Arthroscopic Repair for Posterior Shoulder Instability

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Purpose: The purpose of this study was to evaluate outcomes of a consistent arthroscopic stabilization technique for recurrent posterior instability. **Methods:** Thirty-four consecutive shoulders with symptomatic recurrent posterior instability were treated with arthroscopic repair and evaluated at a mean follow-up of 36 months (range, 12 to 67 months). Two patients were excluded because of prior surgery, leaving 32 for further analysis. The mean age was 21.4 years (range, 15 to 33 years). There were 26 male and 6 female patients, and in 59% the dominant shoulder was affected. A known traumatic injury had occurred in 25 (78%), but only 2 (6%) had a documented dislocation. Arthroscopic repair was performed with the patient in the lateral decubitus position through an anterosuperior 12-o'clock viewing portal. Suture anchor repairs were performed in 30 cases and plication to the intact labrum in 4. A sling and derotation wedge were used for 4 weeks, followed by progressive active range of motion, with weight lifting at 3 months and return to contact sports at 6 months. Of the 34 cases, 22 met the inclusion and exclusion criteria and had complete preoperative and postoperative shoulder outcome scores. **Results:** Significant improvement ($P = .001$) from preoperatively to final follow-up was seen for American Shoulder and Elbow Surgeons scores, from 68 to 93; Simple Shoulder Test scores, from 9.3 to 11.6; and visual analog scale scores, from 3.5 to 0.8. All patients returned to their previous level of athletic activity. Two patients reported postoperative instability; none required reoperation. There were no other postoperative complications. **Conclusions:** This study represents a consecutive series of patients with recurrent posterior instability who underwent arthroscopic posterior stabilization. In this population arthroscopic posterior labral repair and capsular plication provided significant clinical improvement and low rates of recurrent instability and revision surgery. **Level of Evidence:** Level IV, therapeutic case series.

Posterior glenohumeral instability is a relatively rare entity, representing about 2% to 10% of all cases of instability.[1-4] Posterior instability can be classified as an acute traumatic event, as atraumatic instability, or as the result of repetitive microtrauma, often in association with generalized ligamentous laxity.[2,3] Most patients with symptomatic posterior instability do not remember a specific traumatic event, such as a dislocation that required reduction. It is much more common to report a subluxation event during athletic activity. Subsequently, patients have shoulder pain with activity and may have vague symptoms that are not localized posteriorly. On close questioning, most will describe the shoulder "slipping out." There is typically a loss of performance and confidence in the shoulder. Recurrent dislocation that requires reduction, which is common with anterior recurrent instability, is very rare with posterior recurrent instability. Cases of recurrent instability can be due to repetitive microtrauma, such as swimming, overhead swinging in volleyball, and gymnastics. Lastly, a small percentage of cases have a significant component of ligamentous laxity.[2] Patients with both traumatic and atraumatic causes are often competitive athletes aged between 15 and 40 years. The presenting symptoms in

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patients affected by recurrent posterior instability are sometimes vague but often include an inability to participate in their sporting activity, pain, and repeated subluxation events.

Traditionally, treatment for posterior glenohumeral instability consisted of physical therapy. Operative stabilization was reserved for patients in whom nonoperative strategies failed. Early reports of open stabilization for posterior instability showed high recurrence rates, delay or inability to return to sports or prior activity levels, and low patient satisfaction.[5-9] Recent technologic advances have led to the establishment of arthroscopic stabilization for posterior instability as the standard of operative treatment. Results have been mixed in the few published series examining outcomes.[10-15]

To date, few studies have evaluated the results of arthroscopic posterior stabilization in athletes with recurrent posterior instability. The purpose of this study was to evaluate outcomes of a consistent arthroscopic stabilization technique, using an anterosuperior 12-o'clock viewing portal, from a single surgeon for recurrent posterior instability. We hypothesized that arthroscopic stabilization for recurrent posterior instability in this population would provide predictable results with improvement in shoulder outcome scores and return to the chosen athletic and recreational activity levels.

