

# Differences in the arthroscopic treatment of anterior and posterior shoulder instability in long-term follow-up

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## Abstract

**Background:** Shoulder dislocations are frequent orthopedic injuries encountered in emergency services. Increasing the arthroscopic experience of physicians and developing technology has left the place of open surgical repair to arthroscopic reconstruction procedures. This study aimed to examine the results of arthroscopic reconstruction procedures for anterior and posterior shoulder instability.

**Methods:** In this study, 89 patients diagnosed with shoulder instability and treated arthroscopically in our clinic between January 1, 2013, and September 1, 2020, postoperative range of motion and functional results are evaluated with Rowe and WOSI scores.

**Results:** Fifty-seven of 89 patients had anterior, and 32 patients had posterior glenohumeral instabilities. In our study, 14 patients (15.7%) were under 20 years old, 55 patients (61.8%) between 21-30 years, 16 patients (18.0%) between 31-40 years, and 4 patients (4.5%) over 40 years. A total of 72 males (80.9%) were included in the study, with 17 females (19.1%). In the postoperative period, the mean shoulder joint flexion of all patients was recorded as 166.6 degrees, internal rotation 79.8 degrees, and external rotation was 79.9 degrees. The mean preoperative total WOSI score of all patients was 1062.6, whereas this score was 150.7 postoperatively. According to the Rowe score, there were poor results in all patients in the preoperative period, whereas the Rowe score of 70 patients was excellent; three patients were good, 11 patients were moderate, and five patients were poor in the postoperative period.

**Conclusions:** Arthroscopic treatment of glenohumeral instability could provide predictable success in unidirectional shoulder instability.

**Keywords:** Glenohumeral Instability, Arthroscopy, Shoulder, Dislocation.

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## INTRODUCTION

Normal healthy shoulder function has been defined as the excellent harmony between mobility and stability (1). Shoulder mobility is primarily enabled by the glenohumeral joint, whereas its stability is provided through the complex interaction of anatomical structures that passively or actively stabilize the joint (2). The impairment of this mobility and stability balance in support of mobility is clinically reflected as a glenohumeral joint dislocation. Each year, about half of all major joint dislocations are glenohumeral joint dislocations (3).

Glenohumeral instabilities can be classified in several ways. If shoulder instability is classified as per the factor inducing it, it can be defined as traumatic or atraumatic. The direction of the movement can also characterize shoulder instability. Anterior and posterior instabilities are the most common types, while inferior, superior, and multidirectional instabilities have also been reported. To make a classification as per the degree of instability, two groups as dislocation and subluxation can be mentioned. When classified according to the time of injury, it can be defined as acute and chronic.

Approximately 80-90% of anterior shoulder dislocations typically occur after a trauma that applies excessive force on the shoulder in abduction and external rotation (4, 5). The incidence of traumatic anterior glenohumeral instability is 1.7% in the general population (6). When this traumatic event damages soft tissues or bone structures, such as the humeral head-glenoid, which contribute to shoulder stability, the risk for recurrent dislocation increases.

Posterior shoulder dislocation directly impacts the anterior shoulder or indirect forces when the arm is in abduction, internal rotation, and forward flexion (7). In general, indirect forces are electric shock and epileptic seizures. Compared to anterior instability, posterior shoulder instability is rarer and corresponds to 2-10% of all instability cases (8-10).

While it is assumed that immobilization for three to four weeks following the reduction of the first dislocation prevents recurrent dislocation, our current knowledge has indicated that immobilization for more than a week decreased the recurrence rate in cases with anterior dislocation for the first time (11). Recent studies have also shown that immobilization in internal rotation or external rotation does not provide superiority to each other in terms of recurrence rates (12).

