

Original Article

Evaluating the results of Bankart repair in recurrent traumatic anterior shoulder dislocation

Seyed Rohallah Mousavibaygei¹, Sahel Moein², Danial Sharifi Razavi³, Farshid Haghi⁴, Rasool Karimi Matloub⁵

¹Assistant Professor, Qom University of Medical Sciences, Qom, Iran; ²Faculty of Medicine, Shahroud University of Medical Sciences, Shahroud, Semnan, Iran; ³Orthopedic Surgeon at Tehran University of Medical Science (IKHC), Tehran, Iran; ⁴Student of Dalian Medical University, Dalian Medical University, Dalian, Liaoning, China; ⁵Student of Arak University of Medical Science, Iran

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Abstract: Introduction: Bankart procedure is considered a safe and effective technique in the management of traumatic shoulder dislocation. Various studies have evaluated the results of Bankart Repair in different populations. The aim of the current study is to evaluate and report the outcomes of Bankart capsulorrhaphy in patients with recurrent shoulder dislocation in Iran. Methods: This is a clinical trial without a control group that was performed in 2021. The study population consisted of all patients diagnosed with recurrent anterior shoulder dislocation and Bankart lesion that were candidates for Bankart capsulorrhaphy in 2012-2020. All patients that met the inclusion criteria entered the study using census method. We assessed variables including shoulder range of motion (ROM), shoulder joint symptoms using Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, Rowe score, Constant Shoulder Score and patient's quality of life using 36-Item Short Form Survey Instrument (SF-36) before surgeries and within 2 months, 6 months and 1 year after surgeries. Results: Data of 300 patients were analyzed. All patients underwent Bankart capsulorrhaphy. Patients were followed up for minimum of 1 year after surgery. These data showed improvements in external rotation, abduction, DASH score, Rowe score and SF-36 in patients ($P < 0.05$ for all items). No significant changes were observed within 1 year in forward elevation ($P = 0.07$), internal rotation ($P = 0.125$) and Constant Shoulder Score ($P = 0.082$). Conclusion: Bankart surgery is an effective method for reducing pain and recurrence of shoulder dislocation. Based on our results, using Bankart surgery led to significantly increased shoulder functions among patients.

Keywords: Bankart, shoulder dislocation, shoulder function

Introduction

The glenohumeral joint has a great range of motion among our body joints. Because of this great freedom of motion, sports activities and trauma can cause a shoulder dislocation [1]. A dislocated shoulder is when the head of the humerus is out of the shoulder joint. Symptoms include shoulder pain and instability [2]. Complications may include a Bankart lesion, Hill-Sachs lesion, rotator cuff tear, or injury to the axillary nerve [3].

A Bankart lesion is a common sports activities injury that can cause anterior shoulder instability. The functional stability of glenohumeral joints is achieved through static and dynamic stabilizers. Static stabilizers include negative pressure inside the joint, size, shape, and posi-

tion of the glenoid socket, and the presence of capsulolabral complex stabilizers [4, 5].

Dislocation of the shoulder often occurs when the arm is in an abduction position with high force and maximum external rotation. Treatment of primary anterior shoulder dislocation is complex and discussable [6].

Many data have shown that the shoulder is highly susceptible to instability after the first traumatic dislocation [7, 8]. The relative age of the young patient at the time of injury is the most important prognosis factor for recurrence [9].

Bankart repair surgery is considered by many surgeons as the choice treatment for anterior instability, especially if it is due to traumatic

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causes [10]. A Bankart Shoulder Repair procedure is a surgical technique for the repair of recurrent shoulder joint dislocations. Within the procedure, the worn out ligaments are re-attached to the proper place in the shoulder joint, using the objective of rebuilding normal function. Because the torn capsule or labrum is repaired directly in the glenoid cavity [11, 12].

Epidemiologic data have indicated vast range of success rate in different populations [9]. So far, various studies have evaluated the results of Bankart Repair in different populations but to the best of our knowledge very few studies have investigated these results in our country. The aim of the current study is to evaluate and report the outcomes of Bankart capsulorrhaphy in patients with recurrent shoulder dislocation in Iran.

Methods and material

Study design

This is a clinical trial without a control group that was performed in 2021 in Aban and Kish referral orthopedic clinics in Teheran, Iran. The study population consisted of all patients diagnosed with recurrent anterior shoulder dislocation and Bankart lesion that were candidates for Bankart capsulorrhaphy in 2012-2020. The study protocol was approved by Research committee of Tehran University of Medical Sciences and the Ethics committee has confirmed it (Ethics code: IR.MUMS.MEDICAL.REC.1398.422).

