

# Back to Sports After Arthroscopic Revision Bankart Repair

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**Background:** Recurrent instability following primary arthroscopic stabilization of the shoulder is a common complication. Young, athletic patients are at the greatest risk of recurring instability. To date, the literature contains insufficient description regarding whether return to sports is possible after revision arthroscopic Bankart repair.

**Hypothesis:** Patients presenting with recurrent instability after primary arthroscopic stabilization should expect limitations in terms of their ability to partake in sporting activities after revision surgery.

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

**Methods:** Twenty athletes who underwent arthroscopic revision stabilization of the shoulder after failed primary arthroscopic Bankart repair were included in the study after completing inclusion and exclusion criteria surveys. Athletic Shoulder Outcome Scoring System (ASOSS), Shoulder Sport Activity Score (SSAS), and the Subjective Patient Outcome for Return to Sports (SPORTS) scores were determined to assess the participants' ability to partake in sporting activities. Furthermore, sport type and sport level were classified and recorded. To assess function and stability, Rowe, American Shoulder and Elbow Surgeons, Constant-Murley, and Walch-Duplay scores were measured and recorded.

**Results:** Follow-up consultations were carried out after a mean of 28.7 months. The mean age at follow-up examination was 27.75 years. At the time of follow-up, 70% of the patients were able to return to their original sporting activities at the same level. However, 90% of patients described a limitation in their shoulder when participating in their sports. At 28.7 months after surgery, the mean ASOSS score was 76.8; the SSAS score decreased from 7.85 before first-time dislocation to 5.35 at follow-up ( $P < .005$ ). The SPORTS score was 5.2 out of 10 at the follow-up consultation. Function- and instability-specific scores showed good to excellent results. The mean external rotational deficit for high external rotation was 9.25°, and for low external rotation it was 12°.

**Conclusion:** Patients can return to their original type and level of sport after arthroscopic revision Bankart repair, but they must expect persistent deficits and limitations to the shoulder when put under the strains of sporting activity. Patients with shoulder injuries who partake in sports that put greater demand on the shoulder show the smallest probabilities of returning to sporting activity.

**Keywords:** revision surgery; Bankart repair; recurrent instability; return to sports; rehabilitation

Recurrent instability of the shoulder after arthroscopic primary stabilization is a frequent complication.<sup>1,13,21</sup> The surgical treatment approach is demanding and requires physicians to adequately address all revision-specific abnormalities. Above all, assessment and treatment of significant glenoid bone loss are of the greatest importance for successful outcome.<sup>14</sup> For restabilization of the shoulder after primary arthroscopic Bankart repair, different surgical techniques are described in the literature. The most common techniques are the Latarjet procedure and the arthroscopic revision Bankart repair.<sup>14</sup> The criteria that determine the technique used consider primarily the

condition of the bony defect, sporting demand, and the quality of the capsule-labrum-ligament complex. Comparative studies have not been able to demonstrate significant advantages for any one of these techniques.<sup>14</sup> The clinical results after primary arthroscopic shoulder stabilization are inhomogeneous in the case of athletes, according to the literature.<sup>4,16,31</sup> Overhead sports and contact sports tend to show significantly higher redislocation rates, and athletes in these sports who experience dislocation must expect a persisting deficit in terms of their sporting activities even after primary stabilization.<sup>10,31</sup> To date, the literature has not provided an adequate assessment of ability to carry out sports after arthroscopic revision Bankart repair following a previous arthroscopic primary stabilization.

