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SLAP Lesions of the Shoulder

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Summary: A specific pattern of injury to the superior labrum of the shoulder was identified arthroscopically in twenty-seven patients included in a retrospective review of more than 700 shoulder arthroscopies performed at our institution. The injury of the superior labrum begins posteriorly and extends anteriorly, stopping before or at the mid-glenoid notch and including the "anchor" of the biceps tendon to the labrum. We have labeled this injury a "SLAP lesion" (*S*uperior *L*abrum *A*nterior and *P*osterior). There were 23 males and four females with an average age of 37.5 years. Time from injury to surgery averaged 29.3 months. The most common mechanism of injury was a compression force to the shoulder, usually as the result of a fall onto an outstretched arm, with the shoulder positioned in abduction and slight forward flexion at the time of the impact. The most common clinical complaints were pain, greater with overhead activity, and a painful "catching" or "popping" in the shoulder. No imaging test accurately defined the superior labral pathology preoperatively. We divided the superior labrum pathology into four distinct types. Treatment was performed arthroscopically based on the type of SLAP lesion noted at the time of surgery. The SLAP lesion, which has not been previously described, can be diagnosed only arthroscopically and may be treated successfully by arthroscopic techniques alone in many patients. **Key Words:** SLAP lesion—Superior labrum—Arthroscopy.

With the advent of shoulder arthroscopy, it is now possible to diagnose certain injury patterns that cannot be diagnosed using radiographic methods. One such injury pattern involves the superior aspect of the glenoid labrum, in which the injury begins posteriorly and extends anteriorly, stopping at or above the mid-glenoid notch. This area of the labrum is functionally important, since it serves as the "anchor" for the insertion of the long head of the biceps tendon. For simplicity, we call this injury pattern, a "SLAP" lesion (*S*uperior *L*abrum *A*nterior and *P*osterior). SLAP lesions are not common but are a source of significant disability to the patient, are difficult to diagnose without arthroscopy, and are often successfully managed with arthroscopic treatment. This paper presents the findings of superior labral pathology in a group of patients who underwent shoulder arthroscopy at the Southern California Orthopedic Institute. A review of these patients suggests a classification system for superior labral pathology that helps to guide the appropriate therapy. We present here the preliminary results of such treatment and point to possible future directions for improving therapeutic outcomes.

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The technique described in this article will be demonstrated in a forthcoming Video Supplement to Arthroscopy.

MATERIALS AND METHODS

A retrospective review was conducted of more than 700 shoulder arthroscopies performed by the surgeons at the Southern California Orthopedic In-

stitute from January 1, 1985 to December 31, 1988. This review identified 27 patients who had significant pathology of the superior labrum at the time of arthroscopy. The charts and operative videotapes were reviewed for each of these patients, and the lesions were classified into different types.

RESULTS

Patient characteristics

There were 23 males and four females in this study. The average age at the time of surgery was 37.5 years, with a range from 20 to 60 years old. There were 15 injuries of the right shoulder and 12 injuries of the left shoulder. Time from injury to surgery ranged from 2 months to longer than 60 months, with an average of 29.3 months. Patients were treated with a variety of methods, including physical therapy, steroid injections, and nonsteroidal antiinflammatory drugs prior to surgery.

Two distinct mechanisms of injury were apparent. The most common mechanism, seen in 13 patients, was a compression force applied to the shoulder. This usually occurred as the result of a fall onto an outstretched arm, with the shoulder positioned in abduction and slight forward flexion at the time of impact. A second mechanism of injury was due to traction on the arm, either as a result of a sudden pull on the arm (six patients) or as a result of throwing or of an overhead sports motion (two patients). In six patients, onset of shoulder symptoms was insidious, and no mechanism of injury could be determined.

Clinically, all patients complained of pain in the shoulder, usually greater with overhead activities. A painful "catching" or "popping" sensation with overhead activities was reported preoperatively in 12 of the patients. On physical examination, the most useful diagnostic tests were the biceps tension test (resisted shoulder flexion with the elbow extended and forearm supinated) and the joint compression-rotation test. The compression-rotation test is performed with the patient supine, the shoulder abducted 90° and the elbow flexed at 90°. A compression force is applied to the humerus, which is then rotated, in an attempt to trap the torn labrum. Labral tears may be felt to catch and snap during the test, as meniscal tears do with MacMurray's test.

