Return to Sport After Arthroscopic Treatment of Posterior Shoulder Instability

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Background: Arthroscopic treatment of posterior shoulder instability has become more popular and effective in recent years, but few data are available concerning the rate of return to sport.

Purpose: To present our experiences with arthroscopic posterior labral reconstruction in athletes and review our results, with a particular focus on the rate of return to sport.

Study Design: Case series; Level of evidence, 4.

Methods: Included in the study were 40 arthroscopic stabilizations performed because of posterior shoulder instability in 37 athletes at a single institution. During follow-up, the athletes' rate of return to sport was calculated. Shoulder function was evaluated based on a pre- versus postoperative comparison of the Rowe instability score and the American Shoulder and Elbow Surgeons score. Additionally, the return-to-sport rate was compared among different subgroups: traumatic versus atraumatic origin of injury, competitive versus recreational athletes, high-risk versus low-risk sport, and posterior-only versus anterior and posterior stabilization. Data were statistically analyzed using paired-samples *t* test and nonparametric Fisher exact test.

Results: The average follow-up period was 54.4 months (range, 24-112 months). Three shoulders (7.5%) continued to have posterior subluxations postoperatively. There were 34 excellent, 3 good, and 3 fair results based on the Rowe score (average postoperative score, 92.9), and patients achieved an average postoperative American Shoulder and Elbow Surgeons score of 92.7. The pre- to postoperative improvement was statistically significant in both scoring systems ($P < .001$). Of the 37 patients, 36 (98.2%) were able to return to sport activity: 27 of them (72.9%) to their original sport and 19 (51.4%) at their preinjury level. A significantly higher rate of return to the same sport occurred in athletes who had traumatic injury compared with a subgroup of athletes without a traumatic event ($P < .02$).

Conclusion: More than half of the athletes were able to return to their preinjury level of sport after arthroscopic posterior labral reconstruction. In addition, low recurrence rates and good functional outcomes were seen in >90% of the patients, and 98% returned to sport activity. The athletes had a significantly higher rate of return to sport if their posterior shoulder instability had a clear traumatic origin.

Keywords: posterior shoulder instability; arthroscopic surgery; labral repair; return to sport

Shoulder instability is a common disorder, but posterior shoulder instability is less common, traditionally entailing about 2% to 10% of all instability cases.[13,19,23,26] In many cases, the diagnosis and treatment of posterior shoulder instability can be a challenge for the orthopaedic surgeon. The cause of posterior shoulder instability is complex and multifactorial, and its origin can be traumatic or atraumatic. Patients can be divided into 2 main groups: a traumatic group, in which patients sustain posterior dislocation or subluxation episodes, and an atraumatic group, in which patients do not have a clear traumatic event but can have repeated microtraumas or overuse due to extreme mobility of their shoulder joint during sport activity.[4,21,26] Clinically, the symptoms consist of shoulder pain in adduction–internal rotation of the arm or discomfort during shoulder loading due to the injury of the posterior labrum, the posterior capsule, and the posterior band of the glenohumeral

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ligaments; however, athletes usually do not sense subluxation of the joint.[18,21,26] Athletes who participate in any contact sports, swimming, throwing, weightlifting, or golf face a greater risk of posterior instability caused by microtrauma or overuse.

Recent studies have shown a significantly increased rate of patients with posterior and combined instability, mainly in the younger, physically active population.[3,13,18,19,21,26] Nonoperative treatment is often unsuccessful, particularly for athletes who want to return to sport at the preinjury level.[6,11,23] After unsuccessful nonoperative treatment, an increasing number of patients with posterior shoulder instability can be successfully treated using arthroscopic posterior labral and capsular reconstruction.[2,5,16,21,24,26,28,29] However, a limited number of studies evaluating the rate and level of return to sport after arthroscopic treatment of posterior shoulder instability are available.