METHODS

Patient Selection

After receiving approval from the Institutional Review Board, we performed a retrospective review of cases from 2004 to 2009 and identified a total of 127 consecutive patients who underwent arthroscopic stabilization by the senior author. After review, 34 patients were found to have undergone isolated posterior stabilization. Exclusion criteria included multidirectional instability, prior surgery, history of a seizure or neuromuscular disorder, or absence of preoperative shoulder outcome scores. Two patients were excluded for prior surgery on the same shoulder. Of the remaining 32 patients, 25 had completed preoperative shoulder outcome worksheets, including the visual analog scale score for pain, Simple Shoulder Test (SST), and American Shoulder and Elbow Surgeons (ASES) score, whereas 7 had no preoperative shoulder outcome scores. Three were lost to follow-up and thus had no postoperative shoulder outcome scores. Thus 22 patients with both preoperative and postoperative shoulder outcome scores were included in the analysis. Three patients had no preoperative shoulder outcome scores but had been evaluated at follow-up. We included these when describing rates of revision and postoperative symptoms of instability or dislocation.

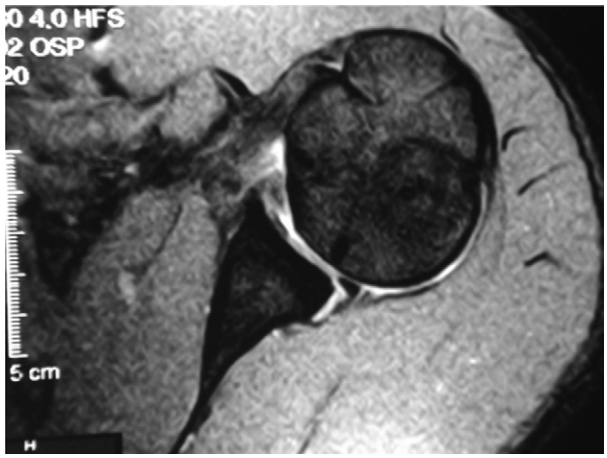

Figure 1. Representative axial section of an MR arthrogram showing a fluid signal between the posterior labrum and glenoid surface in a patient with posterior instability.

Diagnosis was confirmed by clinical examination and magnetic resonance (MR) imaging or MR arthrography (Fig 1). On clinical office examination, all patients manifested symptomatic posterior instability, with abnormal posterior translation to and over the glenoid rim with reproduction of their feeling of instability, apprehension, and discomfort. All had a positive posterior load-shift test. Of 22 patients, 15 could posteriorly subluxate the shoulder with horizontal adduction at chest height with slight internal rotation. This would reduce with horizontal extension of the arm at chest height. No patient exhibited stigmata of ligamentous laxity. There were no sulcus signs or abnormal anterior translations.

Routine shoulder radiographs, including true anteroposterior, scapular Y, and axillary views were obtained. Preoperative MR imaging showed posterior-inferior labral injuries in 18 of 22 cases. Nonoperative treatment had failed in all patients, and all were having recurrent posterior instability after a course of physical therapy, time, bracing as needed, and/or avoidance of their chosen sport.

Patient Demographics

Patient demographics of the 32 cases are displayed in Table 1. The mean follow-up of the 22 cases that had both preoperative and postoperative shoulder out-

Table 1. *Demographic Data of 32 Patients Who Underwent Arthroscopic Posterior Stabilization and Met Inclusion Criteria*

	Data
Age [mean (range)] (yr)	21.4 (15-33)
Gender [no. (%)]	
Male patients	26 (81.2)
Female patients	6 (18.8)
Smoker [no. (%)]	3 (9.4)
Alcohol use [no. (%)]	8 (25.0)
Bilateral symptoms [no. (%)]	1 (3.1)
Sports activity before surgery [no. (%)]	
Football	13 (40.6)
Baseball/softball	6 (18.8)
Other	9 (28.1)
Laborer [no. (%)]	3 (9.4)
Acute event [no. (%)]	25 (78.1)
Dislocation [no. (%)]	2 (6.3)
Affected side [no. (%)]	
Left	11 (34.4)
Right	21 (65.6)
Dominant hand	19 (59.4)

come scores was 35.5 months (range, 12 to 67 months). Most of the patients reported participation in 1 or more athletic activities, including football, baseball, softball, volleyball, swimming, lacrosse, wrestling, weight training, and cheerleading. Of the patients, 8 reported playing at the college level, 10 at the high school level, and 1 at a casual level, whereas 3 were identified as laborers. Patients most commonly presented with loss of performance in their respective athletic activity, recurrent subluxations, and pain.

