Knee Surg, Sports Traumatol, Arthroscopy (1995) 3:50–54

Knee Surgery
Sports Traumatology
Arthroscopy

Shoulder

Arthroscopic shoulder stabilization using Mitek anchors

F. Hoffmann, G. Reif

Orthopädische Klinik im Klinikum Rosenheim, Bereich: Arthroskopische Chirurgie,
Lehrkrankenhaus der Ludwig-Maximilians-Universität, München, Germany

Abstract. The purpose of this paper is to report our experience with an arthroscopic stabilization technique using bone anchors in the treatment of chronic unidirectional anterior-inferior shoulder instability. 30 of 32 patients (average age, 26 years) were followed for an average of 24 months (range 12 to 36). There were 28 patients with dislocations and four with subluxations. In the group of the dislocators five patients had more than 10 dislocations and 15 patients between one and seven (average three). In 68% a sport injury was the reason for the first dislocation. Due to the length of the labroligamentous detachment two to four anchors were used for stabilization. According to the criteria of Rowe, in the group of the subluxators (4) two had an excellent and two a good result. In the group of the dislocators (26) two patients dislocated their shoulder again after reconstruction without a new accident, one had a recurrent dislocation from significant trauma. Two of them had an open stabilization afterwards. Overall there were 53.9% excellent, 34.6% good and 11.5% poor results. In 50% there was no restriction of shoulder motion, 21% had a loss of external rotation of 5° and 29% of 10°. Arthroscopic shoulder stabilization with help of Mitek anchors seems to be a good method for treatment of chronic unidirectional anterior-inferior instabilities with less than 10 dislocations preoperatively. All patients, who suffered a spontaneous recurrent dislocation, had more than 10 dislocations before. In these cases this arthroscopic procedure is not suited to restore stability, even if a Bankart-lesion is present.

Key words: Arthroscopic shoulder stabilization – Mitek bone anchors – Early results

Introduction

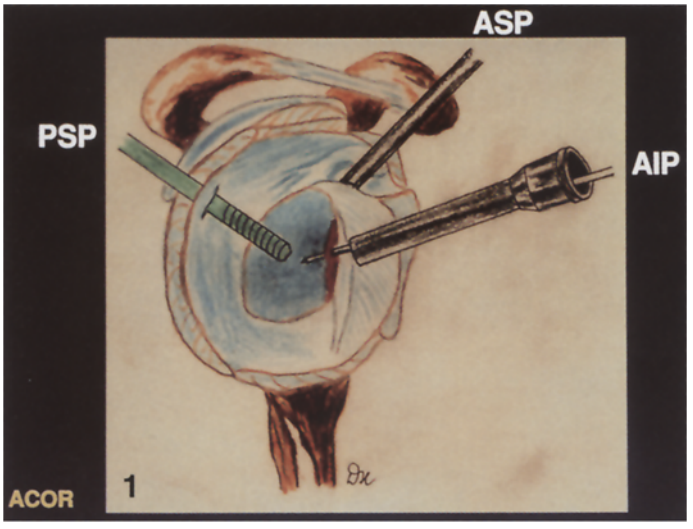
The importance of the glenohumeral ligament labrum complex has been known since the first description by Broca and Hartmann in 1890 [5]. In 1906 Perthes and later Bankart have shown, that the detachment of the labrum is a reason for recurrent instability and emphazised the refixation to regain stability [3, 4, 23]. Several other studies have demonstrated the importance of the inferior glenohumeral ligament labral complex (IGLLC) for the stability of the glenohumeral joint, especially in the abducted externally rotated position [19, 21, 28]. Arthroscopy has evolved in the shoulder through the diagnostic and excisional phases into the reconstructive phase [10]. Johnson described an arthroscopic staple capsulorrhaphy in 1986 and in 1987 Morgan published his arthroscopic suture technique [14, 18]. Since that time several other arthroscopic techniques have been described, including the use of removable rivets, tacks, suture anchors and screws [1, 26, 27, 31, 32, 34].

