Arthroscopic Repair of Circumferential Lesions of the Glenoid Labrum

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Arthroscopic Repair of Circumferential Lesions of the Glenoid Labrum

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Background: Symptomatic pan-labral or circumferential (360°) tears of the glenohumeral labrum are an uncommon injury. The purpose of the present study was to report the results of surgical treatment of circumferential lesions of the glenoid labrum with use of validated outcome instruments.

Methods: From July 2003 to May 2006, forty-one shoulders in thirty-nine patients (thirty-four men and five women) with a mean age of 25.1 years were prospectively enrolled in a multicenter study and were managed for a circumferential (360°) lesion of the glenoid labrum. All patients had a primary diagnosis of pain and recurrent shoulder instability, and all underwent arthroscopic repair of the circumferential labral tear with a mean of 7.1 suture anchors. The outcomes for thirty-nine of the forty-one shoulders were assessed after a mean duration of follow-up of 31.8 months on the basis of the rating of pain and instability on a scale of 0 to 10, a physical examination, and three outcome instruments (the Single Assessment Numeric Evaluation score, the modified American Shoulder and Elbow Surgeons score, and the Short Form-12 score).

Results: Significant improvement was noted in terms of the mean pain score (from 4.3 to 1.1), the mean instability score (from 7.3 to 0.2), the mean modified American Shoulder and Elbow Surgeons score (from 55.5 to 89.6), the mean Short Form-12 score (from 75.7 to 90.0), and the mean Single Assessment Numeric Evaluation score (from 36.7 to 88.5). Six shoulders required revision surgery because of recurrent instability (two), recalcitrant biceps tendinitis (two), or postoperative tightness (two). All patients returned to their preinjury activity level.

Conclusions: Pan-labral or circumferential lesions are an uncommon yet extensive injury of the glenohumeral joint that may result in recurrent instability and pain. The present study demonstrates that arthroscopic capsulolabral repair with suture anchor fixation can restore the stability of the glenohumeral joint and can provide a reliable improvement in subjective and objective outcome measures.

Level of Evidence: Therapeutic Level IV. See Instructions to Authors for a complete description of levels of evidence.

Shoulder instability and injuries to the glenoid labrum are common in an athletic population. Traumatic lesions of the anterior glenoid labrum, i.e., Bankart lesions, were first described by Perthes[1] and Bankart[2]. Their association with anterior glenohumeral instability and their treatment with arthroscopic repair have been well documented[3-6]. Arthroscopic repair of posterior or reverse Bankart lesions for the treatment of posterior glenohumeral instability has also shown

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A video supplement to this article will be available from the *Video Journal of Orthopaedics*. A video clip will be available at the JBJS web site, www.jbjs.org. The *Video Journal of Orthopaedics* can be contacted at (805) 962-3410, web site: www.vjortho.com.

good results with regard to returning athletes to their preinjury level of participation[7-10].

Superior labral lesions were first described by Andrews et al.[11] in a population of throwing athletes. Snyder et al.[12] later classified SLAP (superior labrum, anterior and posterior) lesions into four categories and initially described arthroscopic techniques for repair. Maffet et al.[13] added three additional types of SLAP lesions in 1995. The relationship between Bankart lesions and SLAP lesions is well known, and arthroscopic repair has been associated with good results[14-17], but the treatment of other combinations of lesions has rarely been described.

Experienced shoulder arthroscopists have recognized the combination of anterior, posterior, inferior, and superior labral lesions that present as a circumferential detachment of the entire labrum from the glenoid rim. Powell et al.[18] first classified this lesion as a pan-labral SLAP type-IX lesion. Lo and Burkhart[19] provided a description of the triple labral lesion (anterior labrum, posterior labrum, and type-II SLAP lesion) in a retrospective review of seven patients. Two of the seven patients had complete circumferential detachment of the labrum. All of these lesions were repaired with arthroscopic suture anchor fixation to bone, with no cases of recurrent instability. We also had noted this pan-labral lesion, and in 2003 we began to prospectively follow the outcomes after arthroscopic suture anchor fixation. The purpose of the present report is to describe the clinical findings, pathological findings, arthroscopic repair technique, and clinical outcomes in a series of patients with a pan-labral lesion who were managed with circumferential repair of the anterior, posterior, inferior, and superior aspects of the glenoid labrum.