Although imaging techniques, such as magnetic resonance imaging (MRI) and computed tomographic arthrography, were helpful in defining associated pathology, none of them accurately defined the superior labral pathology that was diagnosed arthroscopically. Recently, magnetic resonance arthrography with intraarticular injections of Gadolinium have revealed these lesions in some patients.

Operative findings and classification of lesions

All patients underwent arthroscopic examination of their shoulders using the fifteen-point shoulder arthroscopic evaluation system. All had superior labral pathology, which was classified as one of four types.

Type I

The superior labrum had marked fraying with a degenerative appearance, but the peripheral labral edge remained firmly attached to the glenoid, and the attachment of the biceps tendon to the labrum was intact (Fig. 1A, B).

Type II

Fraying and degenerative changes were similar in appearance to those of Type I. In addition, the superior labrum and attached biceps tendon were stripped off the underlying glenoid, with the result that the labral-biceps anchor was unstable and arched away from the glenoid (Fig. 2A, B). In these cases, the question arises whether this is indeed pathologic or simply a variation of normal anatomy. Detrisac and Johnson (1) have extensively studied normal labral anatomy. They found that the labrum was always attached to the underlying glenoid peripherally, with varying attachment of the central edge. Clearly, then, a detachment of the superior labrum from the peripheral aspect of the glenoid is abnormal. In some cases, a partial detachment was seen, with the remaining attachment of the labrum to the glenoid occurring medial to the articular surface of the glenoid along the glenoid neck. As Detrisac has noted, the articular cartilage of the glenoid normally extends to the attachment of the labrum. In partial detachment of the labrum, the labrum is attached to the bone along the glenoid neck, inferior to the articular surface edge of the glenoid.

Type III

A bucket-handle tear was noted in the superior labrum. The central portion of the tear was displaceable into the joint, while the peripheral portion

1A,B

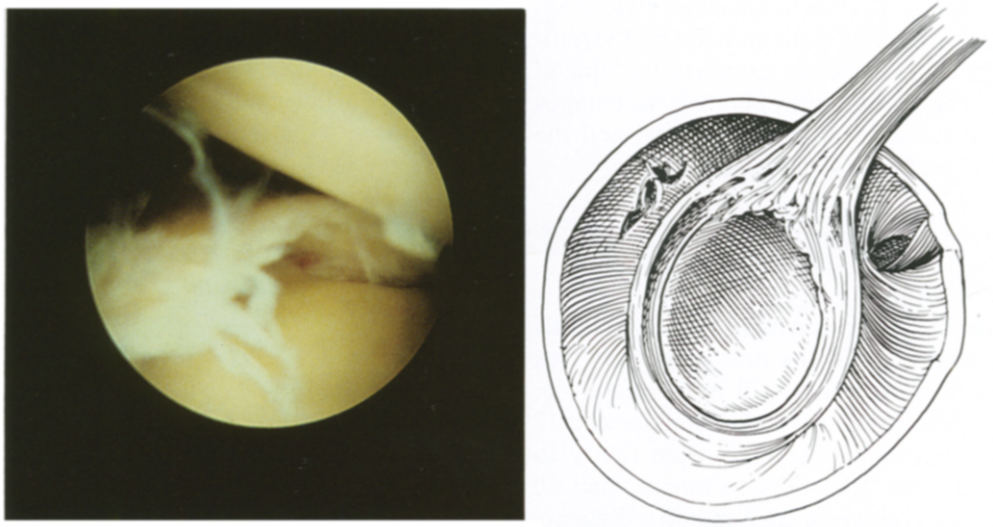

FIG. 1. Arthroscopic (A) and schematic (B) illustration of Type I SLAP lesion.

of the labrum remained firmly attached to the underlying glenoid and to the biceps tendon, which was also intact (Fig. 3A, B).