Shoulder arthroscopy is an accepted method for treating many pathologies nowadays. The scope of injuries that can be treated with arthroscopic surgery has been broadened significantly owing to the technological developments in recent years and the increase in the skills and experiences of surgeons in arthroscopic intervention. Complex shoulder injuries have also been affected positively by these developments. Due to the possibility of early rehabilitation and minor damage to tissues, arthroscopic treatment has been widely accepted as preferred more than open surgery in instability surgery.

In our study, we aim to present the outcomes of our surgical technique by evaluating when patients could return to work and sports activities, whether they experienced the loss of workforce, at what level the shoulder joint ranges of motion were affected compared to the preoperative period, whether degenerative arthritis occurred clinically or radiologically in their glenohumeral joints after the surgery, whether their luxation or subluxation complaints continued after the surgery, and whether the direction of instability had an effect on the success of surgical treatment after arthroscopic instability surgery performed upon the physical examination and radiological evaluation of patients who presented with the complaints of shoulder instability.

## MATERIALS AND METHODS

### *Patient Selection*

This study included patients who presented to the clinic of orthopedics and traumatology in a university hospital with complaints of shoulder instability and underwent arthroscopic surgical repair between January 1, 2013, and September 1, 2020. The inclusion criteria of these patients were posttraumatic shoulder dislocation (at least once) and those who underwent arthroscopic anterior or posterior shoulder dislocation surgery. The study's exclusion criteria were non-traumatic voluntary dislocations and patients with multidirectional instability. This study included 89 patients who met these criteria. Of these 89 patients, 32 had posterior glenohumeral instability, and 57 had anterior glenohumeral instability.

Firstly, detailed medical history of patients who presented to our department with suspected instability was taken. It was questioned and recorded what patients' jobs were, whether they felt like their shoulders were dislocated, if they had dislocations before, what mechanism caused the dislocations, how many times they occurred, how old patients were when they had their first dislocations, when

they had their latest dislocations, whether the reduction procedure after dislocation was performed by a doctor under hospital conditions or they did it by themselves.

After questioning the medical history, sulcus, anterior-posterior drawer, Kim, anterior-posterior apprehension, and load and shift tests were routinely applied to patients to detect instability during physical shoulder examination and specify the type of instability, if any. Shoulder joint ranges of motion were checked and recorded.

The anteroposterior x-ray of the shoulder and shoulder arthro-MR were routinely requested from patients with a medical history and examination finding in favor of instability, and computed tomography images were additionally requested from patients with a suspected bone lesion.

After the plain x-rays, arthro-MR, and computed tomography images of the patients with instability were reviewed, an operation was planned for arthroscopic surgical repair for the patients for whom surgical fixation was deemed necessary.

### ***Surgical Method***

For arthroscopic repair, the patients were taken to the operating table in the beach chair position, their instability examinations were repeated under anesthesia, and then the arthroscopic procedure was initiated for their shoulder joints using posterior and anterior portals. We used a standard 30-degree angle scope. The posterior portal was opened 1.5 cm medial and inferior to the posterior corner of the acromion. Before the anterior portal was opened, the angle and position that would provide the best access to the glenoid labrum and anteroinferior capsule were determined with an epidural needle. The anterior portal was opened over the rotator interval, 1 cm lateral to the anterior corner of the acromion, under the guidance of the epidural needle, using the outside-in method. The presence of the anterior or posterior labral lesions was recorded. We decorticated the neck of the glenoid with a burr to reveal the bleeding bone necessary for tissue healing. The glenoid was drilled at a medial angle of 45 degrees to cover 2 mm of the glenoid lip, and a 2.9 absorbable or 3 mm metal anchor (Mitek 2.9 Lupine Ancor or 3 mm Fastin Threaded Anchor) was placed. The polydioxanone (PDS) was passed through the labrum and ligament, 5-7 mm inferior to the placed anchor with the help of a suture carrier system (Mitek, Ideal Suture Shuttle). Subsequently, the anchor threads were carried by this PDS and passed through the labrum and ligament. Afterward, sutures

were placed with the sliding knot technique, and fixation was achieved.