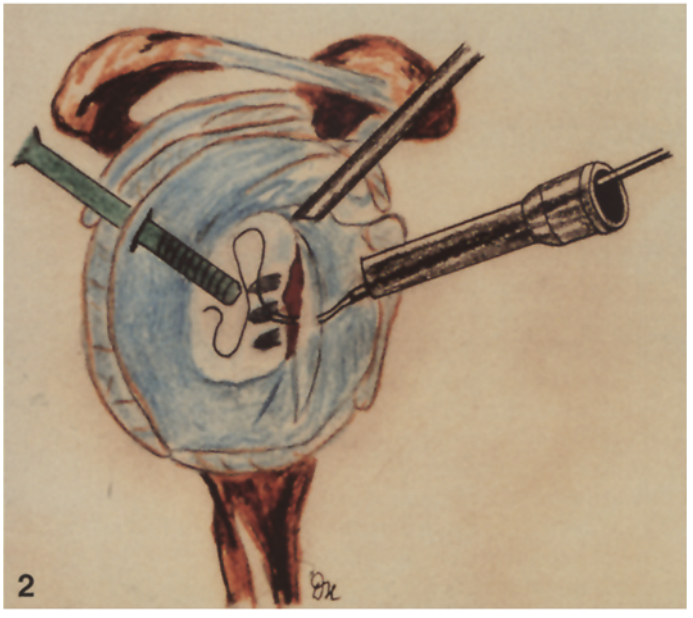
In attempt to avoid the surgical morbidity of open shoulder repair and the potential complications in using arthroscopic staples, screws and transglenoidal sutures we report our experiences with an arthroscopic technique described by Wolf using bone anchors for repair of chronic Bankart and ALPSA-lesions ("*a*nterior *l*abroligamentous *p*eriostal *s*leeve *a*vulsion lesion": the difference to the Bankart-lesion is, that there is no rupture of the scapular periosteum together with the anterior labroligamentous structures) [21, 34].

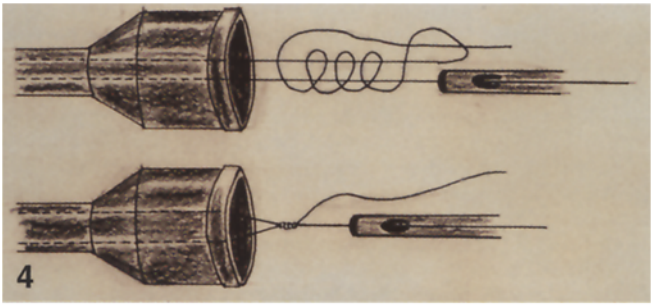
Materials and methods

In an ongoing prospective study 32 patients with a chronic unidirectional anterior-inferior shoulder instability were stabilized arthroscopically with help of suture anchors (Mitek, Norwood, MA) between 1990 and 1992 all by the same surgeon (F.H.). There were 20 men and 12 women; the average age was 26 years (range, 16 to 51). Patients were excluded, if instability was multidirectional or voluntary and if there was a significant loss of glenoid bone stock. The patients with multidirectional and/or voluntary instability were primarily treated nonoperative and in rare cases with an open capsular shift procedure. If there was a significant osseous defect at the glenoid an open bone block procedure was performed. 28 patients had suffered dislocations and four subluxations, in 68% related to sport injuries. There were 18 right and 14 left shoulders, the dominant arm was involved in 69% (22 of 32). Eleven of 28 patients were active in overhead sports (e.g. tennis, volleyball, handball). In the group of the dislocators five patients had suffered more than 10 dislocations and 23 patients between one and seven

Correspondence to: F. Hoffmann, MD, Orthopedic Department, Division of Arthroscopic Surgery, Pettenkoferstrasse 10, D-83022 Rosenheim, Germany