Surgical Technique

All patients were placed in the lateral decubitus position. An examination under anesthesia was performed to evaluate glenohumeral laxity and humeral translation before lateral positioning (Fig 2). This confirmed the posterior direction in all patients. In no patient did examination lead to locked posterior dislocation. The arm was placed in a 3-point shoulder traction apparatus (Arthrex, Naples, FL). Standard posterior and anterior portals were used.

The anterior portal is made just lateral to the coracoid tip and brought into the glenohumeral joint just over the superior border of the subscapularis tendon. Large 8.25-mm threaded cannulae are used in the anterior and posterior portals. The 12-o'clock anterior superior portal is first localized with a spinal needle. It is placed just anterior to the acromioclavicular joint and directed into the joint in the "axilla" of the long head of the biceps tendon just beneath the tendon-labral junction anterior to the long head origin. This is between the biceps and labrum. A switching stick is placed in the same orientation, and then, a 6-mm threaded cannula is placed. This allows the arthroscope and sheath to be placed down this cannula for excellent visualization of both the anterior and posterior joint lines all the way down into the axillary pouch. Thus the surgeon is viewing from a superior orientation and working anterior to posterior through the respective working cannulae. The arthroscopic examination showed posterior-inferior labral detach-

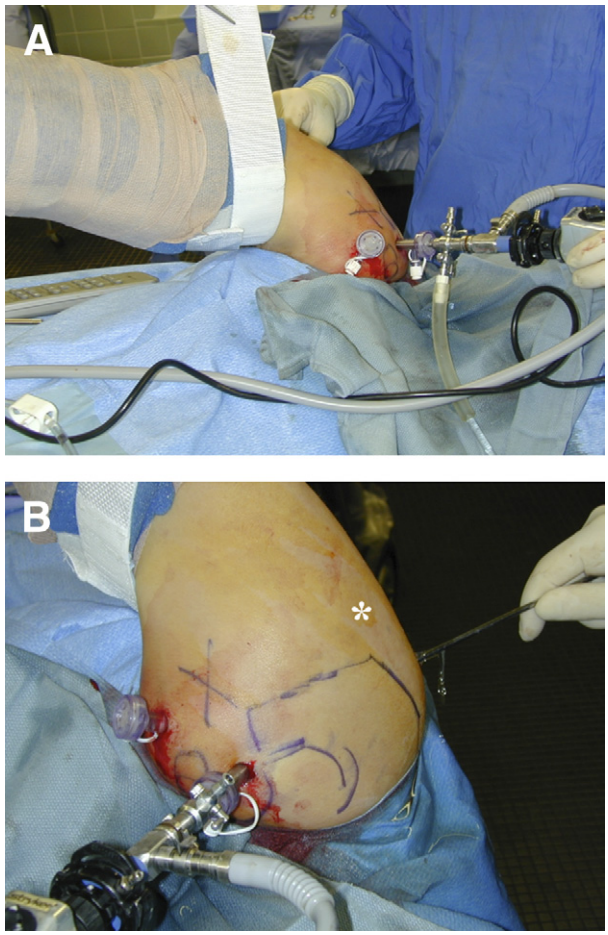

Figure 2. Preoperative positioning and portal placement in a right shoulder. (A) The patient is placed in the lateral decubitus position. After an examination under anesthesia, the arm was placed in a 3-point shoulder traction apparatus. (B) Standard posterior and anterior portals are used, as well as an accessory 12-o'clock portal for the arthroscope, allowing the surgeon to work through both anterior and posterior portals. The asterisk (*) marks the placement of the spinal needle for percutaneous anchor placement. The spinal needle is placed approximately 3 cm distal to the posterolateral corner of the acromion and aimed at the glenoid rim.

ment in 18 of 22 cases. Instruments and elevators from either the anterior or posterior portal are used to elevate and prepare the labral tear, glenoid neck, and glenohumeral joining capsule. Suture anchors are placed on the articular margin by first localizing the proper angle with a spinal needle. Access to the posterior-inferior glenoid rim for percutaneous anchor placement is facilitated by spinal needle localization. The spinal needle is placed approximately 3 cm distal to the posterolateral corner of the acromion and aimed at the glenoid rim (Fig 2B).

