

Increased Failure Rates After Arthroscopic Bankart Repair After Second Dislocation Compared to Primary Dislocation With Comparable Clinical Outcomes



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Purpose: The purpose of this study was to compare rates of recurrent dislocation and postsurgical outcomes in patients undergoing arthroscopic Bankart repair for anterior shoulder instability immediately after a first-time traumatic anterior dislocation versus patients who sustained a second dislocation event after initial nonoperative management. **Methods:** A retrospective chart review was performed of patients undergoing primary arthroscopic stabilization for anterior shoulder instability without concomitant procedures and minimum 2-year clinical follow-up. Primary outcome was documentation of a recurrent shoulder dislocation. Secondary clinical outcomes included range of motion, Visual Analog Scale (VAS), American Shoulder and Elbow Surgeons Shoulder Score (ASES), and Shoulder Activity Scale (SAS). **Results:** Seventy-seven patients (mean age 21.3 years \pm 7.3 years) met inclusion criteria. Sixty-three shoulders underwent surgical stabilization after a single shoulder dislocation, and 14 underwent surgery after 2 dislocations. Average follow-up was 35.9 months. The rate of recurrent dislocation was significantly higher in the 2-dislocation group compared to single dislocations (42.8% vs 14.2%, $P = .03$). No significant difference was present in range of motion, VAS, ASES, and SAS scores. The minimal clinically important difference (MCID) was 1.4 for VAS and 1.8 for SAS scores. The MCID was met or exceeded in the primary dislocation group in 31/38 (81.6%) patients for VAS, 23/31 (74.1%) for ASES, and 24/31 for SES (77.4%) scores. For the second dislocation cohort, MCID was met or exceeded in 7/9 (77.8%) for VAS, 4/7 (57.1%) for ASES, and 5/7 for SES (71.4%) scores. **Conclusion:** Immediate arthroscopic surgical stabilization after a first-time anterior shoulder dislocation significantly decreases the risk of recurrent dislocation in comparison to those who undergo surgery after 2 dislocation events, with comparable clinical outcome scores. These findings suggest that patients who return to activities after a primary anterior shoulder dislocation and sustain just 1 additional dislocation event are at increased risk of a failing arthroscopic repair. **Study Design:** Retrospective comparative study; Level of evidence, 3.

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The shoulder is the most commonly dislocated major joint, with dislocations occurring at a rate of 23.9 per 100,000 person-years in the United States, the vast majority of which occur in the anterior direction.^{1,2}

Longitudinal studies on nonsurgical management of traumatic anterior shoulder instability have demonstrated high rates of recurrent instability, approaching 72% to 100% in high-risk populations including males,

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younger patients (age 18-20 years old), contact athletes, and military cadets.³⁻⁷ Furthermore, there is evidence that multiple instability events can cause further attrition to the osseous and soft tissue stabilizers of the shoulder.⁸⁻¹¹ Arthroscopic Bankart repair is a widely performed procedure for patients with anterior shoulder instability and has demonstrated overall favorable outcomes and low complication rates.¹²⁻¹⁵ A recent systematic review of 10 prospective studies on traumatic first-time anterior dislocations found a 7-fold lower recurrence rate with arthroscopic Bankart repair compared with nonoperative management.¹⁶

There remains significant debate over the optimal management strategy for patients presenting with a new diagnosis of anterior shoulder instability. Many surgeons would favor initial nonoperative treatment for a first-time anterior shoulder dislocation, particularly for the in-season athlete, with consideration for surgical intervention if a second instability event occurs. Recently, evidence of the cumulative effect of repeated dislocations has shifted treatment toward early operative intervention in individuals with risk factors for recurrent instability. Several studies have shown improved outcomes in patients undergoing surgical stabilization after a single dislocation compared with surgery after multiple dislocation events.^{17,18} However, other investigations have not shown an overall difference in postoperative outcomes between single- and multiple dislocations.¹⁹⁻²¹ There is a paucity of research comparing outcomes specifically between first and second-time anterior shoulder dislocations.

