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Evaluation of Factors Affecting Outcomes in Arthroscopic Bankart Repair

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ABSTRACT

Objective: This study aims to investigate the factors that affect the functional outcomes of patients undergoing arthroscopic Bankart repair.

Materials and Methods: We evaluated patients undergoing Bankart lesion repair in this study, which involved a total of 68 patients. For each patient, we identified the number of dislocations, Constant scores, number of sutures, and arthroscopic classification (Type 1 to 5).

Results: The postoperative Constant scores of patients with more than one preoperative dislocation were statistically lower than those of patients with only one dislocation (p=0.043). The ABC Type 1 group exhibited significantly better postoperative scores compared to patients in the Type 2 and Type 3 groups (p=0.001; p=0.006). The postoperative Constant scores of patients with ≥3 anchor sutures were determined to be statistically higher than those with <3 sutures (p=0.001). All recurrence cases involved young males with inferior glenohumeral ligament (IGHL) tears, and three out of four recurrences were observed in patients with more than one preoperative dislocation.

Conclusion: Constant scores improved in all groups compared to the preoperative evaluation. Better functional outcomes were observed in patients with ABC Type 1, patients with only one dislocation, and patients who underwent labral repair with three or more anchor sutures.

Keywords: Arthroscopy, shoulder, sports.

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INTRODUCTION

The incidence of anterior shoulder instability has been reported to be around 2%, with trauma being the most common cause.[1] Two main pathologies associated with anterior shoulder instability are Bankart lesion and capsuloligamentous laxity. A Bankart lesion refers to a tear in the anteroinferior labrum, often accompanied by injury to the inferior glenohumeral ligament (IGHL). This tear can extend superiorly, resulting in a superior labrum anterior posterior (SLAP) lesion, which can also affect the biceps tendon.[2,3] The labrum plays a crucial role in increasing the depth and articular surface area of the glenoid. When it is torn, known as a Bankart lesion, shoulder instability can occur.[4] Shoul-

der stability is influenced by both static and dynamic components. The static components include the glenohumeral joint, labrum, capsule, and articular surface area, while the dynamic components include the rotator cuff, scapulothoracic motion, and long head of the biceps.

The treatment of glenohumeral instability involves repairing the labrum and ensuring proper tension in the capsuloligamentous structures.[5] Shoulder arthroscopy is the preferred approach for assessing and repairing these structures. Before shoulder arthroscopy, open repair techniques also yielded satisfactory outcomes. However, postoperative range of motion has been shown to be more commonly restricted in open procedures.[6–8] Nowadays, shoulder arthroscopy is commonly used due to its lower morbidity rates compared to open repair techniques. In addition to the Bankart lesion, capsuloligamentous laxity-tear is also an important issue for which a capsular shift procedure is advised.[9] In capsular procedures, it is crucial to avoid excessive tension, which may limit motion.

The objective of this study was to examine the impact of factors such as the number of dislocations, number of sutures, and Arthroscopic Bankart Classification on the outcome of arthroscopic Bankart surgery.

MATERIALS AND METHODS

This retrospective study evaluated patients who underwent Bankart lesion repair for anterior shoulder dislocation, with a follow-up period of at least two years. Ethical approval was granted by the Necmettin Erbakan University Ethical Committee on 18/11/2022 (issue number: 2022/4043). The mean follow-up time was 33.50 months (range: 28–70 months). The research was conducted at the affiliated hospitals of the authors. Preoperatively, a full shoulder examination, direct radiography, and magnetic resonance imaging were performed on all patients. Additionally, all patients completed the Constant-Murley shoulder outcome score form. The instability apprehension test and Jobe apprehension-relocation test were used for preoperative evaluation, along with measuring shoulder motion.