### ***Postoperative Management***

In the postoperative follow-up, immobilization was ensured with a velpau bandage for three weeks. Passive pendulum exercises were started immediately after surgery, and the patients were asked to do these exercises 5 times a day for 10 minutes. The stitches were removed on the 15th day. Physiotherapy was started in the 3rd week, and strengthening exercises were started between the 8th and 12th weeks. After the sixth month, they could return to sports activities.

In the third postoperative week, patients' ranges of motion were recorded without forcing them a lot. Until the sixth week, patients were recommended to do the described pendulum exercises to avoid carrying weight, internal-external rotation, and challenging stretching exercises.

In the sixth postoperative week, patients' ranges of motion were again checked and recorded. Patients were requested to perform the described abduction, adduction, flexion, extension, and internal-external rotation movements until the 10<sup>th</sup> week.

At the postoperative 10<sup>th</sup> week follow-up, patients' ranges of motion were re-checked, and patients were told that they could do all movements except contact sports and exposure to impact. They were explained that there would be no restriction in shoulder movements from the fourth month onward.

In addition to routine follow-ups, patients were called for follow-up in the second, fourth, and eighth months to evaluate their ranges of motion.

In the postoperative period, our treatment outcomes were assessed with the Rowe and WOSI scores. This study was approved by the clinical research ethics committee of the Atatürk University (Date: 08.12.2016 number: 19) and written consent was obtained from all patients participating in the study.

### ***Statistical Analysis***

SPSS 25.0 packaged software was used for data analysis. The distribution of data was assessed by the Shapiro-Wilk test. The Mann-Whitney U and Wilcoxon tests were applied since the data did not show a normal distribution. Data were evaluated at a significance level of 0.05.

## RESULTS

When the patients in our study were divided into four groups as under 20 years of age, 20-30 years of age, 31-40 years of age, and over 40 years of age, 55 patients (61.8%) were in the 21-30 age group. A total of 14 patients (15.7%)

under 20 years of age were determined. In total, 72 male (80.9%) and 17 female (19.1%) patients were included in the study. When the total number of dislocations in the shoulder joints that patients complained about were questioned, the mean total dislocation number was recorded as 5.1 (range: 1-12) in 89 patients (Table 1).

**Table 1. Demographic data of the patients**

Instability		Anterior (n: 57)	Posterior (n: 32)	Total (n:89)
Age		26.9 (SD: 6.9) [r: 18-45]	25.5 (SD: 5.7) [r: 18-39]	26.4 (SD: 6.5) [r: 18-45]
Total Number of Dislocation		6.3 (SD: 3.6) [r: 1-12]	2.9 (SD: 1.3) [r: 1-5]	5.1 (SD: 3.4) [r: 1-12]
Age categorical	<20	8 (14.0%)	6 (18.8%)	14 (15.7%)
	20-30	36 (63.2%)	19 (59.4%)	55 (61.8%)
	31-40	9 (15.8%)	7 (21.9%)	16 (18.0%)
	>40	4 (7.0%)	0	4 (4.5%)
Gender	Male	48 (84.2%)	24 (75.0%)	72 (80.9%)
	Female	9 (15.8%)	8 (25.0%)	17 (19.1%)
Side	Right	45 (78.9%)	16 (50.0%)	61 (68.5%)
	Left	12 (21.1%)	16 (50.0%)	28 (31.5%)
Dominance	Right	40 (70.2%)	23 (71.9%)	63 (70.8%)
	Left	17 (29.8%)	9 (28.1%)	26 (29.2%)
Trauma Mechanism	Falling	46 (80.7%)	2 (6.3%)	48 (53.9%)
	Sports injury	9 (15.8%)	11 (34.4%)	20 (22.5%)
	Epileptic attacks	2 (3.5%)	17 (53.1%)	19 (21.3%)
	Electrical accident	0	2 (6.3%)	2 (2.2%)
Dislocation Intervention	Doctor	44 (77.2%)	16 (50.0%)	60 (67.4%)
	Bonesetter	9 (15.8%)	10 (31.3%)	19 (21.3%)
	Patient	4 (7.0%)	6 (18.8%)	10 (11.2%)

