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Bankart Repair in Traumatic Anterior Shoulder Instability

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ABSTRACT

Background: Latest studies have shown effective clinical outcomes after arthroscopic Bankart repair (ABR) but have shown some risk factors for re-dislocation after surgery. We assessed whether patients are at a risk for re-dislocation during the first year after ABR, examined the recurrence rate after ABR, and sought to recognize new risk factors.

Materials and Methods: We performed ABR utilizing bioabsorbable suture anchors in 51 consecutive shoulders (50 patients) with traumatic anterior shoulder instability. Average patient age was 26.5 (range, 15–40) years. We assessed re-dislocation after ABR using patient telephone interviews (follow-up rate, 100%) and correlated re-dislocation with several risk factors.

Results: Re-dislocation after ABR occurred in five shoulders (9.8%), of which 4 sustained re-injuries within the first year with the arm elevated at 90° and externally rotated at 90°. Of the remaining 46 shoulders without re-dislocation, 4 had re-injury under the same conditions within the first year. Consequently, re-injury within the first year was a risk for re-dislocation after ABR ($P < 0.001$, chi-squared test). Using multivariate analysis, large Hill-Sachs lesions (odds ratio, 6.75; 95% CI, 1.35-64.5) and <4 suture anchors (odds ratio, 9.45; 95% CI, 1.88-72.5) were significant risk factors for re-dislocation after ABR.

Conclusion: The recurrence rate after ABR was not associated with the time elapsed and that repair strategies should augment the large humeral bone defect and use >3 anchors during ABR.

Keywords: Risk factor, Arthroscopic Bankart repair, Re-dislocation.

INTRODUCTION

Arthroscopic Bankart repair (ABR) deliver stolerable outcomes for recurrent anterior shoulder instability. Nevertheless, latest studies have shown recurrent rates of 4%–19% [1-3]. Numerous factors, comprising a young age at the time of surgery, male gender, participation in collision sports,shoulder instability on both sides, joint hyperlaxity, early return to contact sports, the size of the humeral defect (Hill-Sachs lesion), and bone defects have been linked with the recurrent instability [4–6]. Moreover, a recent study showed that 55% of the re-dislocations after ABR occurred within the first year, and afterward, the recurrence rate decreased for up to 5 years [7]. Consequently, these outcomes prompted us to assess whether the patients with primary ABR are at risk for re-dislocation during the first year after the surgery. Moreover, the current work studied the recurrence rate after ABR and sought to recognize new risk factors.

MATERIALS AND METHODS

Fifty-one consecutive shoulders (50 patients) using ABR for traumatic anterior shoulder instability from January2015 to January2017 at King Abdulaziz Hospital. The average patients age were 26.5 (range, 15–40) years. Inclusion criteria: recurrent anterior shoulder instability after an apparent traumatic episode, at least three dislocation/subluxations before the surgery, a Bankart lesion or anterior labral periosteal sleeve avulsion lesion confirmed during arthroscopy, and an arthroscopic capsulolabral repair achieved using three or more suture anchors.Exclusion criteria included: multidirectional instability, revision Bankart repairs, and full-thickness rotator cuff tears.Preoperative radiographic imaging, consisting of anteroposterior, scapular Y, and axillary views, was acquired to assess the glenoid shape of the glenoid and the presence of any bony (i.e., Bankart or Hill-Sachs) lesions. Contrast magnetic resonance imaging of the affected shoulder was assessed for the occurrence of a Bankart lesion and any other shoulder injury before surgery.

We successfully contacted all the 50 patients who underwent ABR in our institution via telephone. A re-visit for postoperative evaluation was requested although most of the patients declined the visit. Consequently, the patients' present status, including postoperative injury and re-dislocation with either subluxation or complete dislocation, was inquired via phone.

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Since previous studies have recommended that both glenoidal and humeral head bone defects are closely associated with re-dislocation after ABR [8, 9], these bony defects were measured using an arthroscopic probe technique [1]. For glenoid bone defects, using the anterosuperior-viewing portal, a probe with 3-mm calibrated marks was placed through the posterior portal across the glenoid so that its tip rested on the bare spot. The distance from the center of the bare spot to the posterior glenoid rim was then measured. The probe was then used to measure the distance from the anterior glenoid rim to the center of the bare spot. Finally, the probe was used to measure the distance from the center of the bare spot to the inferior glenoid rim [10]. Humeral head defects (Hill-Sachs lesions) were also measured with arthroscopic probe techniques, based on an estimation of the width, depth, and length, as measured intraoperatively with the arthroscopic probe [1]. The critical size of a Hill-Sachs lesion that causes instability is thought to be a volume > 250 mm3 [11, 12]; consequently, such lesions described large Hill-Sachs lesions.