In this study, we present our experiences with arthroscopic posterior labral reconstruction and review our postoperative results, with a particular focus on the athletes' rate of return to sport. We also examine the rate of return to sport by subgroups, such as traumatic or atraumatic origin of injury, competitive or recreational sport activity, high-risk (contact and overhead) sport or low-risk sport, and posterior-only or anterior and posterior stabilization. Our primary hypothesis was that arthroscopic posterior labral reconstruction would be an effective method to allow athletes to return to sport. The secondary hypothesis was that the postoperative results would be better for patients with traumatic injury who played competitively in a low-risk sport and had unidirectional (posterior-only) instability, as opposed to those with atraumatic injury who played recreationally in a high-risk sport and had anterior and posterior refixation.

METHODS

This retrospective study was undertaken on athletes who underwent arthroscopic posterior labral reconstruction by the senior author (A.P.). Between 2009 and 2018, this procedure was performed on 40 shoulders in 37 patients at our institution. Approval for this study was provided by the ethics committee of our institution. The diagnosis of posterior instability was based on the patients' history, physical examination, and magnetic resonance imaging findings. Moreover, the indication for arthroscopic labral reconstruction was verified by arthroscopic findings during surgery. Each patient had posterior labral tear without glenoid bone loss or substantial reverse Hill-Sachs lesion. All patients had a minimum of 6 months of physiotherapist-supervised nonoperative treatment before surgery, consisting of strengthening exercises and proprioceptive training. Surgical treatment was recommended in case of ineffective nonoperative therapy. Arthroscopic labral reconstruction was performed in all cases. Posterior labral and capsular reconstruction was performed on 25 shoulders, whereas posterior and anterior repair was required for 15 shoulders.

Patients who had any shoulder surgery before the posterior labral reconstruction, who were not involved in any sport activity, or who had concomitant pathologic findings during surgery (rotator cuff tear, superior labral anterior-posterior tear, or hyaline surface erosions) were excluded from this study.

Surgical Technique

The operations were performed with the patient under general anesthesia in the lateral decubitus position with the arm in 45° of abduction. The posterior portal was placed 1 cm distally and 1 to 2 cm laterally versus the standard posterior portal, so the portal position was at an ideal angle for the insertion of the anchors into the posterior glenoid rim. The standard anterior portal was placed more superior, commonly just above the biceps tendon, for the optimal placement of the camera. This position is important for ideal access to the posteroinferior glenoid rim, which is why a complementary posterolateral portal may need to be placed from a more lateral and distal position (Figure 1).

Debridement of the glenoid rim and mobilization of the injured labrum were performed in the same way as for anterior labral refixations. We used FasTak (Arthrex) single-loaded titanium anchors for all surgeries. Suturing of the posterior labrum, capsule, and glenohumeral ligament can be technically more difficult compared with that of the anterior side. We used sliding knots for the refixation, supplemented by 3 half knots. It is important to place the knots behind the glenoid rim, not too close to the articular surface, for better capsular fixation and to avoid articular surface irritation.

Postoperative Rehabilitation and Follow-up

In the postoperative period, the arm was immobilized in a sling in 0° of rotation, but wrist and elbow exercises were begun on the first postoperative day. After 4 weeks of immobilization, the patients could start exercise treatment in order to restore full range of motion. Adduction and internal rotation were allowed only after 6 weeks, followed by strengthening and proprioceptive training. Sport activity could be started after 5 to 6 months.

During follow-up, we registered the subjective opinions of the patients (whether they were completely satisfied, satisfied, moderately satisfied, or dissatisfied with their postoperative results), their return to sport activity and level of return, and the results of physical and radiologic examinations. The Rowe instability score and the American Shoulder and Elbow Surgeons (ASES) standardized shoulder assessment score were recorded for the evaluation of shoulder function at the follow-up examination, and the results were compared with the preoperative values. During the physical examination, shoulder range of motion, stability tests (apprehension, adduction-internal rotation, Kim test, and jerk test), and isometric strength of the rotator cuff were assessed using ergoFET digital force gauge (Hoggan).