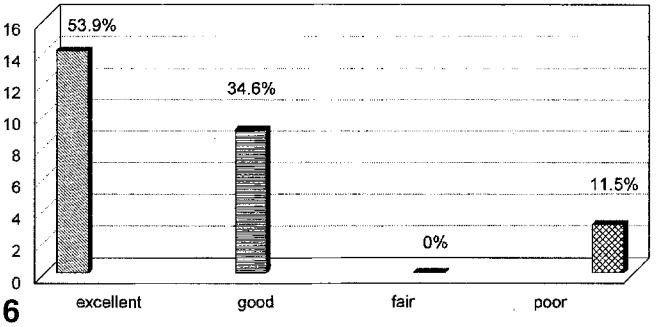


Fig. 1. Arthroscope in the anterior superior portal *(ASP)*, outflow cannula in the posterior superior portal *(PSP)*, drill through the 8.4 mm cannula in the anterior inferior portal *(AIP)*

Fig. 2. Using a suture hook a suture is inserted through the detached IGLLC

Fig. 3. Using an inserter the anchor is passed down through the cannula and is inserted into the first drill hole

Fig. 4. Creation of a fishing knot, which is slid down the cannula with a knot pusher

Fig. 5. Three anchors are inserted and the sutures are tied. The labrum is attached to the glenoid

Fig. 6. Results according to Rowe's score

(average, three). Only one patient was operated two months after the first dislocation, all others had more than one dislocation. The interval between the first dislocation and the operation was 35 months on the average (range, 2–156).

All patients were evaluated preoperatively including a careful history and physical examination. They all had a positive apprehension sign in abduction and external rotation. Besides plain radiographs in AP (also in internal rotation) and axillary view a double-contrast arthrographic computer-assisted tomogram was performed in 10 cases, 4 patients had a magnetic resonance imaging.

Clinical results were graded functionally using the rating system described by Rowe et al. [28]. A Fisher's exact test was used to compare variables that might offer predictive value for success or failure.

Operative technique

The operation is performed in general anaesthesia with the patient in the beach chair position. A bean bag facilitates the positioning of the patient. The forearm lies on a support in a neutral position. An examination under anaesthesia of both shoulders is performed to assess the direction and degree of instability. This examination is done with the arm in 0° and 90° abduction under axial compression of the humeral head on the glenoid surface and with stabilization of the scapula. After sterile draping and marking of the surface landmarks a blunt obturator in the arthroscope cannula is inserted from the standard posterior superior portal (PSP). The blunt obturator has to be changed into a 4 mm 30° wide angle arthroscope. Under arthroscopic control an anterior inferior portal (AIP) and an anterior superior portal (ASP) are created with an "outside-in" technique [33, 34]. The skin incision for the AIP is exactly lateral of the tip of the coracoid process and enters the joint above the superior border of the subscapularis tendon. The ASP is located lateral to the coracoacromial ligament in line with the base of the coracoid process. The entry point in the joint is the rotator cuff interval. We use an arthroscopy pump (Friatec, Friedrichshafen, Germany) with the inflow through the arthroscope cannula. If we find a Bankart lesion or a chronic anterior labroligamentous periostal sleeve avulsion (ALPSA) with medially displaced and healed labroligamentous structures, we change the arthroscope into the ASP and the outflow cannula to the PSP. Using a banana knife and a periostal elevator in the AIP the ALPSA-lesion is converted to a Bankart lesion by dissection of the entire complex of fibrous tissue, labrum, glenohumeral ligaments and periosteum from the anterior scapula [3, 4, 21]. Then a debridement and abrasion of the anterior rim of the glenoid cavity and scapula neck is accomplished with an aggressive meniscal cutter and a motorized burr. Now the cannula in the AIP is switched to a 8.4 mm threaded cannula (Linvatec, Largo FL). The drill guide and drill are inserted and drill holes are created at the glenoid rim (Fig. 1). To avoid any damage to the articular surface the drill must be angled 15°–20° medially to the plane of the glenoid surface. The number of drill holes is dependend to the length of the labroligamentous detachment, usually 2 to 4 drill holes are sufficient. For placing sutures in the detached IGLLC we have used a suture punch (Linvatec, Largo, FL) in the beginning, now we use a 90° suture hook (Mitek, Norwood, MA) with a 0-gauge PDS (polydioxanone) suture (Fig. 2). The first suture is inserted through the most inferior portion of the detached IGLLC. A suture grasper is then inserted, pulling out the end of the inserted suture. Now a loop is created through the ligament. An anchor is then mounted on the inserter and fixed to the inserter with a security stitch of 2/0 suture, that is tied over the handle of the inserter. This avoids a losing of the anchor within the joint. The end of the suture which comes through the avulsed surface of the IGLLC is armed with the anchor. The anchor is passed down through the cannula and is then inserted into the first drill hole (Fig. 3). The security suture used to fixate the anchor to the inserter is cut and the inserter is pulled out. A common fishing knot is made and slid down the cannula with a knot pusher (Fig. 4). Two counterrunning knots complete the suture. According to the length of the labral detachment this procedure must be repeated two or three times (Fig. 5). For fixation of the proximal anchor it is sometimes helpfull to switch the arthroscope to the PSP. The portals are closed by suture and an immobilizer and a Cryocuff (Aircast Europa, Stephanskirchen, Germany) is applied.