Inclusion and exclusion criteria

Inclusion criteria were age more than 18 years, diagnosis of Bankart lesion by expert orthopedic surgeon, diagnosis of anterior shoulder dislocation, candidates for Bankart capsulorrhaphy via arthroscopy technique, admission in our clinics in 2012-2020 and signing the written informed consent to participate in this study. The exclusion criteria were previous shoulder surgery, poor bone quality resulting from conditions such as cancer, metabolic bone diseases in the humerus, previous correction surgeries of the humerus, osteoporosis, osteomyelitis, active or chronic infection of the upper limb, presence of tumors or local bone cysts and death of the patient.

Study population

All patients that met the inclusion criteria entered the study using census method. Demographic data of patients including age, gender and comorbidities were obtained. We assessed variables including shoulder range of motion (ROM), shoulder joint symptoms using Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, Rowe score, Constant Shoulder Score and patient's quality of life using 36-Item Short Form Survey Instrument (SF-36).

Measuring tools

The following items were assessed for each patient before the surgeries by expert orthopedics: ROM of the shoulder: normal range of motion of the shoulder include: Forward Elevation (160-170), Abduction (170-180), Internal Rotation (40-45), and External Rotation (50-55) (8). Range of the shoulder joint pain was measured by Numerical Rating Scale.

Shoulder joint symptoms were also assessed by the means of DASH score [13]. DASH score includes a questionnaire that examines symptoms (such as pain, weakness, etc.) as well as the patient's ability to perform some physical activity, and patients answer all the questions according to their health status last week. The minimum score is 30 and the maximum score is 150.

Rowe score was also used to determine the stability of the shoulder, ROM and its performance [14]. This score consists of a three-part questionnaire in which in the first part the stability of the shoulder joint, in the second part the range of motion of the shoulder, and in the third part the patient's performance is examined, and the results are declared as excellent (90-100), good (75-89), fair (51-74), and poor (50 or less).

Constant Shoulder Score consists of two parts that were filled by the physician and the patients before surgeries [15]. These items included pain (15 points), daily activity (20 points), movement (40 points) and power (25 points).

SF-36 was also filled for each patient. This questionnaire is an oft-used, well-researched, self-reported measure of health covering eight

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Table 1. Demographic variables of study population

Variables		Mean	SD
Age (years)		33.4	6.29
		Frequency	Percent
Gender	Male	300	100%
	Female	0	0
Dominant hand	Right	222	74%
	Left	78	26%
Affected shoulder	Right	186	62%
	Left	114	38%

domains of health [16]. The SF-36 questionnaire is a standard generic or general questionnaire without cultural restrictions and is one of the most valid quality of life questionnaires used to assess quality of life. The questionnaire has 36 questions and eight dimensions, the dimensions of which include physical function, role limitation due to physical health, role limitation due to emotional problems, sense of life, mental health, social function, physical pain and general health, all of which are summarized in two parts, physical and mental. The scoring of the questions according to the Rand scoring system is from zero (worst quality of life) to 100 (best quality of life) and by adding the scores of the specific questions for each dimension and dividing the number obtained by the number of questions of the same dimension, the score is obtained.

Interventions and follow-up

All patients underwent Bankart capsulorrhaphy by one expert orthopedic surgeon from 2012-2020. Patients were visited regularly after surgeries and same measurements were performed within 2 months, 6 months and 1 year after surgeries. Data were obtained and analyzed.

Statistical analysis

After collecting the study data, they were entered into SPSS software (version 25, IBM Corporation, Armonk, NY) and analyzed. Qualitative variables were compared using χ^2 and quantitative variables were compared using Paired T-test. Wilcoxon nonparametric test was also used. Quantitative variables had a normal distribution and a standard deviation was pre-

sented. In all tests, values of $P < 0.05$ were considered as a significant level.

Results

Populations

A total number of 303 patients entered this study based on inclusion criteria and underwent Bankart capsulorrhaphy within 8 years. Three patients were excluded due to improper follow-up during this study. Data of 300 patients were analyzed. Primary analysis of patients showed that the minimum age of patients was 26 years and the maximum was 48 years with a mean age of 33.4 ± 6.29 years. All patients were male (100%) and 74% percent of patients were right-handed and 26% of them were left-handed. In 62% of cases, the affected shoulder was the right and in 38% of the cases, the affected shoulder was the left hand. These data are summarized in **Table 1**. Falling onto an outstretched hand (32.3%) and throwing an object (32.3%) were the two most common causes of shoulder dislocation in patients. Conflict, accidents, and seizures accounted for 16.5%, 12%, and 6.9% of cases, respectively.