Type IV

Bucket-handle tears of the superior labrum similar to those of Type III were noted, but in addition, the tear extended into the biceps tendon. The biceps tendon had an attached partial tear, which tended to displace with the labral flap into the joint (Fig. 4A, B).

The occurrence of each type of lesion was as follows:

Type I—three patients (11%)
Type II—11 patients (41%)
Type III—nine patients (33%)
Type IV—four patients (15%)

Treatment

Treatment of the SLAP lesions was dependent on the type of lesion. In Type I lesions, the torn and frayed labral tissue was debrided back to intact la-

2A,B

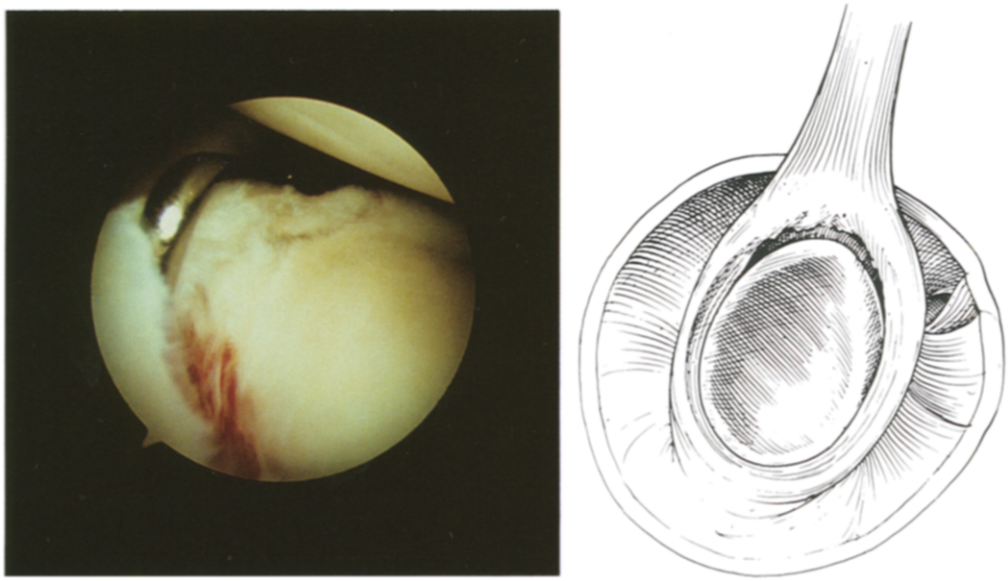

FIG. 2. Arthroscopic (A) and schematic (B) illustration of Type II SLAP lesion.

3A,B

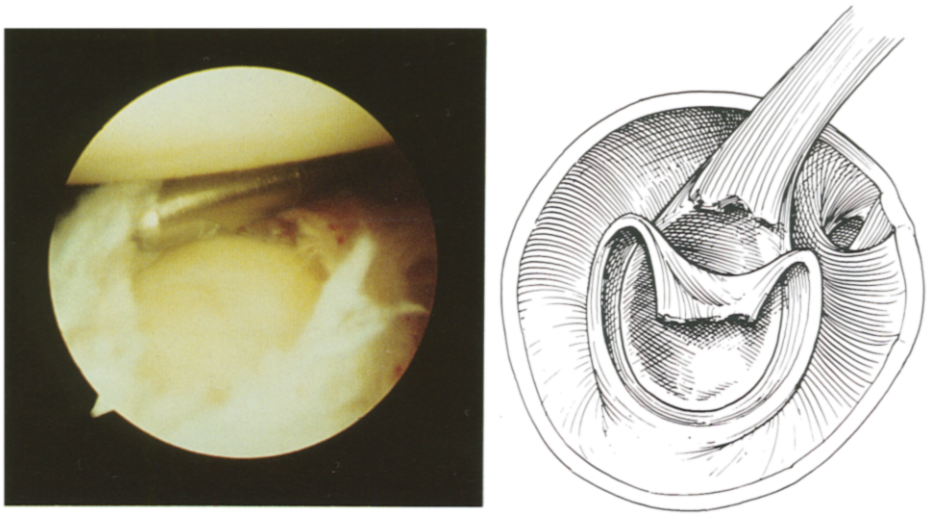

FIG. 3. Arthroscopic (A) and schematic (B) illustration of Type III SLAP lesion.