Materials and Methods

The SOMOS Research Collaborative

The United States Department of Defense beneficiary population represents one of the largest and most homogeneous patient populations in the country. The Society of Military Orthopaedic Surgeons (SOMOS) recognized the potential benefits of military-wide collaboration in the study of patient outcomes in this population, and, in 2004, the SOMOS Research Collaborative was established. The purpose of this collaborative was to standardize the collection, storage, and analysis of clinical outcome data sets across the military to foster multicenter outcomes research.

Patients

The present study was registered with ClinicalTrials.gov (reference number NCT00849927). All patients undergoing shoulder surgery were entered into the database and therefore had preoperative objective and subjective measurements. From July 2003 to May 2006, all patients with a surgically documented circumferential lesion of the glenoid were offered enrollment in this study. The inclusion criteria consisted of the surgical confirmation of the pan-labral lesion and documentation of preoperative outcome scores. These scores included the Single Assessment Numeric Evaluation (SANE) score, the modified American Shoulder and Elbow Surgeons (modified ASES) score, and the Short Form-12 (SF-12) evaluation as well as visual analog scores for pain and instability. These visual analog scores allowed a patient to mark both pain and instability on a line that was numbered from 0 to 10. The scores were calculated as the percentage of the distance between the 0 and 10 points on the line. Patients were excluded from the study if they did not have a circumferential (360°) labral tear that had been confirmed arthroscopically, had a nerve deficit (axillary or suprascapular) on physical examination, demonstrated chondral damage beyond grade 2 according to the Outerbridge classification system[20], had a rotator cuff tear, or could not complete the follow-up examinations.

A total of forty-one consecutive shoulders in thirty-nine patients (including thirty-four male patients and five female patients) with a mean age of 25.1 years (range, seventeen to thirty-eight years) were prospectively enrolled. Thirty-seven of the thirty-nine patients were right-hand dominant. Thirty shoulders were on the dominant side, and eleven were on the nondominant side. All patients had a primary chief complaint of shoulder pain with a history of anterior and/or posterior shoulder instability. All patients had had a traumatic onset of symptoms, twelve as a result of contact sports, and all had had a failure of initial nonoperative management. Two shoulders had had a previous operation: one had had a previous open Bankart repair four years before the pan-labral repair operation, and the other had had a previous posterior arthroscopic labral repair and subsequently sustained an anterior dislocation. The latter shoulder was revised with an open inferior capsular shift procedure, two years prior to the pan-labral operation. Twenty-six shoulders presented with evidence of primary anterior instability. The patients with primary anterior instability clearly remembered the initial dislocation event and demonstrated an abducted and externally rotated arm at the time of dislocation. Twenty-four of the shoulders with primary anterior instability also had radiographs, made before reduction, showing an anterior dislocation. An additional five shoulders in the primary anterior instability group had variable levels of glenoid bone loss (5% to 10%), with small Hill-Sachs injuries. Nine shoulders had evidence of posterior instability as the patients clearly remembered the initial dislocation event and demonstrated a forward flexed, adducted, and internally rotated position of the arm at the time of dislocation. The remaining six patients could not discriminate between anterior and posterior as the direction of the primary dislocation.