SD: standard deviation; r: range

The degrees of shoulder joint flexion, extension, and internal-external rotation of patients were measured and recorded in the preoperative and postoperative 12th week. Preoperative and postoperative joint ranges of motion of patients in anterior and posterior groups are given in Table

2. Shoulder flexion range of motion was significantly higher in the patient group with anterior shoulder instability than in the patient group with posterior shoulder instability in both the preoperative period ( $p<0.001$ ) and postoperative period ( $p:0.012$ ) (Table 2).

**Table 2. Preoperative and postoperative functional capacity of the patients' shoulder joints**

		Anterior	Posterior	Total	p-value*
Shoulder Flexion	Preop	176.4 (SD: 3.9)	173.1 (SD: 3.7)	175.2 (SD: 4.2)	<b>&lt;0.001</b>
	Postop	167.5 (SD: 11.5)	165.0 (SD: 6.2)	166.6 (SD: 9.9)	<b>0.012</b>
	Z	-5.427	-4.490	-7.033	
	p-value**	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	
Shoulder Internal Rotation	Preop	86.0 (SD: 4.0)	85.9 (SD: 3.4)	86.0 (SD: 3.8)	0.690
	Postop	80.1 (SD: 3.4)	79.4 (SD: 8.2)	79.8 (SD: 7.0)	0.816
	Z	-5.504	-3.792	-6.644	
	p-value**	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	
Shoulder External Rotation	Preop	86.9 (SD: 2.9)	85.6 (SD: 3.3)	86.5 (SD: 3.1)	0.070
	Postop	79.4 (SD: 11.2)	80.9 (SD: 3.9)	79.9 (SD: 9.2)	0.713
	Z	-5.336	-4.261	-6.774	
	p-value**	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	

\* Mann-Whitney U test to compare preoperative and postoperative results.

\*\* Wilcoxon test to compare preoperative and postoperative results

SD: standard deviation

Patients' preoperative and postoperative 12th-week Rowe and WOSI scores were calculated and recorded. A significant difference was observed between the preoperative and postoperative Rowe and WOSI scores

of the patients in anterior and posterior groups. However, no significant difference was identified between the scores when analyzed as per the type of instability variable (Table 3).

**Table 3. Preoperative and postoperative Rowe and WOSI scores of the patients**

		Anterior	Posterior	Total	p-value*
Rowe	Preop	31.6 (SD: 4.6)	30.9 (SD: 3.7)	31.3 (SD: 4.3)	0.501
	Postop	86.9 (SD: 15.1)	87.2 (SD: 16.1)	87.0 (SD: 15.4)	0.574
	Z	-6.613	-5.022	-8.259	
	p-value**	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	
WOSI	Preop	1033.0 (SD: 181.1)	1115.3 (SD: 254.8)	1062.6 (SD: 212.9)	0.165
	Postop	189.0 (SD: 284.0)	82.6 (SD: 116.7)	150.7 (SD: 242.4)	0.252
	Z	-6.489	-4.941	-8.154	
	p-value**	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>	

\* Mann-Whitney U test to compare preoperative and postoperative results.

\*\* Wilcoxon test to compare preoperative and postoperative results

SD: standard deviation

Considering the Rowe score obtained in our study, all our patients had poor results in the preoperative period, whereas, out of 89 patients, 70 had excellent results, 3 had good results, 11 had moderate results, and 5 had poor results in the postoperative period.

## DISCUSSION

In this study, falling was the primary cause of the patients with a history of anterior shoulder dislocation. At the same time, epileptic attacks were the primary cause of patients with posterior shoulder dislocation. In this study, the functional and clinical outcomes of patients with anterior or posterior shoulder instability after arthroscopic repair were similar. Arthroscopic surgery was successful in both patient groups.