brum, carefully preserving the attachment of the labrum and biceps tendon to the glenoid. In Type II lesions, the superior glenoid neck below the biceps anchor was abraded to bleeding bone after debridement of the frayed labral tissue, to promote healing of the avulsed labrum to the underlying bone. Although further fixation of the labrum to bone with a staple, screw, or sutures would be desirable, this was not technically feasible at that time. Currently, however, an absorbable fixation tack is used to reattach the superior labrum. Since the biceps tendon insertion tends to displace the labrum away from the bone when the biceps contracts, biceps tenodesis was performed in three patients with grossly unstable, near complete detachment of the biceps anchor from the glenoid, who also had symptoms referable to the biceps tendon. Type III lesions were treated with excision of the bucket-handle tears. Type IV lesions were treated in a similar manner, but also had resection of the split portion of the biceps tendon. If the biceps tear involves more than 50% of the tendon, and if the patient has symptoms referable to the biceps tendon, biceps tenodesis may also be performed.

4A,B

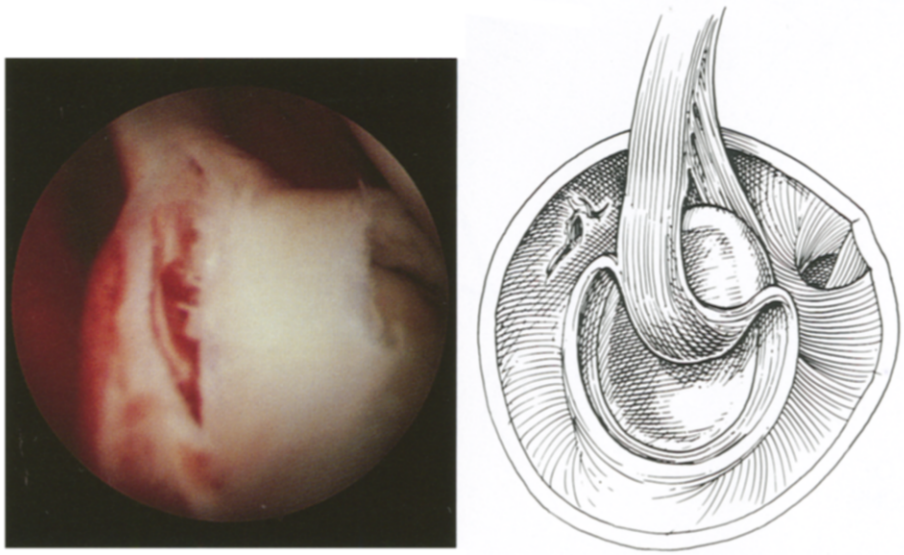

FIG. 4. Arthroscopic (A) and schematic (B) illustration of Type IV SLAP lesion.

Associated pathology

A high incidence of associated pathology was noted in these patients. Associated diagnoses were (some patients had more than one):

Partial rotator cuff tear—seven patients (26%)
Full-thickness cuff tear—four patients (15%)
Anterior instability—four patients (15%)
Humeral head chondromalacia/indentation fracture—four patients (15%)
Acromio-clavicular joint arthritis—three patients (11%)

The superior labral pathology in all patients was treated arthroscopically. Thirteen patients (48%) had primarily superior labral pathology and were treated arthroscopically. An additional three patients (11%) had primarily superior labral complex pathology but underwent arthroscopically assisted open biceps tenodesis in addition to the arthroscopic treatment. Nine patients (33%) had open procedures for repair of major associated pathology, while two patients (7%) had arthroscopic stabilization of anterior instability.