Statistical Analysis

Statistical analysis was performed using the paired-samples t test to compare the preoperative and

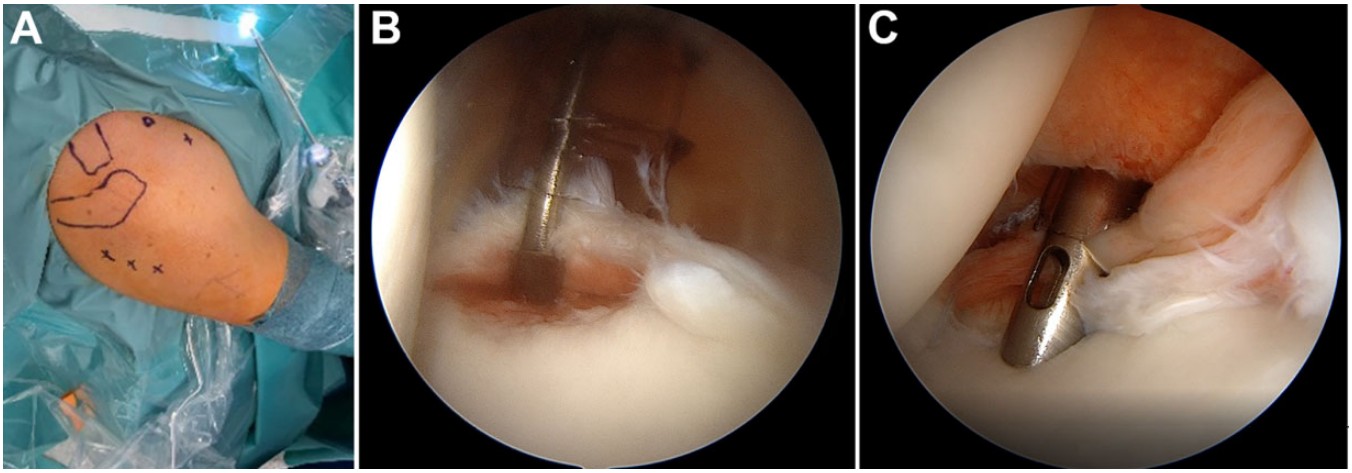

Figure 1. (A) Markings indicating the standard posterior portal (bottom left), the posterolateral portal (bottom right), and the point in between the modified posterior portal (middle), which can be used for viewing and also for anchor and suture insertion. (B) Posteroinferior labral tear viewed from the modified posterior portal; the camera is placed in the anterosuperior portal. (C) Insertion of the second anchor from the modified posterior portal.

postoperative results of the Rowe and ASES scores and using the nonparametric Fisher exact test to compare the return-to-sport rate of the subgroups. We also performed a subgroup analysis of return to sport based on the following aspects: traumatic versus atraumatic injury, competitive versus recreational athlete, high-risk (overhead or contact) sport versus low-risk sport, and posterior-only versus anterior and posterior refixation. Statistics were calculated using R statistical software (Version 3.6.1., The R foundation). The significance level was set at $P < .05$.

RESULTS

There were 15 men and 22 women in the series of 37 patients, with an average age of 22.7 years (range, 14-44 years). The dominant side was operated on in case of 26 shoulders. Clear traumatic onset of the symptoms was found in 23 patients. The 37 patients included 27 competitive athletes (among them 6 national team athletes) and 10 recreational athletes. Among the different sports, several athletes played combat and overhead sports, such as boxing, wrestling, handball, or water polo (Table 1). The average follow-up period was 54.4 months (range, 24-112 months).

A total of 3 patients (7.5%) reported posterior subluxations postoperatively. Of these, 1 patient underwent reoperation, during which 2 more anchors were inserted. The other 2 patients were able to continue their sport at a lower level with nonoperative therapy. During the postoperative physical examination, all but 3 patients had negative adduction–internal rotation and apprehension tests, and most of them had full range of motion, except for 8 patients with a slight internal rotation deficit. Rotator cuff strength was normal for all patients compared with that of the contralateral side. All patients were satisfied with their results; 21 (57%) were completely satisfied, 16 (43%) were satisfied, and none were moderately satisfied or dissatisfied. All patients said they would choose to have the surgery again. The detailed outcome scores are provided in Table 1.