The purpose of this study was to compare rates of recurrent dislocation and postsurgical outcomes in patients undergoing arthroscopic Bankart repair for anterior shoulder instability immediately after a first-time traumatic anterior dislocation versus patients who sustained a second dislocation event after initial nonoperative management. We hypothesized that patients sustaining 2 anterior shoulder dislocations would be at greater risk for recurrent dislocations after arthroscopic repair and would have worse objective and patient reported outcomes.

Methods

Institutional review board approval was obtained before initiation of the chart review. Patients who underwent surgical stabilization for a diagnosis of anterior shoulder instability between 2013 to 2019 in the sports medicine division of a single academic institution were reviewed retrospectively. Data were pooled from 5 fellowship-trained shoulder and sports medicine surgeons with more than 5 years of experience. Demographics, clinical history, physical examination, imaging, operative details, and postoperative course for all patients were reviewed in the electronic medical record.

Patients were eligible for inclusion if they were between 14 and 40 years of age, had a clinical encounter with a diagnosis of anterior shoulder instability supported by preoperative clinical history and diagnostic imaging, had a documented clinical history of exactly 1 or 2 anterior shoulder dislocation events requiring closed reduction (including reduction by emergency department, athletic trainer, and self-reduction), underwent arthroscopic Bankart repair for the treatment of anterior shoulder instability, and were followed up for more than 2 years after surgery. Subjects were excluded if they had a history of posterior or multidirectional instability, sustained greater than 2 dislocation events, underwent an open procedure, or had a history of previous arthroscopic or open surgery on the operative shoulder. Additional exclusion criteria included presence of associated shoulder pathology including humeral avulsion of the glenohumeral ligament, or had associated procedures performed at the time of arthroscopic Bankart repair including remplissage, rotator cuff repair, and osseous transfer stabilization procedures.

All procedures were performed with use of standard suture-anchor techniques with placement of at minimum 3 suture anchors. All patients underwent a similar physical therapy protocol, and all patients returned to unrestricted activities and sports at approximately 6 months after surgery. Primary outcome was documentation of recurrent shoulder dislocation during the postoperative period. Secondary clinical outcome measures were assessed including range of motion in forward flexion, Visual Analog Scale (VAS), American Shoulder and Elbow Surgeons Shoulder Score (ASES), and Shoulder Activity Scale (SAS) scores. Secondary clinical outcome measures were assessed before surgery and at final follow-up. If revision surgical stabilization was performed, secondary outcome data were recorded from the final postoperative visit before additional surgical intervention.

Glenoid bone loss and Hill-Sachs lesion size were estimated using T1 magnetic resonance imaging (MRI) sequences performed by a 1.5-Tesla scanner per previously validated methods.²² Glenoid bone loss was calculated using the best-fit circle method on oblique sagittal T1 MRI sequences. The best fit circle was aligned to the anteroinferior glenoid; bone loss was determined as the ratio between the diameter of the glenoid at the point of maximum bone loss and the diameter of the circle of best fit.^{22,23}

For statistical analysis, continuous variables were assessed using the Student *t*-test for parametric data and Mann-Whitney *U* test or Wilcoxon signed rank test for nonparametric data as indicated. Significance was set at $P < .05$. The statistical analysis was performed using the SPSS software package (SPSS Version 26.0.0.1, IMB, Armonk, NY). Power analysis was performed with

G*Power software (version 3.1.9.7) using estimated surgical failure rates based on findings in first-time dislocators reported in a recent systematic review by Belk et al.²⁴ (8.5%) and a previous investigation by Vaswani et al.,¹⁸ which found an average increase in surgical failure by 26% for each prior dislocation event. A minimum sample size of 38 patients in each group was determined to be necessary to achieve a power of 80% with an $\alpha = 0.05$. The proportion of patients who met or exceeded the minimal clinically important difference (MCID) was determined for each patient reported outcome score using either previously published anchor-based reference threshold values for anterior shoulder instability (8.5 for ASES²⁵), or determined using distribution method with 0.5 the standard deviation (SD) of the baseline score (VAS pain and SAS).²⁶