The software JMP (SAS Institute Inc., Cary, NC, USA) was used for statistical analysis. Since the development of re-dislocation was a time-dependent outcome variable, we used survival methodology to examine the probability of re-dislocation occurring after ABR, by setting re-dislocation as the end-point. Student's t test or chi-squared test was used to compare the bony defect size between the patients with or without re-dislocation. A chi-squared test was used to examine the correlations between the clinical parameters and re-dislocation after ABR. Logistic multivariate analysis was then performed to further evaluate the significant parameters obtained from the Pearson's chi-squared test, accompanied by the odds ratio with 95% confidence intervals. The data were expressed as the mean values with the standard deviation. A P value < 0.05 was considered significant.

RESULTS

After collecting the patient's information, correlations of several risk factors were determined, including gender, injured side, age at first dislocation and surgery, arm dominance, type of sport (collision, contact, overhead, or others), waiting time prior to surgery, number of dislocations preoperatively, number of suture anchors used, superior labrum anterior and posterior (SLAP) lesion, and tear of the capsular. The patient demographic data are shown in Table 1.

Table 1: Patients demographic data

		Range	Mean ± SD	Median	Number (n)	Percentage(%)
	Age (y)	15–40	24.5 ± 9.59	23,2		
	Age at first dislocation (y)	13–40	23.1 ± 8.4	21		
Gender	Male				40	78,4%
	Female				11	21,6%
Injuryto dominant arm	No				21	41,2%
	Yes				30	58,8%
Injured side	Right				29	56,9%
	Left				22	43,1%
Dominant side	Right				45	88,2%
	Left				6	11,8%
Type of sport	No sport				21	41,2%
	Collision				10	19,6%
	Contact				7	13,7%
	Overhead				13	25,5%
Waiting time to surgery (months)	>6				35	68,6%
	<6				16	31,4%
Number of re-dislocations prior to surgery	<5				16	31,4%
	>5				35	68,6%
Number of suture anchor used	3				23	45,1%
	4				21	41,2%
	5				7	13,7%
SLAP lesion	Yes				1	20,0%
	No				4	80,0%
Tear of capsular	No				43	84,3%
	Yes				8	15,7%

Of the 51 shoulders treated with ABR, a total of 5 (9.8%) experienced re-dislocation. Of these, 4 shoulders were re-injured within the first year with the arm elevated at 90° and externally rotated at 90°. Another experienced re-injury and re-dislocation after surgery. Therefore, most re-dislocations (78%) occurred within the first year after ABR. Of the 5 patients who had a re-dislocation, 1 patient underwent re-operation, and the remaining 4 patients were treated non-operatively or refused operation. Of the 46 shoulders without re-dislocation, 4 shoulders had a traumatic injury within the first year under the same conditions (90° elevation and 90° external rotation). The shoulders were re-dislocated during contact and overhead sports (n = 1), as well as activities of daily livings (n = 3). Consequently, re-injury within the first year proved to be a risk for re-dislocation after ABR (P < 0.001, chi-squared test, Table 2).

Table 2: Correlation between injury within the first year after surgery and postoperative re-dislocation.

Injury within 1 year	Re-dislocation (+)	Re-dislocation (−)	Total
Yes	4	4	8
No	1	42	43
Total	5	46	51

Using a chi-squared test, we found that a large Hill-Sachs lesion (>250 mm3) [1] (P = 0.010), glenoid bone defect (>20%), and less than four suture anchors (P = 0.012) were considered significant risk factors for recurrence after ABR (Table 3). In contrast, there was no evidence of a relationship between re-dislocation and other factors such as age at the time of first dislocation (P = 0.31), gender (P = 0.73), the number of previous dislocations before ABR (P = 0.32), waiting time prior to surgery (P = 0.29), arm dominance (P = 0.60), injured side (P = 0.51), SLAP lesion (P = 0.25), or capsular tear (P = 0.59).

Table 3: Analysis of risk factors for re-dislocation after ABR by a chi-squared test.

Variable	P value
Large Hill-Sachs lesions	0.010
Numberofanchors	0.012
Glenoidboneloss (>20%)	0.039

When the variables that demonstrated significance with the chi-squared test were further entered into multivariate analysis, the number of suture anchors used (odds ratio, 9.45; 95% CI, 1.88-72.5) and large Hill-Sachs lesions (odds ratio, 6.75; 95% CI, 1.35-64.5) remained independently predictive (Table 4).