The aim of this study was to address whether it is possible to return to the original level of sporting activity after

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TABLE 1  
Patient Demographics

No. of patients	23
Redislocation rate, n (%)	3/23 (7.6)
No. of patients at follow-up	20
Dominant side, n (%)	11 (55)
Age at revision surgery, y, mean $\pm$ SD	25.5 $\pm$ 7.27
Age at primary surgery, y, mean $\pm$ SD	21.85 $\pm$ 6.11
Age at follow-up, y, mean $\pm$ SD	27.75 $\pm$ 7.19
Interval from surgery to follow-up, mo, mean $\pm$ SD	28.7 $\pm$ 8.45
Interval from surgery to surgery, mo, mean $\pm$ SD	39.55 $\pm$ 31.62
Preinjury sport level, n	
Competitive sports $\geq$ 2 times per week	5
Noncompetitive sports $\geq$ 2 times per week	12
Health-related sports participation $\geq$ 1 times per week	3
No sports	0
Preinjury shoulder sport group, n <sup>a</sup>	
Noncollision/nonoverhead sports (G1)	2
High-impact/collision sports (G2)	7
Overhead sports (G3)	9
Martial arts sports (G4)	2

<sup>a</sup>Categorization of sport groups according to Allain et al.<sup>3</sup>

arthroscopic revision stabilization of the shoulder. The hypothesis of this study was that patients must expect significant deficits regarding sport-specific scores after revision surgery for restabilization of the shoulder.

## METHODS

Patients were accepted into the study if within the past 5 years they had undergone arthroscopic revision surgery for restabilization of the shoulder after previous primary arthroscopic Bankart repair. Only those patients fulfilling the inclusion and exclusion criteria retrospectively were included in the study. Exclusion criteria were any bony glenoid defects greater than 20%, analogous to Nofsinger et al<sup>22</sup>; a Hill-Sachs lesion greater than 2, according to Calandra et al<sup>9</sup>; a hyperlaxity within the shoulder of more than 1° sulcus sign in preoperative anesthesia; any concomitant abnormality of the biceps or the rotator cuff; and any osteoarthritic alterations of the joint.

All patients were actively participating in sporting activities at least once per week both before the first dislocation of the shoulder and after the primary stabilization. The sport level was divided into 4 groups (Table 1). All patients were nonprofessional athletes. During the follow-up consultation (FU 1), all patients were examined by use of a

uniform scoring system and standardized examination protocols. The specific scores were recorded retrospectively for the time prior to the first dislocation (FU -1) and also after primary arthroscopic stabilization (FU 0). To assess postoperative function, sport-specific, instability-specific, and function-specific scores were evaluated. A physical examination was performed for signs of instability and assessment of range of motion for both shoulder joints.

## Scores Specific to Shoulder Sports

The different sport types that put strain on the shoulders were categorized according to Allain et al<sup>3</sup> into 4 groups: G1, noncollision/nonoverhead sports (n = 2); G2, high-impact/collision sports (n = 7); G3, overhead sports (n = 9); and G4, martial arts sports (n = 2). The sport level was divided into “no sports,” “health-related sports participation  $\geq$ 1 times per week,” “noncompetitive sports  $\geq$ 2 times per week,” and “competitive sports  $\geq$ 2 times per week.” The subjective and objective sporting capability of the shoulder was assessed with the Athletic Shoulder Outcome Scoring System (ASOSS). This measures subjective parameters, such as pain, strength, endurance, instability, time period under stress, intensity level under stress, and performance level, as well as the range of motion, compared with the untreated shoulder.

Furthermore, the Shoulder Sport Activity Score (SSAS) and the Subjective Patient Outcome for Return to Sports (SPORTS) were recorded. The SSAS is based on 3 questions that assess stress placed on the shoulder by the sport, stress attributable to the sporting level, and the limitations in the sport due to the shoulder. The SPORTS is a commonly used score to address a patient’s ability to resume his or her previous sport level after stabilization of the shoulder.<sup>8</sup> Through the SPORTS score, the patient assesses effort, performance, and pain in the shoulder with regard to the return to the original sport practiced. It is a simple score, with 0, 3, 6, 9, and 10 points assigned. However, the score does not take into account the type of sport and the sport level of the patient.