There were 2 surgical complications. In 1 patient, the inferior anchor was inserted improperly, which we noticed on postoperative radiographs. Therefore, we performed an additional operation for anchor removal. The other complication was a postoperative axillary nerve neurapraxia in a patient with an atraumatic multidirectional loose shoulder with posterior instability. For this patient, the second posterior portal was most likely too close to the axillary nerve, causing scar tissue irritation of the nerve and postoperative deltoid muscle atrophy. After a neurolysis, the patient fully recovered.

Overall, there were 34 excellent, 3 good, and 3 fair results for the 40 shoulders of the 37 patients based on the Rowe score. The pre- to postoperative improvement in both Rowe and ASES scores was statistically significant, as analyzed using the paired-samples t test: the Rowe score increased from 40.5 ± 13.1 preoperatively to 93.0 ± 11.4 postoperatively, and the ASES score increased from 64.9 ± 7.0 to 92.7 ± 9.1, respectively ($P < .001$ for both).

Of the 37 athletes, 36 (97.3%) were able to return to sport activity, 27 of them (73.0%) to the same sport and 19 (51.4%) to their preinjury level. We found a significantly higher rate of return to the same sport, from a statistical perspective, for athletes whose posterior shoulder instability was clearly caused by a traumatic injury compared with athletes who did not report a traumatic event ($P < .02$, nonparametric Fisher exact test). The odds ratio of an athlete's returning to sport was 6.8 times higher if a trauma caused his or her posterior instability. We also found a strong tendency to return to sport for athletes who were in the low-risk subgroup, but the difference was not statistically significant ($P = .054$). We found a similar rate of return to the same sport for competitive versus recreational athletes (74% vs 70%, respectively); the difference was not statistically significant. Among the national team athletes (n = 6), the rate of return to sport was higher (100%), and only 1 national team athlete

TABLE 1
Postoperative Results[a]

					Rowe Score		ASES Score	
Age, Sex	Direction	Sport	Level	Return to Sport	Preop	Postop	Preop	Postop
20 y, M	P	Thai boxing	C	Same level	15	95	53	95.0
17 y, F	A+P	Water polo	C	Other sport	40	95	69	83.3
17 y, F	P	Dancing	C	Gave up	30	75	66	83.3
21 y, F	P	Rhythmic gymnastics	C	Other sport	40	90	70	76.7
19 y, F	A+P	Kayak	C	Lower level	40	75	53	66.7
16 y, F	A+P	Handball	N	Same level	30	100	57	100.0
34 y, F	A+P	Fencing	N	Same level	55	95	73	80.0
14 y, F	P	Swimming	C	Lower level	40	60	75	85.0
20 y, M	P	Gymnastics	C	Other sport	35	90	68	88.3
16 y, F	A+P	Swimming	C	Lower level	40	95	75	98.3
20 y, F	P	Volleyball	C	Same level	55	100	70	100.0
21 y, M[b]	P	Swimming	N	Same level	40	100	66	100.0
25 y, M	A+P	Wrestling	N	Same level	40	90	69	81.7
14 y, F	P	Karate	C	Same level	35	100	60	100.0
19 y, M	P	Karate	C	Same level	35	100	66	98.3
20 y, F[b]	P	Body building	R	Same level	35	100	57	98.3
19 y, M	P	Kung Fu	C	Same level	15	95	63	93.3
28 y, M	A+P	Volleyball	R	Lower level	45	100	73	88.3
18 y, F	P	Water polo	C	Lower level	25	60	63	66.7
27 y, M	A+P	Wall climbing	R	Lower level	45	80	74	93.3
13 y, M	A+P	Handball	C	Same level	40	100	74	100.0
37 y, M	A+P	Handball	C	Same level	30	100	53	100.0
18 y, F	P	Swimming	N	Lower level	60	100	66	88.3
23 y, M	A+P	Water polo	C	Same level	70	100	76	98.3
22 y, M	P	Water polo	C	Other sport	75	95	68	98.3
22 y, F	P	Swimming	R	Same level	45	95	63	100.0
22 y, M	P	Soccer	R	Same level	55	100	63	98.3
28 y, F	P	Jiu-jitsu	R	Other sport	45	95	57	96.6
22 y, F[b]	P	Body building	R	Other sport	40	60	63	85.0
21 y, F	A+P	Water polo	C	Other sport	25	100	56	100.0
29 y, M[b]	A+P	Boxing	R	Other sport	45	100	53	100.0
23 y, F[b]	P	Swimming	R	Same level	45	95	63	100.0
22 y, F	P	Frisbee	C	Same level	55	100	68	100.0
44 y, F	A+P	Water polo	C	Lower level	40	95	66	85.0
30 y, M[b]	A+P	Boxing	R	Other sport	45	100	57	98.3
39 y, M	P	Swimming	R	Same level	15	95	66	96.6
25 y, F	P	Javelin	N	Same level	45	100	63	96.6
17 y, F	P	Handball	C	Other sport	35	95	77	98.3
28 y, F	P	Fitness	R	Same level	25	95	57	96.6
26 y, F	P	Running	R	Same level	50	100	68	96.6