The view from the 12-o'clock portal allows guidance to the low glenoid. Then, the drill guide is percutaneously placed through a small stab incision on the articular margin of the posteroinferior glenoid. This technique allows an excellent position low on the glenoid for the first anchor, typically in the 5- or 7-o'clock position. The labrum is then repaired to the glenoid with 2.9-mm MicroMax absorbable suture anchors single loaded with MaxBraid suture (Biomet Sports Medicine, Warsaw, IN). Typically, a tuck of capsule is taken with the suture-passing device (Spectrum; ConMed Linvatec, Largo, FL) and then directed under the labral detachment. A No. 0 Prolene suture (Ethicon, Somerville, NJ) is passed and used to shuttle the suture anchor suture through the labrum and capsule. The suture pass through the capsule is made inferior to the suture anchor position to create a superior shift and reduction in capsular volume when the suture is tied. In cases where only capsular plication was performed, the Spectrum soft-tissue repair system was used to shuttle a suture through the capsule to the intact labrum, and a No. 2 braided nylon suture was used for plication (Fig 3).

Postoperative Rehabilitation

After surgical repair, patients' shoulders were immobilized in an Apex sling with a derotation wedge (Biomet Bracing, Warsaw, IN) for 4 weeks. In that the pathology and operative repair was posterior, this position puts less potential stress and tension on the posterior repair and capsule. The patient was allowed to use the hand, wrist, and elbow in the sling and wedge. At 4 weeks, the wedge was removed and a standard sling was worn for 1 additional week. Pendulum exercises were instituted and active-assisted range of motion was begun with elevation limited to 120° so as not to stress the posterior repair. At 6 weeks, isometric exercises for internal rotation, exter-