All physical examinations were performed by the treating orthopaedic surgeon (J.M.T., M.T.P., or D.J.S.). The symptomatic shoulder was compared with the contralateral shoulder in terms of range of motion, strength, tenderness, and provocative maneuvers. Range of motion was examined in forward flexion, abduction, and external and internal rotation at 0° and 90° of abduction. As part of our normal protocol, values that were not significantly different from those on the unaffected, contralateral side were recorded as "normal." Any value that was noted to be abnormal was recorded in degrees, or, in the case of internal rotation at 0°, the spinal level. On physical examination, no patient was noted to have a loss of active or passive motion in flexion, abduction, internal rotation, or external rotation at 0°. Thirty-nine of the forty-one shoulders demonstrated a positive apprehension sign[21], and thus the arms were not taken to maximum external rotation in the abducted position in these patients. Strength testing was accomplished with manual muscle testing, and the results for the involved shoulder were compared with those for the contralateral arm in all forty-one cases. Specific testing included shoulder abduction, internal and external rotation at 0°, resisted scaption (elevation in the scapular plane), lift-off, and belly-press testing[21], as well as elbow flexion and extension, wrist flexion and extension, and interosseous muscle testing. No motor deficit was noted in any of these positions. All shoulders had pain-induced limitation of strength testing during an active compression test[21]. Provocative maneuvers included anterior and posterior load and shift testing, an anterior apprehension test, a push-pull test for posterior instability, and an active compression test[21]. As mentioned, thirty-nine of the forty-one shoulders had a positive apprehension test[21]. Care was taken to place the patient with the arm in 90° of abduction and then to increase external rotation. Patients were asked to discern when they became symptomatic and then were asked whether they had the sensation that the shoulder was "coming out" or whether the only symptom was pain. A positive apprehension test was defined as a sensation of the former. All forty-one shoulders had a positive push-pull test for posterior laxity[21] and pain. This test is performed by placing the patient supine on the examining table with the arm in 90° of abduction and neutral rotation. The wrist is grasped and "pulled" by the examiner with one hand, while the shoulder is "pushed" backward with the other hand. A positive test is signified by subluxation of the joint with a reproduction of the symptoms. Tests for impingement signs, including the Neer sign, the Hawkins sign, and painful arc, were performed on all forty-one shoulders[21]. At least one of the signs was positive in all shoulders. An active compression test was performed on all forty-one shoulders and was noted to be positive with pain and weakness in all. No shoulder demonstrated an increased sulcus sign or any sign of hyperlaxity.

Magnetic resonance imaging scans were made for all forty-one shoulders, and all radiographic reports were reviewed. Thirty of the forty-one scans were performed following a gadolinium contrast injection. Intraoperatively, all patients underwent an examination under anesthesia, with particular attention being directed toward anterior and posterior laxity as compared with the contralateral side according to the grading system for instability established by the American Shoulder and Elbow Surgeons[22,23]. Inferior laxity was assessed on the basis of a sulcus sign, measured in centimeters from the edge of the acromion to the top of the humeral head. At the time of arthroscopy, all shoulders demonstrated a complete circumferential tear of the glenoid labrum, and one shoulder had an additional complete radial split of the labrum at the 1 o'clock position (anteriorly), which was repaired. After surgical repair, intraoperative examination while the patient was still under anesthesia showed restoration of normal anterior and posterior glenohumeral translation "to the rim" in all shoulders.

Postoperatively, patients were seen at two weeks, six weeks, three months, six months, one year, and yearly after that. A history was taken, with particular attention being paid to recurrence of dislocation or the sensation of apprehension or pain. Beginning at three months, physical examination was performed to assess range of motion, anterior apprehension, and posterior reproduction of symptoms with use of a push-pull test[21]. In addition, strength testing was accomplished, as was an active compression test. Shoulder outcomes were reassessed with use of the SANE, modified ASES, and SF-12 questionnaires at each follow-up visit, beginning at six weeks. In addition, each patient was asked if he or she would undergo the procedure again. All surveys were administered with use of a standard form and the responses were entered into the SOMOS database. De-identified patient data were combined among surgeons.