Results

A total of 478 consecutive patients were reviewed, and 77 patients met criteria for inclusion in this study. Sixty-three shoulders underwent surgical stabilization after a single shoulder dislocation event and 14 underwent surgery after sustaining two documented shoulder dislocations. Reasons for exclusion were inadequate follow-up ($n = 143$), posterior/multidirectional instability ($n = 85$), >2 dislocations ($n = 63$), open procedure ($n = 54$), revision surgery ($n = 28$), concomitant procedure (e.g., remplissage) ($n = 25$), and humeral avulsion of the glenohumeral ligament lesion ($n = 3$). Of the population with inadequate follow-up, 122 patients were primary dislocators, and 21 had sustained 2 dislocations. Loss to follow-up was comparable in both the single- (122/185, 65.9%) and 2-dislocation (22/36, 61.1%) groups. Demographic characteristics of patients eligible for inclusion in the study are listed in Table 1. Patients meeting eligibility had a mean age of 21.3 years old (± 7.3 years) and were predominantly male (79.2%) and nonsmokers (93.5%), and the majority sustained injury to their dominant side (61.0%). Overall, 46.7% of patients participated in contact sports at various levels of competition. No eligible patients had a previous diagnosis of hyperlaxity in the medical record or had a

documented Beighton score of ≥ 4 . There was no statistically significant difference in demographic characteristics between the single and second dislocation cohorts (age, gender, body mass index, smoking history, and demand including contact sports and manual labor).

Table 2 compares imaging characteristics between the single and second dislocation groups. A greater proportion of patients with two dislocations had presence of glenoid bone loss on MRI but this value did not reach statistical significance (22.2% vs 35.7%, $P = .32$). The amount of bone loss in patients with evidence of glenoid deficiency did not significantly differ between the groups (5.6% vs. 6.8%, $p = .58$). Presence of a Hill-Sachs lesion was seen in a greater proportion of the 2-dislocation group, but this value did not reach statistical significance (27.0% vs. 50.0%, $P = .12$). There was no significant difference in the proportion of patients with SLAP tears ($P = .76$).

Table 3 lists outcome measures at final follow-up. Average follow-up after surgery was 34.6 months for the single dislocation group and 41.6 months for the second dislocation group ($P = .57$). Overall rate of recurrent dislocations in the cohort was 19.5% and rate of revision surgery was 23.3%. The rate of recurrent dislocation was significantly higher in the second dislocation group compared to patients undergoing surgery after a single dislocation (42.8% vs. 14.2%, $P = .03$). There was no significant difference in overall revision surgical intervention between the groups (19.0% vs. 42.9%, $P = .08$). No significant difference was present in the number of anchors used in the arthroscopic labral repair ($P = .28$), progression to symptomatic glenohumeral osteoarthritis ($P = .51$), or range of motion in forward flexion ($P = .77$).

Patient-reported outcome scores including VAS, ASES, and SAS scores between the groups did not demonstrate a statistically significant difference preoperatively or at final follow-up between the single and second dislocation groups (Table 4). When compared with preoperative assessments, patients demonstrated significant improvement in range of motion and patient

Table 1. Comparison of Patient Demographic Characteristics

	Single Dislocation ($n = 63$)	Second Dislocation ($n = 14$)	<i>P</i> Value
Mean age (yr), mean \pm SD	21.7 \pm 7.3	19.5 \pm 5.5	.30
Male gender	49 (77.8%)	12 (85.7%)	.50
BMI, mean \pm SD	25.3 \pm 4.7	25.8 \pm 3.5	.68
Current smoker	4 (6.3%)	1 (7.1%)	.92
Hyperlaxity	0 (0%)	0 (0%)	N/A
Contact athlete	28 (44.4%)	8 (57.1%)	.40
Manual laborer	2 (3.1%)	0 (0%)	.51
Dominant side involved	41 (65.1%)	6 (42.9%)	.13

BMI, body mass index; M, male; F, female
Significance set at $P < .05$.