The study included patients who underwent Bankart lesion surgery between 2015 and 2022 at our hospital. Patients with any shoulder pathology other than Bankart lesion diagnosed arthroscopically were excluded from the study. Other exclusion criteria consisted of patients with multi-directional instability, those who did not consent to participate in the study, or those with a history of revision Bankart repair. The study sample consisted of patients with an isolated Bankart lesion (n=68). Postoperative radiography, detailed physical examination, and completion of the Constant-Murley shoulder outcome score sheet were conducted for all patients. The Constant-Murley shoulder outcome score evaluates the shoulder in four subheadings: pain, daily activities, range of motion, and strength. The highest function score achievable in this system is 100 points.[10]

Figure 1. Bankart repair with 2 sutures.

All patients underwent diagnostic arthroscopy to evaluate the rotator cuff, long head of biceps, rotator interval, and capsuloligamentous structures, and the findings were recorded. The patient's age, side of the dislocated shoulder, dominant side, gender, number of suture anchors, and the number of dislocations were identified. The arthroscopy form was completed, and the arthroscopic classification of the Bankart lesions was applied.[11–14]

The Arthroscopic Bankart Classification (ABC) is described as follows: Type 1 indicates labral detachment with a well-formed glenohumeral ligament. Type 2 is labral detachment with a poorly formed glenohumeral ligament. Type 3 is a torn ligament with labral disruption. Type 4 is a disruption of the ligament with a glenoid bone defect. Type 5 is a loose glenohumeral ligament and no Bankart lesion.[14]

The number of dislocations (ND): The patients with one preoperative dislocation were evaluated as the number of dislocation group 1 (ND Group 1), and those with more than one dislocation were evaluated as the number of dislocation group 2 (ND Group 2), and these two groups were compared.

The number of suture anchors (NS): Suture anchors with metal studs were used (Fig. 1, 2). According to the number of sutures used, the patients were divided into three groups: <3 sutures (NS Group 1), 3–4 sutures (NS Group 2), and >4 sutures

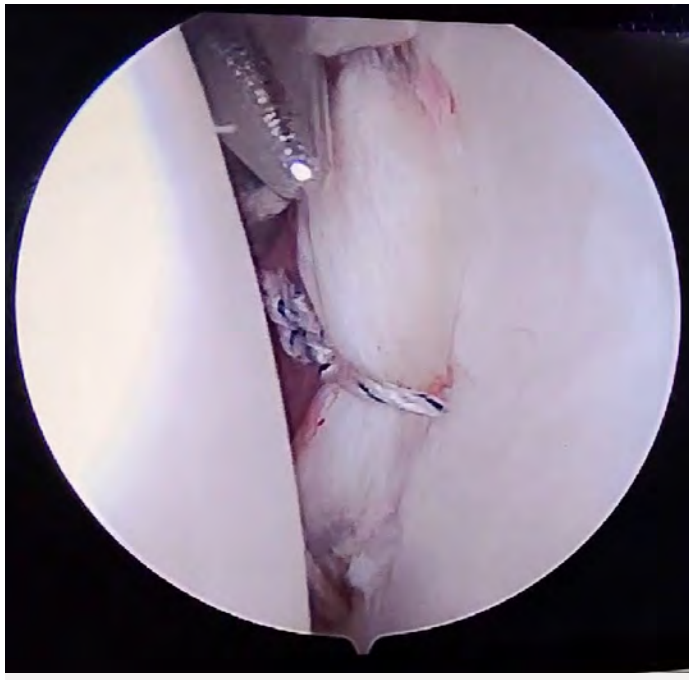

Figure 2. Bankart repair with 3 sutures.

(NS Group 3). The number of sutures to be used was decided based on the size of the tear in the labrum.

General anesthesia was administered to the patients, and they were positioned in the beach chair position. Shoulder examination was conducted to assess anterior instability. Arthroscopy portals, including posterior, anteroinferior, and anterosuperior portals, were created for all patients. Diagnostic arthroscopy was performed using a 4 mm arthroscope through the posterior portal. The movement was restored in all patients by releasing the capsule from the anterior of the glenoid using a shaver, burr, and radiofrequency device.