Surgical Technique

After the induction of general endotracheal anesthesia with or without an upper extremity regional block, the patient was positioned in the lateral decubitus position with a beanbag for support. The operative extremity was positioned in 20° to 30° of abduction with use of a STaR Sleeve and 3-Point Shoulder Distraction System (Arthrex, Naples, Florida) with 10 lb (4.5 kg) of longitudinal and balanced lateral traction. Superficial osseous landmarks were palpated and were traced on the skin with a marker. A diagnostic evaluation of the glenohumeral joint was initiated with use of a 30° arthroscope that was placed through a standard posterior viewing portal. This portal was placed approximately 2 cm inferior and 1 cm medial to the posterolateral corner of the acromion. An anterosuperior instrument portal was made also with an entry point slightly more lateral than the standard anterior portal. A 7.0-mm cannula (Arthrex) was brought into the joint at the most superior portion of the rotator interval without piercing the leading edge of the supraspinatus tendon or the biceps tendon. This position allowed for the placement of suture anchors anterior and posterior to the biceps anchor for repair of the SLAP portion of the pan-labral lesion without violating the rotator cuff. A second portal, anteroinferiorly, was established just above the subscapularis tendon in a similar fashion.

A probe through the anterosuperior portal was used during the initial evaluation of the glenohumeral joint. Through the posterior and anterior viewing portals, we systematically evaluated the shoulder with use of a method similar to that described by Snyder[23] in his fifteen-point anatomy review of the glenohumeral joint. The presence of pan-labral pathology was confirmed as circumferential detachment of the labrum from the glenoid (Figs. 1-A, 1-B, and 1-C). During viewing through the anterosuperior portal, the arthroscopic cannula in the posterior portal was exchanged over a switching stick for an 8.25-mm cannula.

Preparation of the glenoid rim and labrum was performed in a standard fashion. Beginning posteriorly, the labrum was elevated from the 6 o'clock to the 11 o'clock position with use of a combination of liberator (Arthrex) and shaver devices, with a goal of complete liberation of the labrum and

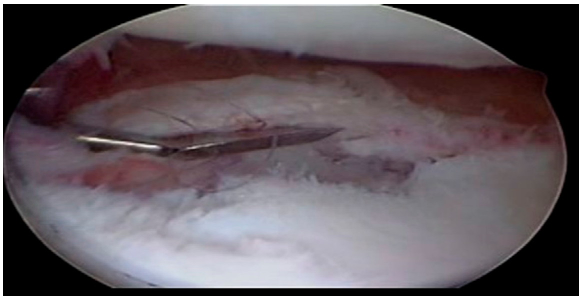

Fig. 1-A

Fig. 1-B

Fig. 1-C

Fig. 1-A Arthroscopic view of a posterior labral lesion in a right shoulder, viewed through the anterosuperior portal. **Fig. 1-B** Arthroscopic view of an anteroinferior labral lesion in a right shoulder, viewed through the anterosuperior portal. **Fig. 1-C** Arthroscopic view of a superior labral lesion in a right shoulder, viewed through the posterior portal.

the creation of a bleeding glenoid surface. We often used a straight biter to remove the most peripheral rim of frayed cartilage to expose the osseous surface of the glenoid rim. The arthroscope was then switched back to the posterior portal, and we proceeded with the same preparation of the anterior labrum, the superior labrum, and the remainder of the inferior labrum and glenoid rim. The anterior labrum was freed until the muscle belly of the subscapularis was visible medially and the labrum could be reduced to the face of the glenoid without tension. We have found it useful to view this portion of the lesion with the arthroscope in the anterosuperior portal and with an instrument retracting the labrum from the anteroinferior portal.

We repaired the labrum circumferentially with 3.0-mm Bio-SutureTak (Arthrex) absorbable or polyethylethylketone (PEEK) anchors (Arthrex) with number-2 FiberWire (Arthrex) and proceeded around the face of the glenoid until complete labral security was achieved. Anchors usually were placed posteriorly in approximately the 7, 9, and 11 o'clock positions; anteriorly in the 5, 4, and 2 o'clock positions; and superiorly in the 11 and 1 o'clock positions (Figs. 2-A, 2-B, and 2-C). We did not use a second cannula for the posterior labral repair as there is often limited room posteriorly. Rather, we used a standard Beath needle from an anterior cruciate ligament set, inserted percutaneously at the posterolateral 7 o'clock position, as a guide for insertion of the suture anchor drill guide. The Beath needle was brought through a stab incision in the skin, 1 cm lateral to the posterior portal, approximately in line with the posterolateral corner of the acromion, and was directed medially and inferiorly to enter the joint inferior to the established posterior cannula. The lateral starting position allowed for a steeper angle relative to the glenoid rim for optimum placement of the suture anchors. The drill guide for the Bio-SutureTak anchors easily slid over the Beath needle into the joint at the 7 o'clock position on the glenoid rim, where it was held while the drill was inserted, followed by the suture anchor. Suture passage was accomplished with use of a Concept Shuttle Relay system (Conmed Linvatec, Largo, Florida), and all sutures were passed retrograde through the labrum and were tied before proceeding to the placement of the next anchor. This approach simplifies suture management but can potentially limit suture passage. An alternative technique would be to pass all sutures before tying. Once passed, all knots were tied with use of a sliding-locking knot, which was reinforced with three reversed half-hitches on alternating posts before proceeding with placement of the next anchor.