Table 2. Comparison of Preoperative Imaging Characteristics

	Single Dislocation (n = 63)	Second Dislocation (n = 14)	P Value
Glenoid bone loss	14 (22.2%)	5 (35.7%)	.32
Mean percent lost in patients with glenoid bone loss, mean \pm SD	5.6% \pm 4.3%	6.8% \pm 3.9%	.58
Hill-Sachs lesion on MRI	17 (27.0%)	7 (50.0%)	.12
Mean length in patients with Hill-Sachs lesion (mm), mean \pm SD	4.5 \pm 5.4	5.2 \pm 5.3	.75
SLAP tear on MRI	20 (31.7%)	5 (35.7%)	.76

MRI, magnetic resonance imaging.

reported outcomes at final follow-up ($P < .01$). The MCID was determined to be 1.4 for VAS and 1.8 for SAS scores. For individuals with available patient reported outcome scores, the MCID was met or exceeded in the primary dislocation group in 31/38 (81.6%) of patients for VAS, 23/31 (74.1%) for ASES, and 24/31 for SES (77.4%) scores at final follow-up. In the two-dislocation cohort, the MCID was met or exceeded in 7/9 (77.8%) of patients for VAS, 4/7 (57.1%) for ASES, and 5/7 for SES (71.4%) scores.

Discussion

The most significant finding of this study was that the rate of recurrent dislocation after arthroscopic Bankart repair was significantly higher in patients who had sustained two dislocation events compared with individuals who underwent surgical stabilization after just one shoulder dislocation at greater than two years average follow-up. The recurrent dislocation rates in this study are high relative some previous investigations^{21,24}; however, they are comparable with the findings in the broader literature. A systematic review of level I and level II studies by Grumet et al.¹⁹ comparing outcomes after arthroscopic repair in patients with single or recurrent anterior dislocation episodes before surgical stabilization found recurrence rates ranging from 7% to 16% in single dislocations compared with 0% to 30% in those with recurrent dislocations. There are multiple potential explanations for the relatively higher failure rates in the present study, including variations in surgical technique, with our study focusing exclusively on arthroscopic repairs, selection bias secondary to loss to follow-up, and the relatively younger average age (21.3 years) and high proportion of contact athletes (46.7%) in our cohort.

Our study demonstrated a nonstatistically significant but clinically meaningful greater rate of revision surgical intervention in the 2-dislocation cohort (19.0% vs 42.9%, $P = .08$). The rate of revision surgery was greater than the rate of redislocation in the single-dislocation group, representing a contribution from individuals with persistent subjective instability and reinjury without a subsequent objective dislocation event. The decision to proceed with revision surgery is affected by many patient-specific factors, because some patients may elect for lifestyle modifications, such as switching sport activities or discontinuing sports altogether, rather than choose to undergo an additional procedure. Overall, all patients achieved favorable patient-reported outcome scores without significant differences between the groups, and the MCID was met in a comparable proportion of patients in both groups.

Multiple randomized clinical trials have demonstrated improved outcomes with primary surgical stabilization compared with nonoperative management of anterior shoulder instability.²⁷⁻²⁹ Yapp et al.²⁷ performed a study of 65 patients ≤ 35 years of age with primary anterior shoulder dislocations randomized to either arthroscopic lavage or arthroscopic Bankart repair, with long-term follow-up averaging 14.2 years. They found a significantly higher rate of recurrent dislocation with lavage compared with Bankart repair (47% vs 12%; $P = .002$), with sustained difference in survival curve analysis for recurrent instability and reoperation rate at 10 years after surgery (58% vs 79%; $P = .018$). However, these studies do not distinguish between the number of instability events and their effect on the chronically unstable shoulder.