## Instability-Specific and Function-Specific Measurement Tools

For the investigation into the patient population, 2 instability-specific scores were applied: the Rowe score<sup>27</sup> and the Walch-Duplay score.<sup>33</sup> Both scores assess the stability of the shoulder, the range of motion, and the day-to-day and sport functionality of the shoulder. In this study, the “stability-specific” Rowe score from 1978 was used.<sup>27</sup> Additionally, the Walch-Duplay score encompasses data

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on the external rotation in 90° of abduction, as well as pain components, and as such was also recorded for supplementary information.

The function-specific measures were the Constant-Murley score<sup>11</sup> and the American Shoulder and Elbow Surgeons (ASES) Shoulder Score. The Constant-Murley score is subjectively and objectively measured on the basis of specific criteria and encompasses the clinical results regarding pain, range of motion, and strength. The ASES score assesses shoulder function with regard to pain and instability as well as day-to-day activities.

### Revision Arthroscopic Bankart Repair

After comprehensive preoperative diagnostic tests were conducted through use of conventional radiography, magnetic resonance imaging, and computed tomography, the arthroscopic revision Bankart repair was performed using the 3-portal technique with a 4-mm/30° scope (Olympus), with the patient in the lateral decubitus position. After diagnostic arthroscopy was completed via a posterior portal, the instability and revision-specific abnormalities were identified. Suture remains found free within the joint were removed, and the bone loss of the antero-inferior glenoid and the postero-inferior humerus head was critically assessed. On completion of the diagnostic arthroscopy, an antero-inferior (midglenoid) portal was created, while conserving the subscapularis muscle,<sup>28</sup> in addition to the standard-practice lateral supracapital portal. Finally, the anterior capsule-labrum-ligament complex was mobilized from the scapular neck up to the subscapular fascia along the anterior glenoid and up to the inferior tip of the glenoid.

After this, the bony edge of the glenoid was prepared by use of an arthroscopic rasp, up to the point where capillary bleeding began. Suture material remaining in the mobilized tissue complex was continually removed. Anchors present in the glenoid from the primary stabilization were left in place, provided that these were found in intraosseous positions and did not show any partial dislocation. Through regular reposition-shift maneuvers, the extent of mobilization was constantly assessed. According to the "suture first" principle, each double-loaded anchor was then implanted by use of the cinch-stitch technique (FiberWire No. 2; Arthrex). The anchors (3.5-mm, knotless Bio-PushLock anchor; Arthrex) were implanted while taking into consideration the inset anchor materials: for the inferior anchor at around the 4:30-o'clock position and for the superior anchor at the 3-o'clock position for the right shoulder. To minimize the risk of expansion of the drilled hole, the drilling and anchor implantation were carried out with no angulation with respect to the antero-inferior portal. A synovial inflow was prevented by placing the capsule-labrum-ligament complex over the cannulated anchor, covering it. This method was described by Oh et al<sup>23</sup> as the "tissue-pulling effect."

### Sport-Specific Rehabilitation

Immediately after surgery, the shoulder was held in a relaxed neutral position in a shoulder abduction sling for 4

weeks, day and night. On day 2 after surgery, gentle swinging exercises were slowly introduced, with abduction limited to 60° with the internally rotated shoulder. Between week 5 and week 6, use of the sling was restricted to just the nighttime, and the limits were set to 90° for abduction and 20° for external rotation. From the fourth month, exercises were carried out covering the entire physiological range of motion, and step-by-step training was started for muscle-building physical therapy. Return-to-play exercises were slowly introduced starting in the fourth month for sensorimotor integration and strengthening of the force couples. After the sixth month, exercises involving physiological load were allowed. Return to overhead and contact sports was recommended only after the seventh month following surgery, and return to competitive sport after the tenth month.

### Statistics

Statistical analysis was carried out with Microsoft Excel database software as well as BIAS (Biometric Analysis of Samples for Microsoft; Epsilon), a biometric statistical analysis program. The analyses were carried out by use of the chi-square statistical test as well as the Wilcoxon-Mann-Whitney test. The significance level, *P*, was .05 by default.