Table 4: Analysis of risk factors for re-dislocation after ABR by multivariate analysis

Variable	P value	Odds ratio	95% CI
Large Hill-Sachs lesions	0.026*	6,75	1.35–64.5
Numberofanchors	0.0041*	9,45	1.88–72.5
Glenoid bone loss	0.148		

DISCUSSION

The current study successfully assessed shoulder re-dislocation after ABR with 100% follow-up through phone survey.

We found a significant relationship between re-dislocation and preoperative risk factors, including a large Hill-Sachs lesion and the use of less than four suture anchors. Re-dislocation mainly and significantly occurred within the first year after the operation. Accordingly, we confirmed that the risk of re-dislocation after ABR is greater in the first year compared to subsequent postoperative years, indicating that the recurrence rate after ABR is not related with the time elapsed and suggests the importance of extra care within this period. Ahmed et al. [7] have correspondingly presented that patients were at risk for re-dislocation within the first year after ABR, and subsequently, the rate of recurrence reduced. Bearing in mind that most patients with a high-predicted risk of re-dislocation do not develop recurrent instability, whereas others with a few risk factors can experience failure after ABR, the existence of other factors (e.g., compliance with postoperative immobilization, re-injury after ABR, increase of general activity, and genetic predisposition) might be associated to the intensive incidence of re-dislocation within the first year after ABR.

Alternatively, the repaired capsulolabral complex may not have healed during the first year since the healing process of the repaired site has not yet been completely elucidated.

Long-term follow-up studies for ABR have specified that recurrence rates increase with time [4, 13]. Castagna et al. [13] described that in 31 of 43 shoulders with ABR, 7 were dislocated (22%) at a mean follow-up of 10.9 years, with 3 of the 7 recurrences developing after 6 years. van der Linde et al. [4] showed that in 68 of 70 shoulders with ABR, a total of 24 experienced re-dislocation after surgery (35%), with a mean follow-up period of 8–10 years.

Re-dislocation occurred in 10 shoulders (15%) within the first 2 years, 7 shoulders (10%) at 2–5 years postoperatively, and 7 shoulders (10%) after 5 years. In these studies, two or three suture anchors were used in most cases. As demonstrated in the present study, the use of less than four suture anchors was closely associated with the recurrent instability after ABR [14].

Taken together, the use of fewer anchors in long-term studies may explain why the incidence of re-dislocation increased over time.Earlier studies have specified that a large/engaging Hill-Sachs lesion is significantly involved in re-dislocation after ABR [15, 16]. Traumatic anterior shoulder instability is frequently linked with bone loss from the glenoid, humerus, or both. Bony defects of the glenoid are reported in 5%–56% cases of traumatic anterior shoulder instability [17-19].

The articular arc deficit of the humeral head allows engagement of the bone defect on the anterior glenoid rim, the so-called engaging Hill-Sachs lesion. Enlargement of the bone defect of this lesion is well correlated with the engagement of the glenoid rim [16, 17, 20]. While engagement between the humeral and glenoidal defects were not evaluated in detail in the current study, a large Hill-Sachs lesion was significantly associated with the recurrence after ABR, in line with the results of previous studies [21].Bone loss of >20%–30% is associated with a significant increase in re-dislocation after surgery [8, 22].

In the current study, 10% of the patients had a glenoid bone defect greater than 20%, thus affecting the data analysis in this series. A larger sample of patients with ABR may have elicited a significant association with glenoid bone defects and re-dislocation.

LIMITATIONS

The present study has numerous limitations. First, this study failed to perform direct physical or radiographical examination in all patients who experienced ABR. The patients were phone-interviewed and asked about trauma and/or re-dislocation, and long period of post-surgery, signifying the possibility for recall bias, which cannot be ruled out. Nevertheless, we focused on examining the relationship between clinical parameters and re-dislocation after ABR and successfully contacted all patients by telephone for obtaining details about trauma/re-dislocation after surgery. Furthermore, the current series was a retrospective, not a prospective study. Nevertheless, we were capable to examine the re-dislocation rate after ABR in all patients.

CONCLUSION

The current study specified that a large Hill-Sachs lesion and the number of the suture anchors are significant risk factors for re-dislocation after ABR. Recurrence rate after ABR was not allied with the time elapsed.

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