Management of a primary shoulder dislocation in the athletic population remains highly debated. Many

Table 3. Comparison of outcome measures at final follow-up

Outcome	Single Dislocation (n = 63)	Second Dislocation (n = 14)	P Value
Follow-up (mo), mean \pm SD	34.6 \pm 12.0	41.6 \pm 19.4	.22
Number of anchors used, mean \pm SD	3.6 \pm 1.3	3.9 \pm 1.5	.28
Recurrent dislocation	9 (14.2%)	6 (42.8%)	.03*
Revision surgery performed	12 (19.0%)	6 (42.9%)	.08
Symptomatic GH osteoarthritis	2 (3.2%)	0 (0%)	.51

GH, glenohumeral

*Significance set at $P < .05$.

Table 4. Comparison of Preoperative and Postoperative Functional and Patient-Reported Outcome Scores

Outcome	Single Dislocation	Second Dislocation	P Value	Pre-Post P Value
Pre-op ROM FF	158° ± 29° (n = 63)	161° ± 27° (n = 14)	.81	<.01*
Post-op ROM FF	167° ± 18° (n = 63)	168° ± 9° (n = 14)	.77	
Pre-op VAS score	4.6 ± 2.8 (n = 38)	5.0 ± 3.2 (n = 9)	.73	<.01*
Post-op VAS score	1.4 ± 1.8 (n = 57)	1.9 ± 2.0 (n = 13)	.42	
Pre-op ASES score	67.17 ± 19.71 (n = 31)	59.47 ± 19.78 (n = 7)	.60	<.01*
Post-op ASES score	86.07 ± 15.52 (n = 52)	87.78 ± 16.88 (n = 11)	.79	
Pre-op SAS score	11.2 ± 5.2 (n = 31)	9.5 ± 4.6 (n = 7)	.28	<.01*
Post-op SAS score	13.7 ± 4.5 (n = 52)	11.3 ± 3.8 (n = 11)	.67	

Pre-op, preoperative; Post-op, postoperative; ROM, range of motion; FF, forward flexion; VAS, visual analog score; ASES, American Shoulder and Elbow Surgeons Shoulder Score; SAS, Shoulder Activity Scale.

*Significance set at $P < .05$.

athletes with in-season dislocation events are treated with brief immobilization and physical therapy, with surgical intervention considered if further instability events occur. An observational study of 30 athletes undergoing nonsurgical management after an anterior shoulder instability event found an overall return-to-play rate of 87% after an average of 10.2 days missed.³⁰ After returning to activities, 33% of the athletes experienced recurrent anterior instability with 1.4 instability episodes per athlete. Dickens et al.¹³ prospectively followed up 45 athletes undergoing either nonsurgical management or primary arthroscopic Bankart repair after an in-season anterior instability event and found that athletes undergoing surgical stabilization were 5.8 times more likely to complete the following season without further instability ($P = .004$).

Advocates for early surgical stabilization argue that further instability events can lead to progressive cartilage and osseous attenuation, increasing the risk for failure of a soft tissue repair and potentially necessitating more aggressive surgical intervention. Dickens et al.³¹ performed a prospective study following up 714 athletes (22 of whom developed anterior shoulder instability) and found significantly higher rates of glenoid bone loss in patients with recurrent instability compared with first-time dislocations (22.8 vs 6.8%; $P = .012$). Rugg et al.⁸ performed a prospective analysis of 172 patients with anterior shoulder instability and also found significantly increased glenoid bone loss in patients with multiple dislocation events ($P = .043$), as well as a greater likelihood of bony Bankart lesions (odds ratio = 2.80; $P = .049$) and biceps pathology (odds ratio = 5.03; $P = .032$). Our study did not demonstrate a statistically significant difference in glenoid bone loss (5.6% vs 6.8%; $P = .58$), which likely relates to our study comparing patients with 1 and 2 dislocation events, rather than pooled analysis of all recurrent dislocators. There is also evidence that multiple dislocation events can contribute to instability by causing cumulative injury to the joint capsule. Cadaveric studies by Yoshida et al.³² using a robotic testing system that reproducibly created a Bankart tear

demonstrated that progressively lower forces are needed to produce a dislocation event after an initial anterior dislocation (up to the fifth dislocation). The same model was also found to have the highest concentration of capsular injury in the posterior capsule and anterior axillary pouch, with the degree of capsular surface area change on MRI arthrogram increasing with the number of dislocations.³³

