Two- to Five-Year Followup of Arthroscopic Bankart Reconstruction Using a Suture Anchor Technique

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ABSTRACT

This is a retrospective review of 27 patients (27 shoulders) with recurrent anterior instability who underwent arthroscopic Bankart reconstruction with a suture anchor technique between 1990 and 1993. Average length of followup was 40 months (range, 28 to 64). The average Bankart rating score was 88 (range, 45 to 100) with 70% good-to-excellent results and 30% fair-to-poorest results. The average University of California (Los Angeles) shoulder function score was 32 (range, 27 to 35). The average loss of external rotation in abduction was 5. Eight patients (30%) failed the procedure and had recurrent anterior shoulder instability; seven of these had repeat traumatic events. A Pearson chi-square analysis of multiple variables was performed to determine which correlated with a successful result. A higher success rate was obtained if the patient had five or fewer dislocations before surgical reconstruction. This technique should be limited to patients not returning to contact sports, or in whom the improved cosmetic result or increased postoperative external rotation of the arthroscopic procedure are valued.

Over 150 orthopaedic procedures for the treatment of anterior instability of the shoulder have been described.9 The cause of anterior instability centers around three main concepts: 1) a capsular or labral defect as described by Bankart,12 2) muscular insufficiency as described by Magee and Stack13 and DePalma et al.,8 and 3) bony abnormalities of the glenoid cavity or humeral head. Turkel et al.18 have shown the importance of the inferior glenohumeral ligament/labral complex as a primary stabilizer of the shoulder in the abducted externally rotated position. The presence of a Bankart lesion—defined as a separation of the inferior glenohumeral ligament/anterior labral complex from the glenoid rim—has been reported in 85% of traumatic anterior shoulder dislocations.12

The open Bankart procedure has stood the test of time as an excellent procedure for repair of traumatic anterior capsular and labral avulsions from the glenoid rim. The goal of the Bankart repair is to restore the attachment of the labral/capsular ligaments to the anterior and inferior glenoid rim. Proper repair results in a painless, nondislocating, nonsubluxating shoulder with adequate strength and nearly full range of motion. The Bankart procedure provides consistent and reliable results in eliminating anteroinferior instability and 93% to 97% good-to-excellent results.9,10,17 Although the efficacy of the open Bankart repair is widely accepted, some physicians believe that it is technically difficult. In an attempt to simplify the Bankart repair, we have advocated the use of suture anchors for secure fixation of tissue to the anterior glenoid rim.10,16 This procedure has resulted in 93% (26 of 28) stable shoulders at an average of 3.5 years after surgery.10

As experience with shoulder arthroscopy has advanced, numerous techniques for arthroscopic anterior shoulder stabilization have been described. Many of these are arthroscopic modifications of the classic open Bankart reconstruction. Morgan and Bodenstab14 reported a 5.3% traumatic redislocation rate, with an average followup of 17 months, in patients undergoing a transglenoid suture technique; later, at an average followup of 49 months, Morgan13 reported a 16% redislocation rate in collision athletes. Caspar9 also described a transglenoid technique with multiple sutures; he reported 96% satisfactory results in 49 patients with a 33-month followup. Hawkins9 and Matthews et al.12 have reported arthroscopic modifications of the du Toit staple repair with recurrence rates between 16% (8 of 50) and 24% (6 of 25). These methods
have been associated with technical difficulty, and significant complications have been described related to the use of larger metallic implants about the shoulder. A bioabsorbable fixation device designed for anterior stabilization has also been used with an 8% (2 of 26) early failure rate. In 1991, Wolf et al. described a technique of arthroscopic Bankart repair using Mitek (Westwood, Massachusetts) suture anchors with intraarticular knot tying.

Arthroscopic techniques have the theoretical advantage of reduced complications, decreased discomfort, and improved cosmesis, motion, and strength. In addition, they have the potential for being more anatomic and less destructive to normal tissue planes than open techniques. However, only one long-term study of arthroscopic shoulder stabilization has produced results comparable with those of open Bankart reconstruction. This discrepancy has been attributed to technical difficulty, surgical inexperience, strength of repair, patient selection, poor healing response, and patient noncompliance with rehabilitation programs.