### RESULTS

At the time of follow-up, 27 patients met all the inclusion and exclusion criteria. Four patients could not be reached by either phone or mail 2 years after the surgical revision stabilization and were excluded from the study. Multiple reasons for failure of primary surgery were found, such as return to activity too early or inadequate postoperative rehabilitation. Most of the patients suffered a trauma-based relapse of the shoulder after return to the original type of sports. Technical failures were not found as reasons for redislocation. Three patients experienced traumatic recurrent instability in the shoulder after revision arthroscopic Bankart repair and were restabilized through glenoid augmentation surgery: 1 patient experienced this while playing sport (soccer), and 2 patients suffered traumatic redislocation due to physical trauma unrelated to sport.

Twenty patients (20 men, no women) were examined in follow-up consultation after a mean  $\pm$  SD of 28.7  $\pm$  8.45 months. The mean patient age at the time of the follow-up was 27.75  $\pm$  7.19 years, and the mean age at the time of primary stabilization of the shoulder was 21.85  $\pm$  6.11 years. Before primary Bankart repair and before redislocation, all patients were actively participating in sporting activities at least once per week. All the demographic data are given in Table 1.

In total, 70% (14/20) of patients returned to the same sport at the same level. However, 90% (18/20) of the patients showed persisting deficits and shoulder-related limitations when put under the strains of sporting activity. Only 2 of the 20 patients could attain the full points on the SPORTS score. All other patients reported limitations in their capacity to perform sport due to pain or a functional limitation.

TABLE 2  
Numbers of Participants at Various  
Sport Levels at the 3 Assessment Points<sup>a</sup>

Sport Level	FU -1: Before First-Time Dislocation	FU 0: After Primary Arthroscopic Bankart Repair	FU 1: After Arthroscopic Revision Bankart Repair
Competitive sports $\geq 2$ times per week	5	1	0
Noncompetitive sports $\geq 2$ times per week	12	9	13
Health-related sports participation $\geq 1$ times per week	3	10	7
No sports	0	0	0

<sup>a</sup>FU, follow-up consultation.

On average, the sport level was lower with respect to the original sport level (FU -1) (Table 2). Patients partaking in overhead and martial arts sports (Table 3) and patients taking part in competitive sporting activities more than twice per week had the smallest chances of returning to their original sporting level and their original sport type. No differences were seen, however, between the situation after primary stabilization and revision stabilization of the shoulder. Neither martial arts participant returned to sports, and they avoided any type of high-impact or collision sports.

The stability and function-specific scores showed, on average, good to excellent clinical results for the shoulder. On clinical examination, 2 of the patients showed persisting signs of apprehension. The mean external rotation deficit compared with the contralateral uninjured side for the high external rotation test in 90° of abduction was 9.25°, and for the low external rotation test with the arm at the side it was 12°. The mean time away from sporting activities was 7.85  $\pm$  1.53 months. All score and assessment results are shown in Table 4.

## DISCUSSION

The present results regarding clinical examination after revision arthroscopic Bankart repair, with regard to participants' ability to carry out sporting activities and return to their original sporting level, show that active patients do indeed have a good chance of returning to the original sport at the same level they practiced before first-time dislocation of the shoulder. However, they must expect lasting limitations regarding their sporting abilities. In contrast, our study found good to excellent clinical results regarding function and stability. Patients partaking in overhead and martial arts sports (Table 3) and patients taking part in competitive sporting activities more than twice per week had the smallest chances of returning to their original sporting level and their original sport type (Table 2). This finding is confirmed by the results of many studies investigating the sport-specific outcomes of patients after primary

TABLE 3  
Numbers of Participants in the Shoulder  
Sport Groups at the 3 Assessment Points<sup>a</sup>

Shoulder Sport Group	FU -1: Before First-Time Dislocation	FU 0: After Primary Arthroscopic Bankart Repair	FU 1: After Arthroscopic Revision Bankart Repair
Martial arts sports (G4)	2	1	0
Overhead sports (G3)	9	7	7
High-impact/collision sports (G2)	7	9	6
Noncollision/ nonoverhead sports (G1)	2	3	7