Pre-operation assessments

Data regarding shoulder ROM, DASH score, Rowe score, Constant Shoulder Score and SF-36 were collected.

Our data showed that the lowest rate of forward elevation was 84° in patients and the highest rate was 173° with an average of 158° . The lowest rate of internal rotation in patients was 30° and the highest rate was 51° with an average of 42° . The lowest rate of external rotation in patients was 20° and the highest rate was 45° with an average of 36° . The lowest rate of abduction in patients was 90° and the maximum rate was 180° with an average of 163° . The decrease in external rotation was (0-20) degrees with an average of 10° . These data were compared to the contralateral arm that indicated significant reduction in external rotation and abduction ($P < 0.05$) (**Table 2**).

Surgical procedures

All patients underwent Bankart capsulorrhaphy. Patients were followed up for minimum of 1 year after surgery with an average of 1.25

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Table 2. Mean pre-operative ROM between affected and contralateral arm

Variables		Affected arm	Contralateral arm	P-value
ROM (degree) (mean ± SD)	Forward Elevation	158.21 ± 12.35	162.01 ± 11.36	0.420
	Internal Rotation	42.27 ± 7.82	44.60 ± 6.81	0.312
	External Rotation	36.03 ± 5.22	52.36 ± 7.27	< 0.01
	Abduction	163.37 ± 14.63	181.22 ± 12.33	< 0.001

ROM: range of motion.

Table 3. Comparison of different variable before and after surgeries

Variables		pre-operative	Within 2 months	Within 6 months	Within 1 year	P-value
ROM (degree) (mean ± SD)	Forward Elevation	158.21 ± 12.35	157.36 ± 10.36	158.42 ± 11.82	159.63 ± 9.70	0.072
	Internal Rotation	42.27 ± 7.82	43.20 ± 6.75	43.42 ± 6.92	44.38 ± 8.23	0.125
	External Rotation	36.03 ± 5.22	39.71 ± 4.98	47.30 ± 5.12	53.21 ± 5.60	< 0.01
	Abduction	163.37 ± 14.63	172.39 ± 12.52	179 ± 10.84	182 ± 11.75	< 0.01
DASH score (mean ± SD)		38.23 ± 7.22	26.22 ± 7.46	15.14 ± 8.58	12.47 ± 8.41	< 0.01
Rowe score (mean ± SD)		54.14 ± 6.41	59.07 ± 5.58	72.10 ± 6.32	97.24 ± 7.20	< 0.01
Constant Shoulder Score (mean ± SD)		77.82 ± 9.37	79.36 ± 10.36	80.57 ± 8.24	83.60 ± 7.33	0.082
SF-36 (mean ± SD)		41.17 ± 5.69	62.91 ± 8.74	70.36 ± 7.52	87.14 ± 8.66	< 0.01

ROM: range of motion, DASH: Disabilities of the Arm, Shoulder and Hand, SF-36: 36-Item Short Form Survey Instrument.

years. The minimum time from the beginning of the injury to the time of surgery was 3 months and the maximum was 27 months and its average was 16.63 months.

Post-operation assessments

We collected data regarding shoulder ROM, DASH score, Rowe score, Constant Shoulder Score and SF-36 2 months, 6 months and 1 year after surgeries and compared the data to the pre-operative assessments. These data showed improvements in external rotation, abduction, DASH score, Rowe score and SF-36 in patients ($P < 0.05$ for all items). No significant changes were observed within 1 year in forward elevation ($P = 0.07$), internal rotation ($P = 0.125$) and Constant Shoulder Score ($P = 0.082$) (Table 3).

Further assessments

Based on our data, 93.3% of patients continued to work after operations and 6.7% of cases were forced to change jobs. We showed that 30% of patients were restricted in exercise and 6.7% were restricted in both work and exercise before surgeries. 63.3% did not suffer from any kind of limitations. Sixty-six point seven percent of patients had no pain, 23.3% had mild pain and 10% had moderate pain. No

complications were observed among patients and none of the study population had shoulder dislocation within 1 year after surgeries.

Discussion

Operative procedures for the treatment of anterior shoulder instability include Magnuson-Stack, Putti-Platt, Bristow, inferior capsular shift, and Bankart procedure [17, 18]. The goal of these operations is to prevent the recurrence of the glenohumeral joint instability. Magnuson-Stack, Putti-Platt, Bristow are rarely performed due to complications such as external rotation limitations and degenerative changes in the glenohumeral joint [19, 20]. Bristow procedure is rarely performed because it causes deformity in the normal anatomy of the joint [21]. Based on the results obtained from the problems associated with the other methods, the Bankart procedure is considered a safe and effective technique in the management of symptomatic shoulder dislocation. Many studies have reported that Bankart repair significantly improves functional outcomes in acute shoulder dislocations and decreased dislocation and instability rates [22, 23].