The purpose of this paper is to report an arthroscopic procedure for repairing anterior shoulder instability using suture anchors and an intraarticular knot technique and with more than 2 years of followup.

MATERIALS AND METHODS

Between 1990 and 1993, we performed arthroscopic Bankart reconstruction for recurrent anterior shoulder instability on 27 patients (27 shoulders) at our institution. In a retrospective review, all patients who had an arthroscopic stabilization procedure during this time period were included. The surgical technique consisted of arthroscopic placement of suture anchors along the anteroinferior glenoid. The anchors were then used to repair the capsulolabral detachment. All patients were operated on by the senior clinician (JCR). Twenty patients (74%) returned for an evaluation consisting of a questionnaire regarding pain and function of the shoulder and a physical examination. We obtained true AP radiographs of both shoulders and an axillary lateral view of the operated shoulder to determine signs of glenohumeral arthritis and suture anchor placement. Two patients (7%) were interviewed by telephone and their most recent clinic radiographs were included in the review. The other five patients (19%) had recurrent instability after the initial arthroscopic stabilization procedure and had undergone open surgical stabilization; they are included in the group that had unsuccessful results in our study.

The follow-up questionnaire was a subjective rating of pain, medication use, mechanical symptoms of locking, grinding, or clicking, and any limitations of work or athletic endeavors. The physical examination included range of motion, instability testing (anterior, posterior, and inferior), signs of anterior apprehension, signs of subacromial impingement or rotator cuff tendinitis, and signs of generalized ligamentous laxity. The latter was defined by the presence of two of the following three signs: thumb to wrist touching, metacarpophalangeal hyperextension >90°, or elbow hyperextension >10°. Patients were rated using the Bankart scale described by Rowe et al. and the functional UCLA scale. The Bankart scale places more emphasis on stability and the UCLA scale is weighted toward shoulder function. We defined a successful outcome as a stable joint that functioned well and with minimal or no discomfort. We defined a failure as recurrent instability, or pain that inhibited use of the shoulder for activities of daily living. We reviewed all radiographs separately, in a blinded fashion, using the rating scale shown in Table 1. We divided the anchor placement into three categories: directly on the articular surface of the glenoid, at the glenoid rim, or on the glenoid neck (Fig. 1).

The average age of our patients at followup was 29 years (range, 17 to 44). The average time since surgery was 40 months (range, 26 to 64). The average number of dislocations before surgery was 5 (range, 1 to 20). Ten patients had five or more dislocations before surgery. Nineteen of the initial dislocations occurred during sporting events, including football, basketball, swimming, pole vaulting, hockey, wrestling, and soccer. Two patients sustained their initial dislocations in motor vehicle accidents. Five patients could not recall the initial dislocation.

All patients underwent similar procedures, which included examination under anesthesia. Patients with atraumatic or multidirectional instability were not considered for this procedure. If isolated anterior laxity was identified, diagnostic shoulder arthroscopy in the lateral decubitus position was performed. If a Bankart lesion was identified, and the anteroinferior glenohumeral ligament tissue appeared sound, then this was repaired using Mitek GII anchors in the manner of Wolf et al. The postoperative protocol included the use of a sling for 4 weeks, when range of motion exercises commenced. At 6 weeks, more aggressive physical therapy to increase range of motion and strength was begun.