The postoperative rehabilitation plan followed in this study was consistent with previous research, which involved immobilization for three to six weeks after surgery. After the initial immobilization period, a progressive shoulder motion program was initiated at three to six weeks. Finally, exercises focused on strength were introduced from six to twelve weeks.[15]

Statistical Analysis

The statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) software (version 16.0; SPSS, Chicago, Illinois, USA). Firstly, descriptive statistics were utilized to analyze the data. Normal distribution was assessed using the Shapiro–Wilk test. When comparing two independent groups with a normal distribution, the Student t-test was employed for quantitative data comparison. When comparing two dependent groups, a paired t-test was used to compare the groups with a normal distribution in terms of the quantitative data. When comparing more than two groups, the homogeneity of variance was assessed using the Levene test for data showing a normal distribution. One-way Analysis of Variance (ANOVA) test and Tukey's test were used as post-hoc tests for homogeneously distributed data. P<0.05 values were considered statistically significant.

Table 1. Distribution of descriptive characteristics

	Min–Max	Mean±SD	n	%
Age (years)	18–42	24.52±4.48		
Follow-up time (months)	28–70	33.50±4.06		
Number of dislocations	1–8	2.88±1.54		
Gender				
Female			6	8.8
Male			62	91.2
Side of the shoulder				
Right			46	67.6
Left			22	32.4
Dominant side				
Yes			51	75.0
No			17	25.0
Classification				
Type 1			13	19.1
Type 2			29	42.7
Type 3			20	29.4
Type 5			6	8.8
Number of sutures				
<3			29	42.7
3–4			30	44.1
>4			9	13.2
Number of dislocations (ND)				
=1			31	45.6
>1			37	54.4
Recurrent dislocations				
ND Group 1			1	1.4
ND Group 2			3	4.4

SD: Standard deviation.

RESULTS

The study included a total of 68 patients, consisting of 6 females (8.8%) and 62 males (91.2%). The mean age was 24.52±4.48 years (range: 18–42 years). Table 1 displays the demographic characteristics of the patients.

Table 2. Evaluation of Constant Scores according to the number of dislocations

	1 dislocation n=31 (45.6%) Mean±SD	>1 dislocations n=37 (54.4%) Mean±SD	p*
Constant Score			
Preoperative	63.04±3.38	62.92±3.22	**0.900**
Postoperative	92.04±3.93	89.62±4.28	**0.043**
p**	**0.001**	**0.001**	

SD: Standard deviation; *: Student's t-test; **: Paired t-test.

The mean follow-up period was 33.50±4.06 months. The mean number of dislocations was 2.88±1.54 (range: 1–8). Among the patients, 31 (45.6%) experienced one dislocation, while 37 (54.4%) experienced more than one dislocation. Recurrent dislocation occurred in four patients, all of whom were male with a mean age of 20±1.83.

Regarding the number of sutures used, 29 patients (42.7%) had less than three sutures, 30 patients (44.1%) had three to four sutures, and nine patients (13.2%) had more than four sutures. Right shoulder dislocation occurred in 46 patients (67.6%), while left shoulder dislocation occurred in 22 patients (32.4%). Among the patients, 51 (75.0%) experienced dislocation in their dominant shoulder, while 17 (25.0%) experienced it in their non-dominant shoulder. The lesions were categorized as Type 1 in 13 patients (19.1%), Type 2 in 29 patients (42.7%), Type 3 in 20 patients (29.4%), and Type 5 in 6 patients (8.8%). No patients had Type 4 dislocation.

A-Evaluation in terms of the number of dislocations (Table 2):

Preoperative evaluation: The mean preoperative Constant score for ND Group 1 patients was 63.04±3.38, and for ND Group 2 patients, it was 62.92±3.22. There was no statistically significant difference between the ND groups in terms of preoperative Constant scores (p=0.90).

Postoperative evaluation: The mean postoperative Constant score for ND Group 1 was 92.04±3.93, and for ND Group 2, it was 89.62±4.28. Both ND groups showed significant improvement in their postoperative scores compared to their preoperative scores. However, the postoperative Constant scores of the patients in ND Group 2 were statistically lower than those of the patients in ND Group 1 (p=0.043). There were four recurrence cases in this study, three of which were from ND Group 2, and one was from ND Group 1.