[a]A, anterior; ASES, American Shoulder and Elbow Surgeons; C, competitive sport; F, female; M, male; N, national team athlete; P, posterior; Preop, preoperative; Postop, postoperative; R, recreational sport.
[b]These patients had >1 procedure.

returned at a lower level. The results of subgroup comparisons were similar in the athletes who had posterior-only stabilization versus those who had anterior and posterior stabilization (70% vs 79%, respectively) (Table 2).

DISCUSSION

The most important conclusion of our study is that arthroscopic labral repair for posterior shoulder instability allowed the athletes to return to their sport activity. The overall rate of return to the preinjury level of sport was 51.4%. Furthermore, we found a significantly higher rate of return to the same sport for athletes who had a clear traumatic origin of injury compared with athletes who did not report a traumatic event. When we examined all operated shoulders, our data showed that the rate of recurrent instability was as low as 7.5%.

In recent decades, arthroscopic techniques for posterior shoulder instability have become more popular and accepted because they provide better postoperative results compared with open techniques.[7,9,10,23,27] During arthroscopy, it is important that the surgeon first determine the pathologic changes because numerous different lesions can

TABLE 2
Comparison of Return to Sport for Different Subgroups

	Return to Sport (same + lower level)	
Subgroup	No.	%
Traumatic (n = 23)	20 (15 + 5)	87 (65 + 22)
Atraumatic (n = 14)	7 (4 + 3)	50 (29 + 21)
P value, Fisher exact test	.019	
Competitive athletes (n = 27)	20 (14 + 6)	74 (52 + 22)
Recreational athletes (n = 10)	7 (5 + 2)	70 (50 + 20)
P value, Fisher exact test	.55	
High-risk sport (contact and overhead) (n = 24)	15 (11 + 4)	63 (46 + 17)
Low-risk sport (n = 13)	12 (8 + 4)	92 (61 + 31)
P value, Fisher exact test	.054	
Posterior-only refixation (n = 23)	16 (13 + 3)	70 (57 + 13)
Anterior and posterior refixation (n = 14)	11 (6 + 5)	79 (43 + 36)
P value, Fisher exact test	.420	

be present in posterior instability including posterior labral tears or abrasions, posterior capsular disruption and redundancy, laxity of the rotator interval, and anterior labral injury.[2,9,21,24]