RESULTS

The average Bankart score was 88 (range, 45 to 100). Eighteen patients (67%) had excellent results (score 85 to 100), one patient (4%) had a good result (score 70 to 84), three patients (11%) had fair results (score 50 to 69), and five patients (18%) had poor results (score <49). Therefore, 70% of the patients had a good-to-excellent result and

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
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<tbody>
<tr>
<td>Normal</td>
<td>No joint space narrowing</td>
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<tr>
<td></td>
<td>No osteophytes</td>
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<tr>
<td></td>
<td>No sclerosis</td>
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<tr>
<td>Minimal changes</td>
<td>Slight joint space irregularity</td>
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<tr>
<td></td>
<td>&lt;1 mm joint space narrowing</td>
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<tr>
<td></td>
<td>Slight sclerosis</td>
</tr>
<tr>
<td>Moderate changes</td>
<td>Narrowing ≥2 mm</td>
</tr>
<tr>
<td></td>
<td>Mild-to-moderate osteophytes</td>
</tr>
<tr>
<td></td>
<td>Moderate sclerosis</td>
</tr>
<tr>
<td>Severe changes</td>
<td>Severe joints space narrowing</td>
</tr>
<tr>
<td></td>
<td>Abundant osteophyte formation</td>
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<tr>
<td></td>
<td>Severe sclerosis, cyst formation</td>
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30% had a fair-to-poor result. All eight unsuccessful results were due to recurrent dislocation or subluxation events. There were no failures as a result of pain or further limitations. Of the eight failed operations, seven patients had traumatic redislocations as a result of injury from football, basketball, hockey, or a motor vehicle accident. Five patients subsequently underwent open reconstruction procedures. Three patients had new Bankart lesions and the old lesions had healed to the glenoids. This was demonstrated by fresh hemorrhage and tearing of the inferior gleno-humeral-labral complex from the glenoid. In two patients the capsules remained firmly healed to the glenoids and we performed inferior capsular shifts. At the revision surgery we were unable to specify whether the capsular laxity was the result of the new injury, but we believe it represented inadequate tensioning of the capsule at the arthroscopic procedure. One of these five patients continues to have episodes of recurrent subluxation.

The average UCLA score, which places more emphasis on function of the shoulder, was 33 (range, 27 to 35). Even though some patients had recurrent instability, they continued to function well and most of their limitations were in aggressive athletic endeavors. The pain score was based on a scale of 1 to 10, with 10 being no pain; the average pain score was 8.3 (range, 2 to 10). The patient who had a pain level of 2 continued to have recurrent dislocation events during participation in football.

All patients had 180° of forward flexion at followup. External rotation with the arm at the side averaged 70° (range, 40° to 90°). When compared with the other arm, the average loss of external rotation at the side was 5° (range, +10° to -45°). The patient who lost 45° of external rotation was the same patient with significant pain and recurrent instability. The average external rotation with the arm in the abducted position was 91° (range, 85° to 105°). The average loss of external rotation in this position was 1° (range, 0° to 20°). When the patients with anterior apprehension caused by unconstructed recurrent instability were eliminated, there was no loss of external rotation at the side or in abduction. The average internal rotation was to T-9 (range, L-4 to T-4). This was comparable with the nonoperated side.

The three patients whose operations were unsuccessful and who did not have open reconstructions had both anterior apprehension and signs of anterior instability with increased anterior translation on physical examination. No patient had inferior or posterior instability or apprehension. No patient had signs of impingement or rotator cuff tendinitis.

Twenty-one of the 22 patients (excluding the patients who had open revisions) had radiographs for review. One patient had minimal degenerative changes with similar changes on the nonoperated side. One patient had minimal and one had moderate degenerative changes, with normal radiographs on the nonoperated side. Fifteen patients had two Mitek GII anchors inserted. Three patients had three anchors, two had one, and one had four anchors inserted. Four patients had the anchors placed through the glenoid articular surface, 12 on the rim, and 7 on the glenoid neck. Three anchors had pulled out of the bone and were lodged in the soft tissue around the shoulder. There were no symptoms directly related to these anchors and all of these patients continue to have stable shoulders.

Ten patients had more than five dislocations before the stabilization procedure; five of these patients had recurrent instability. Seventeen patients had five or less dislocations before surgery; three of these patients (18%) developed recurrent instability.