We viewed the placement of all of the anterior and superior suture anchors with the arthroscope in the posterior portal, as described in arthroscopy texts[24,25]. The most inferior grasp of tissue is the most important for reestablishing the tension of the anteroinferior aspect of the glenohumeral ligament. The suture is passed through the tissue at 6 o'clock and is shifted from inferior to superior as it is tied down to the suture anchor at 5 o'clock. A suture shuttle technique is most effective

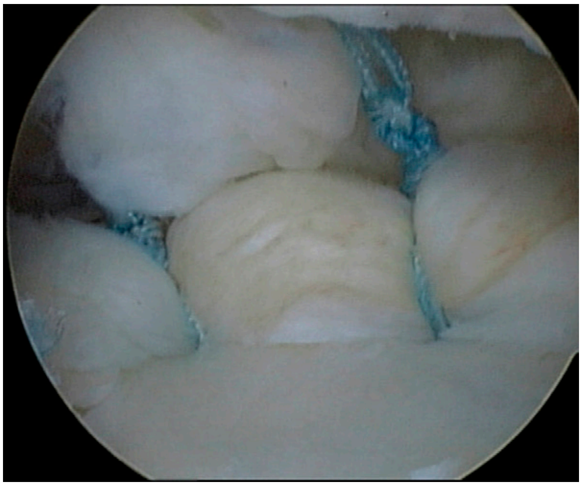

Fig. 2-A

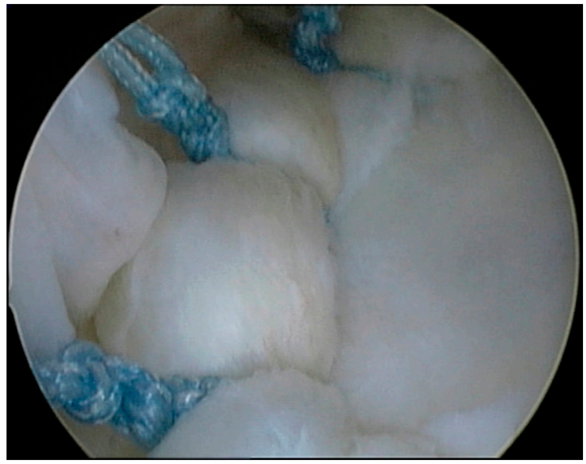

Fig. 2-B

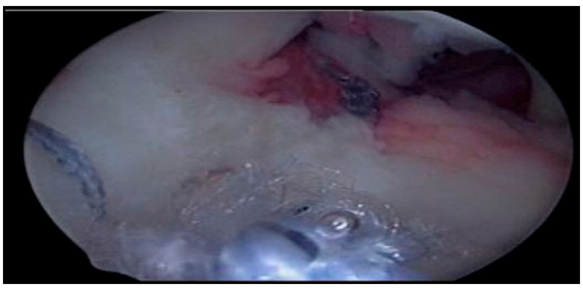

Fig. 2-C

Fig. 2-A Arthroscopic view of a repaired posterior labral lesion in a right shoulder, viewed through the anterosuperior portal. **Fig. 2-B** Arthroscopic view of a repaired anterior labral lesion in a right shoulder, viewed through the anterosuperior portal. **Fig. 2-C** Arthroscopic view of a repaired superior labral lesion in a right shoulder, viewed through the posterior portal.

at this most inferior position, whereas a retrograde retriever can be used to pass the suture at the 3 and 1 o'clock positions.