Like most surgeons, we use the lateral decubitus position for posterior stabilizing procedures rather than the beach-chair position.[2,4,9,16,24,25] During the procedure, one of the most important steps is the appropriate positioning of the posterior portal for anchor insertion. There are 2 solutions for this: one is to create a complementary posterolateral portal, placed distally and laterally from the standard posterior portal, and the other solution is to place a standard posterior portal 1 cm distally and 1 to 2 cm laterally from its original position.[8,16,24,25] We usually create the standard portal more distally and laterally; depending on the position and size of the labral injury, we decide whether to create a complementary posterior portal during the operation. Anatomic studies indicate that the complementary posterior portal is located very close to the axillary nerve, which runs closest to the glenoid rim at the 6-o'clock position. One of our complications was probably attributable to this observation.[20]

During surgery, the labral reconstruction is performed using titanium anchors, complemented by plication of the loosed posterior capsule. The posterior labral injury is not always a complete tear from the glenoid rim, as is usually the case in anterior labral injury. Rather, in many cases, significant abrasions and degenerations can be observed in the posteroinferior labral area.[8,10,16,29]

Based on the postoperative results in the literature, arthroscopic posterior labral refixation delivers good results in terms of both recurrence (2.4%-8%) and return-to-sport rate.[1,2,5,15,16,24,29] It is worth noting, however, that the rate of return to sport at the preinjury level is lower for throwing athletes.[9,21] On one hand, our results are in line with these previous observations, in that only 3 patients (7.5%) in our study experienced some sense of subluxation postoperatively. Our return-to-sport rate was also satisfactory. On the other hand, although we found that the athletes in the high-risk subgroup (contact and overhead athletes) had a lower rate of return to the same sport, this difference was not statistically significant. However, the limited number of patients in the subgroups for statistical analysis could have influenced these statistical conclusions. McClincy et al[17] found similar results when comparing the rates of return to preinjury level of sport for throwing (60%) and nonthrowing (71%) athletes. Radkowski et al[22] observed that throwing athletes returned to sport at a lower rate than did nonthrowing athletes (55 vs 71%), although the difference was not statistically significant.

In our study, the athletes who were treated for arthroscopic posterior or combined shoulder instability had an excellent rate of return to sport (98.2%); however, only 51.4% of them could return to sport at their preinjury level. When we analyzed the return-to-sport rate for different subgroups, the results showed statistically significant differences between the atraumatic and traumatic subgroups. In addition, when we compared the return rates of the traumatic and atraumatic subgroups, we found that those in the traumatic group were 6.8 times more likely to return to their preoperative sport. According to these data and our experience, we believe that athletes who have traumatic injury are better candidates for surgical treatment versus athletes whose injury is not of traumatic origin. These observations are similar to those of Katthagen et al,[12] who found a 90% return-to-sport rate with traumatic posterior instability and a 72% return-to-sport rate with atraumatic shoulder instability. We also observed that the return rate of the competitive athletes was similar to that of the recreational athletes, but the top, national team athletes returned to their preoperative sport at a higher rate (100%). Given that the national team subgroup consisted of only 6 people, we did not examine that subgroup separately because of the limited sample size. The results of the athletes who had posterior-only stabilization versus athletes who had both anterior and posterior stabilization did not differ, so the direction of the instability is not a key factor in the return-to-sport rate for these athletes. This observation is in line with the findings of Kraeutler et al,[14] who evaluated athletes after anterior, posterior, and combined shoulder stabilization and found similar results.

There are some limitations to our study. Although all of the patients in this study were athletes, the number of patients was relatively small. Therefore, our ability to conduct statistical analysis was limited due to the small sample size. Nevertheless, we found clinical improvements using our surgical technique. Additionally, whether an injury can be considered traumatic in origin without a frank dislocation may be questionable. Thus, we carefully asked our patients about the onset of their symptoms, and we included patients in the traumatic subgroup only if they could clearly identify a trauma at the beginning of their shoulder symptoms.

CONCLUSION

More than half of the athletes were able to return to their preinjury level of sport after arthroscopic posterior labral reconstruction, and low recurrence rates and good functional outcomes were obtained for >90% of the patients. Overall, 98% of our patients could return to sport activity, and the athletes had a significantly higher rate of return to the same sport if their posterior shoulder instability had a clear traumatic origin.

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