A Pearson chi-square analysis was performed to determine which variables would correlate with a successful arthroscopic stabilization procedure. The following variables were reviewed: age of the patient, number of dislocations before surgery, time between the first dislocation and surgery, generalized ligamentous laxity as defined by hyperextension of finger or elbow joints, loss of external rotation, suture anchor placement, and number of anchors used. A higher success rate was obtained if the patient had five or less dislocations before surgery. This was statistically significant with $P = 0.035$. The other variables did not statistically correlate with a successful result.

**DISCUSSION**

A surgical procedure to treat recurrent anterior shoulder instability should result in a stable shoulder with nearly full range of motion. The Bankart procedure as modified by Rowe et al.$^{17}$ may lead to good-to-excellent results in a high percentage of patients. In the series of Rowe et al., 97% of patients (140 of 145) were stable, and in the series of Hovelius et al.$^{9}$ 98% of patients (1 of 46) were stable at followup. A loss of 10° to 25° of external rotation is common with open techniques, noted in 30% of patients (38 of 124) in the series by Rowe et al., and 40% of patients (19 of 46) in the series by Hovelius et al. The technical problems associated with passing sutures through the glenoid rim have led us to develop the modification of the technique with suture anchors.$^{15}$ Results for stability using the suture anchor in open repairs have been similar to those of Rowe et al., with a 93% (26 of 28) good-to-excellent results. Excellent external rotation may be achieved with the suture anchor modification; no patients in our open series lost more than 10° of external rotation in abduction.$^{10,15}$

Although preliminary results of various arthroscopic
techniques have been promising, longer followup has revealed failure rates of 13% to 49%.6,7,12,19,22 This study represents a mid-term followup (2 to 5 years) of arthroscopic stabilization using a Mitek suture anchor technique. The 30% failure rate was because of recurrent instability. Seven of the eight unsuccessful results were due to repeat traumatic events. Recurrent instability led to higher pain scores and limitations in athletic endeavors.

The variable that we correlated with a successful result was having five or fewer dislocations before surgery. The probable reason for this correlation is the quality of the repaired tissue. Although Green and Christensen's showed that there was a relationship between the quality of the anterior labrum and capsular tissue and the risk of recurrence after surgery, they could show only a slight trend for poor anterior tissues when there had been a higher number of preoperative dislocations. The arthroscopic technique is used to repair the torn labrum to the glenoid, but is less satisfactory in tightening the anterior capsule; this is more successfully accomplished with an open technique. The anterior structures may become attenuated with repeated dislocation, which potentially compromises the results of arthrogram stabilization in this population with repeated dislocations.

The placement of the suture anchors in relation to the glenoid rim or the number of anchors used did not correlate with a successful result. We have evolved this technique to place the anchors on the glenoid articular surface at the edge of the rim to better re-create the labrum and tension the inferior glenohumeral ligament complex.

The patients in this series were seen early in the learning curve for this technique by the senior author (JCR), but there was no increased risk of failure in the patients early in the series. Although it is too soon to reach conclusions about the absence of degenerative changes on radiographs, prior studies have indicated that osteoarthritis after shoulder stabilization is likely due to overconstraint with decreased external rotation.6 There were no motion constraints in our study group.

With the high failure rate in our series, we have significantly altered how we choose patients to undergo arthroscopic shoulder stabilization. We strongly counsel against stabilization by arthroscopic procedure for any patient who plans to return to contact sports. The open Bankart reconstruction with suture anchors is our surgical procedure of choice in this population. We limit consideration of arthroscopic stabilization to those patients with recurrent traumatic instability of the glenohumeral joint (five or fewer episodes) in whom maintenance of external rotation or cosmesis is an important issue. These patients should be counseled regarding the increased risk of recurrent instability that may follow arthroscopic techniques, even when the best selection criteria are used, and be able to make informed choices as to the appropriate procedure for them. Even when arthroscopic stabilization has been chosen, if examination under anesthesia reveals any significant component of multidirectional instability, or if the arthroscopic appearance of the anterior capsule suggests inadequate tissue, we proceed with an open reconstruction.

REFERENCES