Postoperative regimen

The patients have to wear the immobilizer for 4 weeks. The immobilizer may be removed for pendulum exercises and exercises to 30° flexion and 20° abduction, all in internal rotation. These exercises are demonstrated to the patient at his uninvolved shoulder. After four weeks the patient begins with flexion- and abduction-exercises without external rotation. At six weeks full-range-of-motion exercises are allowed. Overhead sports are not allowed for six months and contact sports for 12 months.

Results

30 of 32 patients were followed for an average of 24 months (range, 12 to 36). One female US-American returned in the United States, one female student changed her residence and did not want to come to the clinical control. She was contacted by phone, had no signs of instability, no restrictions of motion, was playing in a handball team and was satisfied with the operation.

Arthroscopic findings

There were 23 chronic Bankart lesions, seven chronic ALPSA-lesions and two combinations of chronic Bankart with Andrews-lesions (detachment of the anterior superior labrum reaching to the origin of the long biceps tendon) intraoperatively [2, 3, 4, 21]. An associated Hill-Sachs lesion was noted in 17 patients (61%). Chondromalacia of the glenoid was found in seven (22%) and of the humeral head in three patients (9%). There were no lesions of the rotator cuff. Two anchors were used for stabilization in 10 patients, three anchors in 19 patients and four anchors in three patients. There was no significant intra- or perioperative complication.

Clinical evaluation was performed using the functional grading system described by Rowe et al. [28]. In the group of the subluxations (4) there were two excellent and two good results. The loss of external rotation was 30° and 20° in one patient respectively. In the group of the dislocations (26) there were two recurrences after six and 10 months without adaequate trauma and one redislocation after 13 months by a severe traffic accident. Two of these three patients have got an open stabilization (one rotational osteotomy and one Eden-Hybinette procedure) [8, 13, 30].

Counting all patients with a recurrent dislocation as failure there are in 53.9% excellent, in 34.6% good and in 11.5% poor results (Fig. 6). The atraumatic redislocation rate is 8%. There was no loss of external rotation in 51%, a loss of 5° in 19% and of 10° in 30% of the patients. Seventy-one percent of the patients were able to return to their overhead sports activities.

All patients with atraumatic recurrences had more than 10 dislocations preoperatively. This represents a significant difference to those with less than 10 luxations preoperatively, $P < 0.02$. There was no statistical significance between shoulder dominance, overhead sports, sex and age versus recurrent instability.

Discussion

The arthroscopic treatment of glenohumeral instability is developing. The first techniques using staples for refixation of a displaced labrum or to shift an attenuated capsule had a high rate of recurrences (16%–33%) and of complications from the implanted hardware [7, 11, 15,17]. An arthroscopic suture technique, described by Morgan and Bodenstab, could decrease the recurrence rate to 3.6% [18, 19]. With a similar technique Caspari had a failure rate of 4% [6]. These results are nearly similar to those of an open Bankart repair [12, 16, 25]. But other authors could not obtain such good results with an arthroscopic technique. Grana et al. had an atraumatic recurrence rate of 23%, Wolin of 27% and Goldberg et al. of 12% [9, 10, 35]. They pointet out, that the high failure rate is caused by a concomitant insufficiency of the capsule and the glenohumeral ligaments.