There is conflicting evidence regarding whether operative intervention after a primary shoulder dislocation can reduce the rates of recurrent instability and reoperation. A retrospective study by Marshall et al.¹⁷ comparing outcomes after arthroscopic repair between first-time and recurrent dislocations found a 4-fold increased risk for recurrent instability and a 6-fold higher rate of revision surgery in patients with a history of multiple anterior shoulder dislocations ($P < .001$). Another recent retrospective study by Vaswani et al.¹⁸ found that likelihood of surgical failure increased by an average of 26% for each additional dislocation event. There is also evidence that individuals with a history of multiple dislocations are more likely to require coracoid transfer and other open stabilization procedures.^{17,34,35} Conversely, previous systematic reviews of postoperative outcomes after primary versus recurrent dislocations found an increased likelihood of recurrent instability after multiple dislocations that did not reach statistical significance, as well as no difference in functional outcomes or complications.^{19,21} Our findings suggest that patients are at increased risk for recurrent instability after sustaining 1 additional instability event before surgical stabilization. The findings of this study support the consensus statements proposed by the Neer Circle of the American Shoulder and Elbow Surgeons, which had over 90% of participants recommend surgical stabilization after a first-time anterior shoulder dislocation for high-risk athletes after the conclusion of the sport season.³⁶

Our current comparisons between shoulder instability studies are limited by variability in outcome measures and clinical endpoints. We chose to compare confirmed

dislocations rather than subluxation episodes as a more discrete measurement to assess recurrent instability. Standardized reporting of shoulder instability outcomes going forward would facilitate comparisons and pooling of studies in the literature and allow for more generalizable conclusions. Further prospective investigations comparing intervention after single versus multiple instability events, as well as cost-analysis comparing initial surgical and nonsurgical management, may help define the optimal treatment strategy for the primary anterior shoulder dislocation.

Limitations

There were several limitations to the present study. First, this study was retrospective in design and limited by the constraints of a retrospective study. Patient selection was determined by dislocation events that were documented in the electronic medical record; therefore it is possible that additional dislocation events could have occurred that were not documented in clinic or emergency department evaluation. Second, the limited availability of eligible patients who had sustained exactly 2 shoulder dislocation events ($n = 14$) resulted in our study being underpowered despite detecting a significant difference in redislocation (38 patients were needed to achieve 80% power). This suggests that the difference in recurrence risk could be even larger than the findings in the present study and that the difference in reoperation rates is likely clinically significant. Furthermore, the small sample size limits the comparisons that can be made with regard to subjective outcomes, though multiple previous reviews found no significant difference in patient reported outcomes.^{19,21} The sample size was limited by a relatively high loss to follow-up in the study population, with 143 patients failing to meet the 2-year follow-up threshold. Surgical technique was also not standardized in our study, which could potentially influence operative outcomes. However, the variation in surgical technique may also increase the generalizability of the present study. Last, the decision to proceed with surgical stabilization after first-time versus recurrent shoulder dislocations is multifactorial, including influence from patient preference, timing of the athletic season, career aspirations, surgeon preference, and multiple other socioeconomic factors. This represents a potential source of selection bias for timing of surgical intervention.

Conclusion

Immediate arthroscopic surgical stabilization after a first-time anterior shoulder dislocation significantly decreases the risk of recurrent dislocation in comparison to those who undergo surgery after 2 dislocation events, with comparable clinical outcome scores. These findings suggest that patients who return to activities after a primary anterior shoulder dislocation and

sustain just 1 additional dislocation event are at increased risk of failing arthroscopic repair.

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