Shoulder joint dislocations and instability are serious orthopedic problems influencing an individual's normal life and sports success. Acute anterior shoulder dislocation following trauma is a frequent injury that affects between 0.5 and 1.7% of people. Recurrence is reported in close to 90% of instances when it develops in young adults (13).

Anterior glenohumeral instability is the most observed type of glenohumeral instability (14). Of the 89 patients diagnosed with glenohumeral instability included in our study, 57 (64.0%) had anterior glenohumeral instability, and 32 (36.0%) had posterior glenohumeral instability.

Upon reviewing the literature in terms of etiology; Postacchini et al. (15) stated that 75% of anterior dislocations occurred due to trauma, while Robinson et al. (16) reported that posterior dislocations occurred after an accident-fall from a height by 67% and after epileptic seizures by 31.3%. In our study, of 57 patients with anterior instability, 46 described a history of shoulder dislocation after a fall, nine after a sports injury, and two after an epileptic seizure. Of 32 patients with posterior instability, 17 had a history of shoulder dislocation after an epileptic seizure and two after electric shock.

Open surgical repair, considered the gold standard in Bankart repair after a traumatic anterior shoulder dislocation, has been replaced by arthroscopic repair as a result of today's technological developments and increasing arthroscopy experiences (17). Cole and Romeo obtained similar Rowe score in open and arthroscopic Bankart repair and suggested higher score could be obtained as techniques were improved (18).

When the difference between the preoperative and postoperative joint ranges of motion in the anterior instability group was compared to that of the posterior instability group, the postoperative mean external rotation value in the anterior instability group was similar to the postoperative mean external rotation value in the posterior instability group. We believe that this difference, which does not lead to a subjective complaint in patients and does not have any statistical significance, results from the narrowing of the capsule in the direction of instability in the treatment of instability.

The restrictions in the joint movements of the patients in the postoperative period were not found significant when assessed in terms of functional life and subjective complaints. We anticipate that the degrees we obtained in present joint movement restrictions can be reduced to lower values when more effective rehabilitation programs are used, and patients are followed up closely by a specialist physiotherapist.

Raffaele et al. asserted that the Constant and Rowe scores had similar values to those of the contralateral shoulders in patients who underwent arthroscopic Bankart repair and were followed up for about 43 months (17). Yan H et al. found the mean Rowe score of 188 patients, whom they followed up for about 25.3 months, as 91.9 (19). Iwaso H et al., on the other hand, reported that the mean Rowe score increased to 82 in their study on 28 patients (20). In our study, preoperative and postoperative 12th-week Rowe scores of the patients were calculated and recorded. The preoperative mean Rowe score of 89 patients was 31.3, whereas the mean postoperative score was 87.0. A significant difference was observed between the preoperative and postoperative Rowe score of the patients ( $p < 0.001$ ). When these values are taken into account, the postoperative Rowe score obtained in our study seems to comply with the literature.

Because it is valid and widely acknowledged, the WOSI score was chosen as the most acceptable functional outcome score for enrolment. As reflected by the WOSI score, our arthroscopic stabilization outcomes were consistent with those of previous research (21-24).

There are several limitations of this study. The study was conducted in a single center and with a limited number of patients. The fixed study duration resulted in only 1 or 2 years of follow-up for some patients. Different results could be obtained in multicenter studies with large patient numbers.

Arthroscopic shoulder stabilization could provide predictable success in unidirectional shoulder instability without previous surgical intervention. Success rates may be lower in patients who have had previous surgery and in studies with large patient numbers with multiple instabilities.

## Declarations

The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest.

This study was approved by the clinical research ethics committee of the Atatürk University (Date: 08.12.2016 number: 19) and written consent was obtained from all patients participating in the study.

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