We also repaired the superior labral lesion. An 11 o'clock anchor was placed through the anterosuperior portal while the portal and drill guide were directed posterior to the biceps tendon. A "bird-beak" device (Arthrex) was used to pass a simple stitch around the labrum at this level. It was tied in a fashion similar to the other anchors. This was repeated at the 1 o'clock anchor position, anterior to the biceps tendon. All arthroscopic equipment was then removed, and the wounds were closed and dressed in a sterile fashion.

Postoperative Care

While the patient was still in the operating room, the shoulder was placed in a sling with an abduction pillow (UltraSling; DonJoy, Vista, California). This support was slightly modified to bring the pillow around the patient's side in order to maintain the arm in neutral rotation. The patient was instructed preoperatively to wear the abduction pillow at all times for six weeks, except during bathing and during pendulum and elbow, wrist, and hand exercises. Passive range of motion in the scapular plane was started at two weeks.

Six weeks after surgery, the abduction pillow was discontinued and the patient began a supervised program of ac-

TABLE I Outcome Scores for the Forty-one Shoulders in the Cohort

	Preoperative and Postoperative Outcomes*†				
	Pain	Instability	Modified ASES	SF-12	SANE
Preop.	4.3 ± 1.5 (1 to 8)	7.3 ± 1.2 (4 to 9)	55.5 ± 14.4 (32 to 87)	75.7 ± 9.1 (60 to 94)	36.7 ± 18 (5 to 80)
Follow-up	1.1 ± 1.5 (0 to 5)	0.2 ± 0.5 (0 to 2)	89.6 ± 11.1 (58 to 100)	90.0 ± 6.6 (74 to 100)	88.5 ± 11.1 (50 to 100)
P value‡	<0.01	<0.01	<0.01	<0.01	<0.01

*The values are given as the mean and the standard deviation, with the range in parentheses. †Modified ASES = Modified American Shoulder and Elbow Surgeons score, SF-12 = Short Form-12, SANE = Single Assessment Numeric Evaluation score. ‡The p values are the returned values for the t-test analysis between the preoperative and follow-up scores.

tive and passive shoulder range of motion to regain full range of motion by twelve weeks. Strengthening of the deltoid, rotator cuff, and scapular stabilizers was started once full range of motion had been achieved. Progressive sport-specific activity was allowed as strength permitted, with a return to unrestricted activity at six to nine months after surgery.

Statistical Analysis

Comparisons were made between preoperative and postoperative outcome scores. All comparisons were analyzed with use of a paired Student t test, with an alpha of 0.05 established for significance.

Source of Funding

This study was accomplished without external funding.

Results

The outcomes for thirty-nine (95.1%) of the forty-one shoulders were assessed after a mean duration of follow-up of 31.8 months (range, twenty-four to fifty-three months). Outcome measures, including the preoperative and most recent modified ASES, SF-12, and SANE scores, are summarized in Table I. Preoperative scores were compared with the most recent follow-up scores for all variables with use of a paired t test. All forty-one shoulders had improvement when the preoperative scores were compared with the postoperative scores. All patients, including all contact athletes, returned to the preinjury level of sports activity. All patients returned to full active-duty status, with the exception of one patient who had postoperative stiffness and was eventually medically separated from the military.

All forty-one shoulders had a preoperative magnetic resonance imaging scan. The radiologist's interpretation was completely correct for twenty-four (59%) of the forty-one shoulders, including twenty-three (77%) of thirty shoulders among patients who had a magnetic resonance arthrogram and one (9%) of eleven shoulders among those who had a plain magnetic resonance imaging scan. Five shoulders had variable levels of glenoid bone loss (5% to 10%), with small Hill-Sachs lesions. In each case, these lesions were addressed similarly to the rest of the group, with anchor placement on the face of the remaining glenoid and restoration of the tension and bumper effects of the repaired labrum and ligamentous complex.