All transglenoid suture techniques have a potential risk to injure the suprascapular nerve. Tying of the sutures over muscle and fascia is often not very reliable. By using a suture anchor these potential complications can be avoided. Furthermore it is possible to repair a torn IGLLC to the glenoid bone also in the most inferior quadrant. In a small number of cases we have only excellent and good results in the treatment of subluxations. In a group of 30 patients with dislocations there is an overall recurrence rate of 11.5%. The atraumatic recurrence rate is 8%, because one patient suffered a redislocation by a severe traffic accident. In 88.5% an excellent or good result regarding the rating system of Rowe et al. could be obtained [28]. The loss of external rotation was never more than 10°, 50% had no restrictions of motion. All patients with atraumatic recurrences had a Bankart lesion intraoperatively and more than 10 dislocations praeoperatively. In these cases it is not sufficient to repair the Bankart lesion, because it remains a laxity of the capsule and of the glenohumeral ligaments [9, 10, 35]. The future must show, whether these patients can be treated by an arthroscopic repair with capsular plication or labral advancement [34]. Possibly an open glenoid labrum reconstruction with a capsular shift procedure is a suited method for treatment of these patients [23].

Our results of the arthroscopic shoulder stabilization with help of Mitek anchors are encouraging in those patients, which have less than 10 dislocations preoperatively. But the follow-up is short, the future must show, whether these results will be durable. The arthroscopic repair of anterior glenohumeral instability with suture anchors is a technically demanding procedure and should be performed only by surgeons with superior arthroscopic skills [34]. It is certainly difficult to remove an anchor, if it is necessary at any reason.

Summary

The arthroscopic repair of anterior glenohumeral instability with Mitek anchors is technically demanding. It seems to be a good method for treatment of labroligamentous detachment, if the number of dislocations is less than 10 preoperatively. Otherwise this method is not recommended, even if a Bankart lesion is present.

