the use of older historical techniques (eg, Caspari technique, tacks) that predisposed the earlier decade to failure, although they also stressed the difficulty to draw any valid binding conclusions because of the low quality and heterogeneity of the published literature. Interestingly, although the technique used

for our series was uniformly a modern suture-anchor technique, this did not appear to significantly improve the postoperative recurrence rate. This may imply the limit of arthroscopic Bankart repair procedure itself regardless of the implants used.

The best strategies for the treatment of recurrent anterior shoulder instability are still unknown and require further investigations. However, given the results and the currently available literature, we can at least conclude that isolated arthroscopic Bankart repair does not routinely provide sufficient stability and prevent arthritis to all patients with recurrent anterior instability.

This study has several limitations. First, this is a retrospective case series of arthroscopic Bankart repair; therefore, no comparison was made against nonsurgically treated patients or Bankart repair with concomitant procedures. However, this study does represent a series of patients where an “isolated” arthroscopic Bankart repair was uniformly performed in every patient, regardless of patient characteristics or degree of pathology. Second, there were a significant number of patients, which were lost to follow-up. Although the difficulty in conducting long-term studies in this patient population is well known, the missing data may have affected the results. However, it is important to note that despite this, the results of the current study are consistent with previous reports of the long-term outcome of arthroscopic Bankart repair. Third, because preoperative CT was not routinely performed, it was not possible to evaluate either the glenoid or humeral bone defect. Although the glenoid bone loss and Hill-Sachs lesions were evaluated arthroscopically, preoperative CT measurement may have been more precise to determine the degrees of bone loss. Moreover, although this is performed routinely now, preoperative CT may have further guided intraoperative indications for augmentation techniques (eg, remplissage procedure) and improved results.

Conclusion

When isolated arthroscopic Bankart repair is used in all patients with shoulder instability regardless of bony defect, postoperative recurrent instability and arthritis rates were high in this young population in the long-term. Although the cause of postoperative arthritis is still unclear, other surgical procedures including adjunctive procedures or bone transfer procedures may need to be considered to improve recurrent instability.

Disclaimer

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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