There were no intraoperative complications. However, six of the forty-one shoulders had development of difficulties after surgery. Two of these shoulders had subsequent dislocation events. Neither shoulder exhibited bone loss intraoperatively. Both dislocations were in intercollegiate football players who had completed at least one season prior to the redislocation. Both patients had a revision, and both were noted to have a recurrent Bankart lesion on arthroscopy; however, the previous repair of the posterior and superior lesions had healed completely. Both patients underwent an open Bankart repair with a capsular shift at the time of the revision. At the time of the latest follow-up, the patients had modified ASES scores of 95 and 99 and had completed their intercollegiate football careers but were less active athletically. Two other patients had development of postoperative tightness and loss of internal rotation at 90° of abduction and were unresponsive to nonoperative management, and both underwent an arthroscopic release. Both patients returned to full activity, and the most recent SANE scores were 86 and 90. Two shoulders (5%) had a persistent SLAP lesion with recalcitrant biceps tendinitis. Both shoulders were treated with biceps tenodesis. One patient had complete resolution of the symptoms. The other patient had persistent pain in the anterior aspect of the shoulder near the bicipital groove after a subpectoral interference screw biceps tenodesis and underwent a medical board separation from the military.

In addition, one Olympic-level wrestler retired from competition after two seasons and cited the shoulder as a contributing factor.

Discussion

Little has been written on combined lesions of the glenoid labrum[12,13,16,17,26]. Powell et al.[18] first described a circumferential labral lesion as a type-IX SLAP lesion. We are aware of only one report on so-called triple labral lesions. In that retrospective review, Lo and Burkhart[19] described patients with anterior Bankart, posterior Bankart, and type-II SLAP lesions. Two of the lesions were circumferential. The authors noted that these lesions represented 2.4% of all labral lesions.

Lo and Burkhart believed that, given an initial traumatic dislocation in the abducted and externally rotated position, with a positive apprehension test and in the absence of symptomatic posterior instability, the pan-labral lesion is primarily an extension of anterior instability as predicted by the circle concept of instability[12,17,27-29]. Similarly, in our series, twenty-six shoulders had good evidence of a primarily anterior instability mechanism of injury, with the patients specifically remembering an abducted and externally rotated position of the arm at the time of dislocation. These patients also had prereduction radiographs that showed an anterior dislocation or had osseous defects such as anteroinferior glenoid loss or a Hill-Sachs lesion. In contrast, however, nine (22%) of the forty-one shoulders presented with primarily posterior pathology, with the patient clearly remembering the arm being forward flexed and internally rotated. This latter group suggests that this circular instability also may begin posteriorly and progress anteriorly.

Discriminating a pan-labral lesion from a unidirectional labral lesion can be quite difficult. Although we found no litmus test to accomplish this, we did learn several things from our patients that have heightened our suspicion of this lesion. First, no shoulder presented after a single dislocation event, and all shoulders in this population had at least five dislocations. If this lesion does represent a progressive tearing through a circle concept, it makes sense that multiple events may be required to fully detach the labrum. Second, all patients complained of substantial shoulder pain on presentation. Although this certainly can occur in patients with unidirectional instability, many of these patients are relatively asymptomatic between episodes. Third, nearly all shoulders had positive provocative tests for a labral tear in all directions. In our experience, physical examination of a limited labral tear generally yields positive provocative signs primarily in the direction of the tear, especially if the examination is performed well after an instability episode. In contrast, pan-labral injuries remain symptomatic even if there has not been a recent instability event. Finally, our population is an extremely active one, and, because of military requirements, the patients are often discouraged from limiting their activity. This high level of activity may have made them more prone to this injury. Thus, while it can be difficult to discern the pan-labral lesion on the basis of history and physical examination alone, the examiner should have a heightened suspicion when evaluating a shoulder with multiple dislocations, substantial pain in the absence of a recent event, and provocative maneuvers that reproduce the symptoms in anterior, posterior, and superior directions. In such situations, a magnetic resonance imaging arthrogram may be helpful for making a complete diagnosis.