B-Evaluation in terms of classifications (Table 3):

Table 3. Evaluation of Constant Scores according to the classification

	Constant Scores	
	Preoperative Mean±SD	Postoperative Mean±SD
Classification		
Type 1 (n=13)	64.80±2.70	93.90±2.33
Type 2 (n=29)	63.23±3.34	91.14±2.66
Type 3 (n=20)	61.73±3.33	87.20±4.60
Type 5 (n=6)	61.33±1.15	92.33±3.21
p*	**0.084**	**0.001**

SD: Standard deviation; *: One-way ANOVA, post-hoc Tukey test.

Preoperative evaluation: There was no statistically significant difference in preoperative Constant scores among all ABC types (p=0.084). It is noteworthy that the preoperative Constant scores of the ABC Type 1 group were insignificantly higher than those of the other ABC Type groups.

Postoperative evaluation: A highly statistically significant improvement was observed in the postoperative Constant scores of each classification type compared to their preoperative scores (p=0.001). However, when comparing postoperative Constant scores between ABC types, the Type 1 group showed significantly better postoperative scores compared to those of the patients in the Type 2 and Type 3 groups (p=0.001 and p=0.006, respectively). Additionally, the postoperative Constant scores of the patients in the ABC Type 2 group were significantly higher than those of the patients in the ABC Type 3 group (p=0.001). Concurrently, three cases of redislocations were from the ABC Type 3 group, and one was from the ABC Type 5 group.

C-Evaluation in terms of the number of sutures (Table 4):

Preoperative evaluation: The mean Constant score was 63.60±2.40 in NS Group 1, 64.43±3.42 in NS Group 2, and 62.53±4.23 in NS Group 3. No statistically significant difference was found among the groups in terms of their preoperative Constant scores (p=0.081).

Postoperative evaluation: The mean Constant score was 87.90±2.33 in NS Group 1, 91.27±3.61 in NS Group 2, and 90.36±3.80 in NS Group 3. There was a statistically significant improvement in the postoperative Constant scores in all three NS groups compared to their preoperative scores. The patients who received ≥3 sutures had significantly higher postoperative Constant scores compared to those who received <3 sutures (p=0.001).

Table 4. Evaluation of Constant Scores according to the number of sutures

	Constant Scores	
	Preoperative Mean±SD	**Postoperative Mean±SD**
Number of sutures		
1–2 (n=29)	63.60±2.40	87.90±2.33
3–4 (n=30)	64.43±3.42	91.27±3.61
>4 (n=9)	62.53±4.23	90.36±3.80
P*	**0.081**	**0.001**

SD: Standard deviation; *: One-way ANOVA, post-hoc Tukey test.

DISCUSSION

The important finding of our study is that the ABC type of Bankart tear and the number of preoperative dislocations are important parameters in predicting functional outcomes. To improve postoperative outcomes, it is necessary to provide a better repair by increasing the number of suture anchors used.

Several studies in the literature have shown a correlation between the recurrence of anterior shoulder instability and the patient's age and level of activity, with younger patients and those with higher activity levels being at a higher risk of re-dislocation. Additionally, females have been found to have higher recurrence rates than males.[15,16] It has been reported that up to 50% of patients experience recurrence after the first dislocation, and various surgical and conservative treatment methods have been investigated for recurrent dislocations.[17–20] Nowadays, early surgical intervention is recommended by most authors to prevent recurrent dislocations. Bankart surgery was applied to 31 patients after their first dislocation, and the rate of postoperative recurrence was 5.9% during the follow-up period in this study. The recurrence rates for arthroscopic Bankart repair prior to the development of shoulder arthroscopy have been reported to range from 13% to 70%.[21,22] However, with more advanced techniques, these rates have been reduced to 8–10%.[22,23]

The number of dislocations experienced can serve as an indicator of functional outcome. In the current study, there was a statistically significant progression in postoperative Constant scores between patients with one dislocation and those with more dislocations (p=0.043). A systematic review conducted between 1966 and 2008 reported no significant difference in functional outcome between patients with a first-time dislocation and those with recurrent dislocations.[24] However, in this study, patients with a first-time dislocation had better postoperative outcomes, likely due to a lower recurrence rate in this group. Of the four recurrent cases observed, three were in ND Group 2, and one was in ND Group 1, suggesting a relationship between a history of multiple dislocations and the postoperative recurrence rate.