<sup>a</sup>FU, follow-up consultation.

stabilization.<sup>2,12,24,31</sup> Interestingly, our patient group showed significantly worse sport-specific scores for the time just prior to redislocation of the shoulder compared with the original sport level (SSAS 5.65 vs 7.85,  $P < .0001$ ). The sport level was also significantly worse after the primary arthroscopic stabilization compared with the original sport level ( $P = .0082$ ). This is certainly to be considered retrospectively as a risk factor for relapse to instability. A study published in 2011 by Stein et al,<sup>31</sup> investigating sporting ability after primary Bankart repair (with an ASOSS score average of 93.6 and an SSAS average of 7.9), showed significantly better results in the midterm examination, the examination after revision Bankart repair, and in comparison with retrospective responses on clinical scores after primary treatment before redislocation.

Different attributes are described in the literature as risk factors for relapse to instability after primary treatment. Among the most important of these are patient factors. This mainly refers to sporting demand and patient age.<sup>20,26</sup> Young, athletic, active patients are at the greatest risk of a further dislocation of the shoulder. Bony defects are similarly a risk factor for relapse to instability. This mainly concerns glenoid defects. Shin et al<sup>29</sup> showed a significant increase in redislocation of the shoulder, at more than 17.3%, in cases of glenoid bone loss. In our study, all patients with a glenoid defect of more than 20% were excluded. Further risk factors include postoperative persistent movement deficits or a persistent strength or proprioception deficit, as well as incorrect indications for surgery, incorrect technique, and positioning or number of anchors.<sup>20,26</sup> With regard to recovery, 2 factors above all appear to determine the return to sport. The first is the complete regeneration of the external rotation capability, and the second is the possibility of proprioceptive regeneration.<sup>18</sup>

In our study, a statistically significant deficit of the external rotation capability of the shoulder was demonstrated after arthroscopic revision stabilization. The high external rotation showed an average deficit of 9.25°. Overhead athletes are particularly prone to developing a physiologically above-average external rotation over time with

TABLE 4  
Sport-, Instability-, and Function-Specific Scores and Results  
of Clinical Assessment of the Shoulder at the 3 Assessment Points<sup>a</sup>

	FU -1: Before First-Time Dislocation	FU 0: After Primary Arthroscopic Bankart Repair	FU 1: After Arthroscopic Revision Bankart Repair
Sport-specific scores			
ASOSS	100.0	NA	76.8
SSAS	7.85	5.65 <sup>b</sup>	5.35 <sup>b</sup>
SPORTS		4.2	5.2
Instability-specific scores			
Rowe	100.0	NA	90
Walch-Duplay	100.0	NA	85.5
Function-specific scores			
Constant-Murley	100.0	NA	90
ASES	100.0	NA	83
Clinical assessment			
High external rotation deficit, deg	NA	NA	9.25
Low external rotation deficit, deg	NA	NA	12
Positive apprehension, n/total		NA	3/20

<sup>a</sup>ASES, American Shoulder and Elbow Surgeons; ASOSS, Athletic Shoulder Outcome Scoring System; FU, follow-up consultation; NA, not applicable; SPORTS, Subjective Patient Outcome for Return to Sports; SSAS, Shoulder Sport Activity Score.

<sup>b</sup>Significantly worse compared with FU -1 ( $P < .0001$ ).

sporting activity.<sup>5,6</sup> As such, complete recovery of the external rotation capacity after primary Bankart repair is an important objective, especially with athletes in overhead sports. The high external rotation deficit after revision Bankart repair therefore must be considered an important factor influencing poor sport-specific results. It is unclear whether a reduced external rotation capacity after surgical intervention is a consequence of an excessively tight closing of the capsule, reduced elasticity, or capsular plication with subsequent reconstruction of the “neo-labrum.”