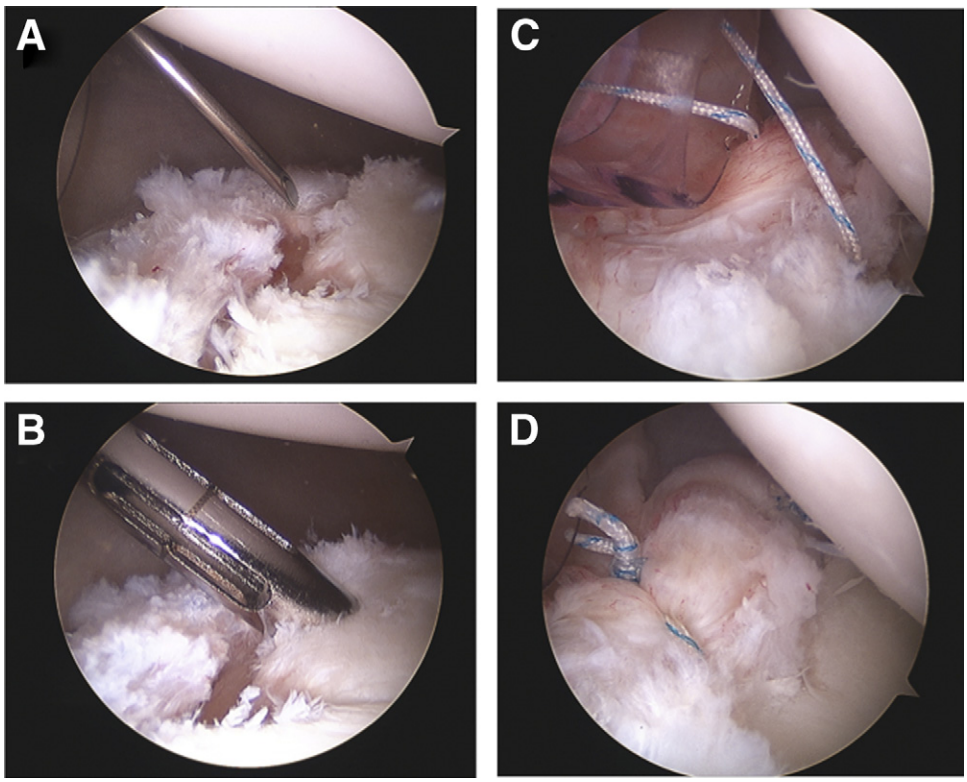

FIGURE 3. Intraoperative arthroscopic images in a left shoulder with a posterior labral detachment seen from the 12-o'clock viewing portal. (A) After elevation of the labrum from the glenoid neck, needle localization of anchor placement is performed. (B) The bioabsorbable suture anchor is placed by use of a guide. (C) Using a Spectrum device, the surgeon shuttles the suture through the detached labral tissue. (D) The suture is tied, approximating the labral tissue to the glenoid rim.

Table 2. *Operative Findings of 32 Patients Who Underwent Arthroscopic Posterior Stabilization and Met Inclusion Criteria*

	Data
Arthroscopy [no. (%)]	32 (100)
Plication alone [no. (%)]	4 (11.8)
Anchor repair [no. (%)]	28 (87.5)
No. of anchors (mean)	1.90
Associated findings [no. (%)]	
Bony Bankart	5 (15.6)
Reverse Hill-Sachs lesion	3 (9.4)
SLAP	6 (18.8)
HAGL	2 (6.3)

Abbreviation: HAGL, humeral avulsion of glenohumeral ligament.

nal rotation, the 3 heads of the deltoid, and the scapular rotators were begun. At 8 weeks, resistive band strengthening for the shoulder was begun. Weight training was allowed at 3 months, and return to contact sports was allowed at 5 to 6 months if the patient had near-normal range of motion and strength.

Statistical Analysis

Statistical analysis was performed with a paired *t* test. $P < .05$ was considered significant, with 95% confidence intervals (CIs) presented. Data are presented as mean ± standard deviation.

RESULTS

Arthroscopic Findings

Thirty-four arthroscopic posterior stabilization procedures were performed. The rates of suture anchor use, the number of cases undergoing plication alone, and associated findings are listed in Table 2. In 6 cases (18.8%) there was evidence of SLAP lesions, the most common associated finding.

Outcomes

Twenty-two patients had complete preoperative and postoperative shoulder outcome scores. In this group the mean visual analog scale score significantly decreased from 3.5 ± 2.1 preoperatively to 0.8 ± 1.3 (95% CI, 1.64 to 3.76) at final follow-up ($P = .0001$). Mean SST scores significantly improved from 9.3 ± 2.5 preoperatively to 11.6 ± 0.7 (95% CI, 1.18 to 3.42) at final follow-up ($P = .0001$). Mean ASES scores also significantly improved, from a mean of 67.9 ± 15.2 preoperatively to 93.2 ± 8.9 (95% CI, 17.72 to 32.88) at a mean of 35.5 months' follow-up ($P = .0001$) (Table 3).

Of the initial 32 patients who met the inclusion criteria, 25 had been evaluated at follow-up, although only 22 had both preoperative and postoperative shoulder outcome scores. Of the 25 who had been seen at follow-up, all patients returned to their previous level of athletic activity. The 3 laborers returned to working at their previous level. Of these 25 patients, 2 (8.0%) reported postoperative symptoms of shoulder instability. No patient required revision surgery. There were no symptoms of persistent pain, wound complications, or infection observed.

DISCUSSION

This study consisted of a consecutive series of patients with isolated posterior glenohumeral instability repaired arthroscopically by a single surgeon. Postoperative instability was reported in 2 patients (8%), whereas no patients required reoperation for stabilization. Validated shoulder outcome methods were significantly improved from preoperative measurements, and all patients were able to return to their preoperative level of competitive activity.