References

1. Altchek DW, Warren RF, Skyhar MJ (1990) Shoulder arthroscopy. In: Rockwood JR, Matzen FA (eds) The shoulder. Saunders, Philadelphia, pp 258–277
2. Andrews J, Carson W, McLeod W (1985) Glenoid labrum tears related to the long head of the biceps. Am J Sports Med 13:337–341
3. Bankart ASB (1923) Recurrent or habituel dislocation of the shoulder joint. Br Med J 2:1123–1133
4. Bankart ASB (1938) The pathology and treatment of recurrent dislocation of the shoulder. Br J Surg 26:23–28
5. Broca A, Hartmann H (1890) Contribution à è etude des luxations de l'épaule. Bull Soc Anat Paris 4:312–336
6. Caspari RB, Savoie FH (1991) Arthroscopic reconstruction of the shoulder: the Bankart repair. In: Mc Ginty JB (ed) Operative arthroscopy. Raven Press, New York, pp 507–515
7. Coughlin L, Rubinovich M, Johannson J, White B, Greenspan J (1992) Arthroscopic staple capsulorrhaphy for anterior shoulder instability. Am J Sports Med 20:253–256
8. Eden R (1918) Zur Operation der habituellen Schulterluxation unter Mitteilung eines neuen Verfahrens bei Abriß am inneren Pfannenrande. Dtsch Z Chir 144:269
9. Goldberg BJ, Nirschl RP, Mc Connell JP, Pettrone FA (1993) Arthroscopic trans-glenoid suture capsulolabral repairs: preliminary results. Am J Sports Med 21:656–665
10. Grana WA, Buckley PD, Yates CK (1993) Arthroscopic Bankart suture repair. Am J Sports Med 21:348–353
11. Hawkins RB (1989) Arthroscopic stapling repair for shoulder instability: a retrospective study of 50 cases. Arthroscopy 5: 122–128
12. Hovelius L, Thorling J, Fredin H (1979) Recurrent anterior dislocation of the shoulder. Results after the Bankart and Putti-Platt operations. J Bone Joint Surg [Am] 61:566–569
13. Hybbinette S (1932) De la transplantation d'un fragment osseux pour remedier aux luxations recidivantes de l'épaule; constations et resultats operatoires. Acta Chir Scand 71:411–445
14. Johnson LL (1986) Shoulder arthroscopy. In: Johnson LL (ed) Arthroscopic surgery: principles and practice. Mosby, St Louis
15. Lane JG, Sachs RA, Riehl B (1993) Arthroscopic staple capsulorrhaphy: a long-term follow-up. Arthroscopy 9:190–194
16. Matsen FA, Thomas SC, Rockwood CA (1990) Anterior glenohumeral instability. In: Rockwood CA, Matsen FA (eds) The shoulder. Saunders, Philadelphia, pp 526–612
17. Matthews LW, Vetter WL, Orveida SJ, Spearmann J, Helfet DL (1988) Arthroscopic staple capsulorrhaphy for recurrent anterior shoulder instability. Arthroscopy 4:106–111
18. Morgan CD, Bodenstab AB (1987) Arthroscopic Bankart suture repair: technique and early results. Arthroscopy 3:111–122
19. Morgan CD (1991) Arthroscopic transglenoid Bankart suture repair. Operative Tech Orthop 1:171–179
20. Moseley HF, Overgaard B (1962) The anterior capsular mechanism in recurrent anterior dislocation of the shoulder. Morphological and clinical studies with special reference to the glenoid labrum and the glenohumeral ligaments. J Bone Joint Surg [Br] 44:913–927
21. Neviaser TJ (1993) The anterior labroligamentous periostal sleeve avulsion lesion: a cause of anterior instability of the shoulder. Arthroscopy 9:17–21
22. O'Brien SJ, Neves MC, Arnoczky SP et al (1990) The anatomy and histology of the inferior glenohumeral ligament complex of the shoulder. Am J Sports Med 19:449–456
23. Paulos LE, Evans IK, Pinkowski JL (1993) Anterior and anterior-inferior shoulder instability: treatment by glenoid labrum reconstruction and a modified capsular shift procedure. J Shoulder Elbow Surg 2:305–313

24. Perthes G (1906) Über Operationen bei habitueller Schulterluxation. Dtsch Z Chir 85:199–227
25. Resch H (1989) Die vordere Instabilität des Schultergelenkes. Hefte Unfallheilkd 195:205
26. Resch H (1991) Beurteilung der einzelnen arthroskopischen Limbusrefixationstechniken und eigenes Vorgehen. In: Resch H, Beck E (Hrsg) Arthroskopie der Schulter-Diagnostik und Therapie. Springer, Wien, New York
27. Resch H (1991) Neuere Aspekte in der arthroskopischen Behandlung der Schulterinstabilität. Orthopäde 20:273–281
28. Rowe CR, Zarins B, Ciullo JV (1984) Recurrent anterior dislocation of the shoulder after surgical repair: apparent causes of failure and treatment. J Bone Joint Surg [Am] 66:159–168
29. Turkel SJ, Panie MW, Marshall JL, Girgis RJ (1981) Stabilizing mechanisms preventing anterior dislocation of the glenohumeral joint. J Bone Joint Surg [Am] 63:1208–1217
30. Weber BG, Simpson LA, Hardegger F (1984) Rotational humeral osteotomy for recurrent anterior dislocation of the shoulder associated with a large Hill-Sachs lesion. J Bone Joint Surg [Am] 66:1443
31. Wiley AM (1988) Arthroscopy for shoulder instability and a technique for arthroscopic repair. Arthroscopy 4:25–30
32. Wolf EM (1988) Arthroscopic anterior shoulder capsulorrhaphy. Tech Orthop 3:67–73
33. Wolf EM (1989) Anterior portals in shoulder arthroscopy. Arthroscopy 5:201–208
34. Wolf EM, Wilk RM, Richmond JC (1991) Arthroscopic Bankart repair using suture anchors. Op Tech Orthop 1:184–191
35. Wolin PM (1990) Arthroscopic glenoid labrum suture repair. Orthop Trans 14:597