The return to preinjury sport level after shoulder stabilization also depends on the shoulder's capacity for proprioception. Regarding primary Bankart repair, studies describe an almost complete regeneration of proprioception after open shoulder stabilization.<sup>25,36</sup> Despite this, a proprioceptive deficit can be seen even after primary Bankart repair.<sup>25</sup> We found no data in the literature relating to recovery of proprioception after revision surgery on the shoulder. Multiple dislocations damage the capsule-labrum-ligament complex to an increasing extent and lead to scarring of the tissue.<sup>17,30,32</sup> Neuroanatomical studies have shown that the greatest number of neuronal structures are found at the anteroinferior capsule-labrum-ligament complex.<sup>35</sup> Increasing damage to this region, particularly due to revision surgeries, supposedly leads to worsened proprioception regeneration and, through this, to worse subjective parameters, particularly when the shoulder is put under the demands of sporting activity. A potentially significant proprioception deficit might explain the discrepancy between our good to excellent functional and instability-specific results and the poor sport-specific results. This theory is also compatible with the results from the literature for clinical assessment after primary Bankart repair.<sup>15,18</sup> The capability for proprioception cannot be

assessed through a score. Further scientific studies should be carried out on this topic.

Our study population consisted of nonprofessional athletes; none of the participants earned a living based on their sporting activity. As was assumed in other studies,<sup>7</sup> it is conceivable that these nonprofessional athletes spent less time on their postoperative rehabilitation and that their motivation to return to their original sporting activity was lower than that of professional athletes. In our study, 4 of the 6 participants who changed their sport type due to their dislocation cited their professional situation and fear of another lengthy period of work absence as their main reasons for this. All 6 participants also cited fear of another dislocation as a justification for their sport type change. This psychological factor is surely not to be disregarded. A patient's experience of a subjectively failed surgical treatment leads to increasing lack of confidence in the shoulder and a negative attitude when answering questions on the evaluation of clinical scores. This was also demonstrated by Krueger et al<sup>19</sup> in a follow-up examination of patients after arthroscopic revision stabilization following a previously performed open or arthroscopic primary intervention. Due to poor values for responses on fear and frustration, a reduced WOSI (Western Ontario Shoulder Instability Index) was found.<sup>19</sup> Warth et al<sup>34</sup> described how capacity for sporting activity with return to the original sport is more important to patients than the disadvantage posed by the risk of further dislocation events. Patients are to expect high levels of frustration and poor capacity of the shoulder to perform sporting activities after the revision stabilization.

Patients who experience a relapse to instability of the shoulder after a primary surgical shoulder stabilization refer to multiple dislocation events in their history. Because patients with recurrent shoulder instabilities and an increased interval from injury to surgery have to expect

a longer rehabilitation phase, an associated poorer regeneration and greater muscular deficits must also be expected in the case of a relapse to instability. In our study, participants needed a break of nearly 8 months on average from the sporting activity, which is a longer break in sporting activity compared with studies of primary Bankart repair. Stein et al<sup>31</sup> reported that a return to sporting activities after primary Bankart repair was possible after 6.5 months.

This study has some limitations. A limited number of participants and heterogeneity of the sport types provided for a high probability of errors. However, all of the patients were nonprofessional athletes who participated in sporting activity at least once per week. Although all of the primary arthroscopic treatments entailed the use of suture anchors, they were performed by different surgeons and not the surgeon who carried out the revision stabilization. Scores for 2 of the time points (before first-time dislocation and after primary arthroscopic Bankart repair) were collected after the patients were enrolled in the study after revision surgery. This might have implications for recall bias. Also, due to the retrospective study design, no preoperative examination findings were available. As such, persistent apprehension and poor external rotation capacity could not be investigated as risk factors for failure of the revision surgery.

## CONCLUSION

Arthroscopic revision Bankart repair allows nonprofessional athletes to return to their original sport type and level, after precise verification of the indication, particularly concerning a possibly significant glenoid defect. However, enduring subjective limitations regarding the capacity to take part in sporting activities must be expected.

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