Arthroscopic instability repairs can be performed with patients in the beach-chair or lateral decubitus position. Visualization and exposure of the posterior

Table 3. *Results of Shoulder Outcome Measures in 22 Patients Who Underwent Arthroscopic Posterior Stabilization With Both Preoperative and Postoperative Shoulder Outcome Scores*

	Preoperative	Follow-up	Mean Difference	*P* Value	95% CI
VAS score [mean (SD)]	3.5 (2.1)	0.8 (1.3)	2.7	.0001	1.64-3.76
SST score [mean (SD)]	9.3 (2.5)	11.6 (0.7)	2.3	.0001	1.18-3.42
ASES score [mean (SD)]	67.9 (15.2)	93.2 (8.9)	25.3	.0001	17.72-32.88

NOTE. Statistical comparison was performed with the paired *t* test.
Abbreviation: VAS, visual analog scale.

pathology are critical to successfully restoring preinjury anatomy in posterior recurrent glenohumeral instability repairs. We have used a 12-o'clock anterosuperior viewing portal with patients in the lateral decubitus position for all instability repairs, both anterior and posterior. In this paper, surgical technique and postoperative rehabilitation were consistent among patients. The surgical technique using the anterosuperior 12-o'clock portal for the arthroscope with the patient in the lateral decubitus position allows the surgeon excellent visualization down the posterior and anterior glenoid rims and into the axillary pouch. This technique provides excellent visualization to place the anchors appropriately on the posterior articular margin. The percutaneous placement of the anchors allows the surgeon to place the anchors inferiorly on the glenoid posterior-inferior articular margin. A cannula is not necessary and can actually hinder obtaining the proper angle and access to the glenoid rim. Furthermore, the technique allows the surgeon to work from front to back and back to front through the posterior-to-anterior cannulae.

Our results are consistent with 2 recent cases series. Provencher et al.[15] described 33 consecutive patients who underwent arthroscopic posterior stabilization with either capsular plication or a suture anchor technique. There were 7 failures (21%), 4 because of instability and 3 because of pain. Most of the patients reported good to excellent outcomes as measured by ASES and Western Ontario Shoulder Instability Index outcome scores. Patients with voluntary instability or prior shoulder surgery showed significantly worse outcomes. No comparison to preoperative shoulder outcome measures was made, however. Similarly, Kim et al.[10] reported 27 patients with traumatic unilateral posterior subluxation who underwent arthroscopic stabilization with labral repair and capsular plication. At a mean of 39 months' follow-up, all patients showed significant improvement in ASES, University of California, Los Angeles, and Rowe scores. One patient reported recurrent instability postoperatively and was unable to return to the preoperative level of activity.

This study is composed mainly of a unique population of patients presenting with posterior glenohumeral instability: athletes with recurrent posterior subluxations. Interestingly, only 2 patients reported prior dislocations requiring reductions. This study highlights the somewhat vague symptoms with which these patients can present and that can be mistaken for other pathology. This is because many of these athletes did not have an identifiable instability event, which is more common after anterior instability, the obvious anterior dislocation requiring reduction.

Many surgeons believe that patients with posterior instability have worse results after arthroscopic stabilization compared with anterior instability. Our results compare favorably with previously published data from prior arthroscopic anterior stabilization procedures.[16-20]

There are several weaknesses to this study. The sample size is small, and thus it is difficult to analyze and draw appropriate conclusions applicable to a large population. In addition, 10 of 32 cases did not have adequate complete preoperative or postoperative shoulder outcome measures to be included in the analysis. This was a retrospective analysis with no control of confounding variables. Surgery and evaluation were performed by a single surgeon. ASES and SST scores were used for evaluation. Western Ontario Shoulder Instability Index scores, a very reliable estimator of outcomes after shoulder surgery, were not available.[21]

CONCLUSIONS

This study represents a consecutive series of patients with recurrent posterior instability who underwent arthroscopic posterior stabilization. In this population arthroscopic posterior labral repair and capsular plication provided significant clinical improvement and low rates of recurrent instability and revision surgery.

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