Our surgical approach to these lesions combines many of the individual labral repair techniques that have been described. Core principles include identification of the entire lesion, meticulous biologic preparation so that bleeding surfaces are available for healing, and secure circumferential fixation with suture anchors placed just on the glenoid face with reestablishment of appropriate bumper and tension effects. Unique to the pan-labral lesion is that complete avulsion of the labrum can make it more difficult to establish initial tension to guide an anatomic repair. We have found that the biceps tendon is an excellent anatomic landmark and that, if it is placed in an appropriate position, the remainder of the reconstruction can be guided from it. There are many different ways to approach the combined labral lesion, and the experience of the surgeon should be paramount in determining the individual technique. The rationale behind repairing all portions of the pan-labral lesion is based on the fact that labral detachment lesions may not heal anatomically, contributing to instability and pain[19,29,30].

The outcomes of the present study after 2.5 years of follow-up are promising. All shoulders showed significant improvement in terms of outcome scores, pain, and the subjective sense of instability. Eight of our patients were collegiate or international level contact athletes, and all returned to that activity for at least one season. It should be noted, however, that the overall rate of failure was 15% (with two cases each of recurrent instability, stiffness, or persistent SLAP lesions). It is likely that the complexity and extent of the lesion contributed to this failure rate as the three essential repairs (anterior, posterior, and superior) each need to heal in order to achieve a successful result. Both of the shoulders with recurrent instability were in contact athletes, which may have put them at an increased risk of recurrence. In addition, we modified our rehabilitation program to account for the posterior lesion, which is a more conservative approach than is commonly undertaken after simple Bankart repair. This may have contributed to the two cases of stiffness.

Several important concepts were learned from the present study. The first is that combined lesions of the glenoid labrum are difficult to diagnose on physical examination. Often, patients with these lesions present with a history of unidirectional instability and have pain and guarding with most examination maneuvers of the shoulder. In addition, we found that magnetic resonance imaging without contrast medium was not very helpful for identifying these lesions. Given the difficulty of making the diagnosis preoperatively, it is important for the surgeon to be prepared for such lesions whenever undertaking arthroscopic treatment of the labrum in order to ensure optimum patient positioning and the availability of an adequate number of suture anchors.

The present study had several weaknesses. The first was the lack of longer-term follow-up. It is unclear whether instability rates will increase over time or if there will be detrimental effects in association with the placement of a mean of 7.1 suture anchors in the shoulder. In addition, it is concerning that two of eight elite contact athletes had a recurrence. Although all eight returned to the previous level of competition, all but one of them had less than two seasons of intercollegiate athletics remaining. It is unclear whether or not repairs performed with this technique would have held up indefinitely in patients involved in contact sports.

An additional weakness is the fact that only one treatment strategy was employed in this group. While all of these patients had failed to improve with nonoperative treatment, it is possible that other treatment strategies may have yielded equivalent or better results. It also should be noted that our population of active military members has job requirements and cultural norms that are not applicable to other populations. In addition, as this was a multicenter study involving procedures performed by three surgeons, there may have been a slight variation in surgical technique and slight variation in anchor-type usage. However, we believe that this multicenter approach and the establishment of the SOMOS Research Collaborative to standardize diagnosis, outcomes, and postoperative regimen increase the external validity of this study. Finally, as all physical examinations were performed by the treating orthopaedic surgeon (J.M.T., M.T.P., or D.J.S.), a potential observer bias was introduced that could have been avoided had an independent blinded examiner performed the examinations.

In spite of these shortcomings, to our knowledge, this is the first study to describe the clinical outcomes of a prospective cohort of patients with pan-labral lesions that were treated surgically. In addition, we were able to increase the power of our study with a multicenter collaboration with use of standardized outcomes-data collection and near-uniform treatment of the patients. Our results demonstrate that the treatment of pan-labral lesions of the shoulder can be associated with reproducible results and a high rate of patient satisfaction and return to activity. Additional study, particularly with longer-term outcomes, is warranted. ■

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