Our study was performed on 300 cases that underwent Bankart capsulorrhaphy within 8 years. Patients were evaluated regarding shoul-

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der ROM, DASH score, Rowe score and SF-36. Data evaluation showed improvements in external rotation, abduction, DASH score, Rowe score and SF-36 in patients but no significant changes were observed within 1 year in forward elevation and internal rotation. Also, most of the patients in our study had no pain and none of the patients had shoulder dislocations within a year after surgeries. The significant point of our study is that, unlike other studies, all of these factors and scores were evaluated together in the current study.

In 2019, Parmar and colleagues reported a prospective review of 30 cases that underwent arthroscopic Bankart repair with a minimum follow-up of 2 years. They were observed that the Rowe score did not change significantly at 3 months follow-up after arthroscopic Bankart repair, but after 6 months follow-up to the 2nd year, a significant improvement was observed [24]. The average Rowe score of this study after 12 months of follow up was 87.96 ± 11.1 . Overall, this study concluded that arthroscopic Bankart repair is a safe and effective technique for treating patients with recurrent traumatic shoulder dislocation. This study is in line with our study.

In 2017, Kalkar and othes conducted a similar study on 21 patients after approximately 30 months of follow-up. The mean Rowe score in this study was 95.45. The results of this study demonstrated that in patients treated with Bankart procedure, no recurrence of the shoulder dislocation was seen [25]. Kim and others also reported that the average Rowe score increased from 30 to 85. In other studies, at average follow-up of 24 months, 3.7 years and 28 months, the final Rowe scores were 93 ± 10 , 92.1 ± 19.1 and 91.3, respectively [26]. The Rowe score obtained in our study is also well consistent with the above studies but our study population is higher than these studies.

In 2017, Saier and colleagues conducted a prospective case series study of 53 patients who underwent Bankart surgery between 2011 and 2013 with a 2-year follow-up [27]. In this study, the assessment of the quality of life after arthroscopic Bankart repair was impaired during the early postoperative period but significantly increased compared to the preoperative levels within 6 to 12 months after surgery. After 12 months of follow-up, a steady-state of func-

tional outcomes and excellent quality of life was observed, indicating a significant association of quality of life outcome scales with functional outcomes. Also in this study, the mean DASH score improved significantly from 45.7 to 28.6 after 24 months of follow-up, which is in line with our study.

In 2014, Shields and colleagues reported a study of 13 patients. In this study, SF-36 was measured in patients with acute shoulder dislocations treated with Bankart repair. The results showed that the mean SF-36 mental component summary (MCS) was increased from the mean value for the United States (US) population, while the mean physical component summary (PCS) was slightly decreased from the mean value for the US population [28]. Overall, the SF-36 data collected showed that the outcomes of patients with acute shoulder dislocation undergoing Bankart repair are comparable to US population norms.

In 2019, Sebastia-Forcada and others conducted a study on patients who underwent Bankart surgery. It was observed that the DASH score was significantly reduced compared to the preoperative period [29]. In this study, it was also found that the quality of life had a significant improvement after the Bankart procedure compared to the preoperative assessment. In 2017, Russo and colleagues reported that the DASH score decreased after 20 months of follow-up after Bankart surgery and the Rowe score increased compared to the preoperative period, which represents the improvement of patients [30]. Our study also confirms the aforementioned studies. The significant point of our study is that, unlike other studies, all of these factors and scores were evaluated together in the current study. Also, one of the limitations of previous studies was the small sample size that this issue is resolved well in our study.

In the present study, a review of the data shows that the Bankart procedure has a significant role in improving shoulder ROM, DASH score, Rowe score, SF-36, and reducing the rate of recurrent instability. These findings are limited due to the retrospective nature of our study. Another limitation is the short follow-up lengths and according to Kirkely and colleagues longer follow-up may change the outcomes. Also, in

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current study, confounding factors were not investigated.

Conclusion

According to the results of this study it seems that open Bankart surgery is an effective method for reducing pain and recurrence of shoulder dislocation. Based on our results, using Bankart surgery led to significantly increased shoulder functions among patients. These results were in line with the findings of previous studies.

Disclosure of conflict of interest

None.

Address correspondence to: Rasool Karimi Matloub, School of Medicine, Arak University of Medical Sciences, No. 8, Hezar Jarib Blvd, Arak City, Markazi province, Iran. Tel: +98-9126632014; Fax: +98-3127268827; E-mail: rasoolkarimi2021@gmail.com

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