Arthroscopic classification is another important parameter that affects the postoperative outcome. In this study, the improvement between preoperative and postoperative Constant scores within each type of dislocation group was statistically significant. Although there was no difference in the increase from preoperative to postoperative Constant scores between the Type 1 and Type 3 groups, the functional outcome, as measured by postoperative Constant scores, showed improvement in the Type 1 group compared to the Type 3 group. The lower scores in the Type 3 group have been attributed to the tear of the inferior glenohumeral ligament (IGHL) since it is known that the IGHL playa a crucial role in both the number of dislocations and arthroscopic classification. In fact, three of the postoperative dislocations occurred in the Type 3 group, and one in the Type 5 group. It should be noted that Type 3 is defined as a tear of the IGHL coexisting with labral disruption. The IGHL is considered the key stabilizer of the glenohumeral joint[25] and therefore may contribute to the poorer outcomes observed in the Type 3 group.

When the number of sutures used in Bankart lesion surgery was evaluated with respect to the increase from preoperative to postoperative Constant scores, all suture subgroups showed significant improvement. However, postoperative Constant scores were statistically better in cases with more than two suture anchors, which is consistent with the existing literature.[26] While the biomechanical superiority of using more anchor sutures could be a possible reason for this observation, further studies are needed to confirm this.

Previous systematic analyses[26] have identified various factors that may be related to recurrence rates, including age, gender, number of dislocations, type of sports, and number of sutures. However, there are also studies that have found no significant effect of these factors on recurrence rates.[24] In the current study, we found that the number of dislocations, number of sutures, and Arthroscopic Bankart classification type had an effect on functional results. The recurrence cases were all males and younger than 23. Recurrence cases were only seen in IGHL torn (ABC Type 3 and 5) cases according to the classification. Additionally, the recurrence rate was higher in cases with >1 preoperative dislocation compared to those with one. Restoring the labrum with three or more anchor sutures resulted in better outcomes in postoperative comparisons. Moreover, postoperative success was greater in cases with one disloca-

tion (ND Group 1) and intact IGHL (ABC Type 1) cases. Although there are studies with variable results, the results we obtained in this study generally align with the existing literature.

There were limitations in our study. Firstly, it was a retrospective study with a relatively small number of patients. Secondly, only the Constant-Murley scoring system was used to evaluate the results. The inclusion of shoulder-specific systems could have enhanced the results. However, the scoring system used in this study is widely employed in the literature. Finally, parameters such as suture anchor type, additional augmentations to the repair, and time from injury to surgery were not included in our study. Studies incorporating more parameters will be decisive in predicting the outcomes of Bankart surgery.

CONCLUSION

Better functional outcomes were observed in ABC Type 1 patients, patients with one dislocation, and those who underwent labral repair with three or more anchor sutures. Recurrence cases were all young males with IGHL tears, and three out of four recurrences were seen in patients with more than one preoperative dislocation. It is important to emphasize the restoration of the labrum in IGHL tear and cases with multiple dislocations, and fixation using ≥3 sutures should be given special consideration, especially in higher types of arthroscopic Bankart classification. Further studies are required to obtain more detailed results.

Peer-review: Externally peer-reviewed.

Ethics Committee Approval: The Necmettin Erbakan University Clinical Research Ethics Committee granted approval for this study (date: 18.11.2022, number: 2022/4043).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Author Contributions: Concept – ÖK; Design – AÖ; Supervision – BS; Resource – ASS; Materials – ÖK; Data Collection and/or Processing – ÖK; Analysis and/or Interpretation – AÖ; Literature Search – AÖ; Writing – AÖ; Critical Reviews – ÖK.

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