Follow-up results

Preliminary results of treatment have been encouraging; most patients have been satisfied after surgery. The length of follow-up is too short to know the true efficacies of the various treatment

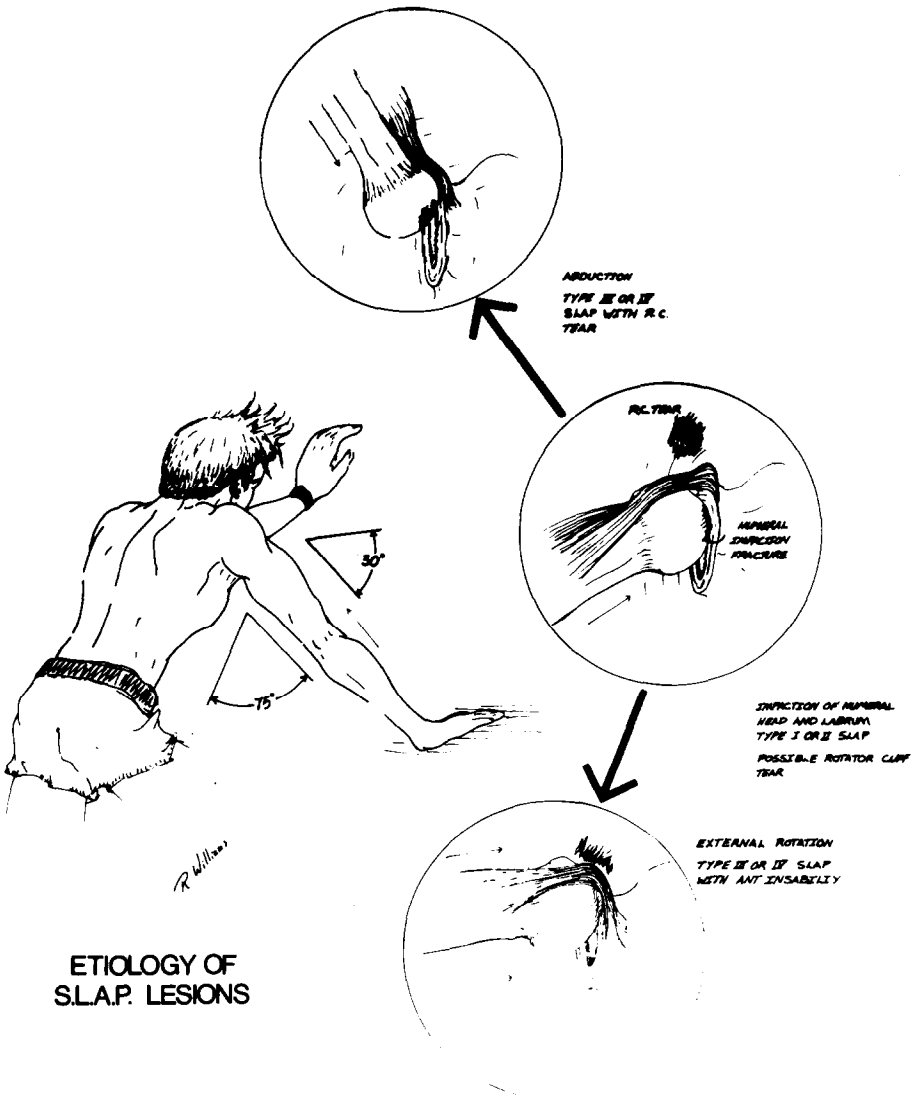

FIG. 5. Postulated mechanism by which SLAP lesion occurs after a fall on an abducted arm.

options. Long-term follow-up on these patients will be reported when available.

Complications

Only one patient had a postoperative complication. In this patient, staple fixation of an unstable Type II lesion was attempted arthroscopically. A postoperative radiograph showed possible impingement of the staple into the joint. The patient was returned to the operating room two days postoperative for open staple removal and biceps tenodesis. He subsequently developed fibroarthrosis of the shoulder, which required manipulation at four months and ten months postoperative. He had residual loss of motion but ultimately returned to work as a police officer. His final rating was fair.

DISCUSSION

This paper describes pathology involving the superior labrum and biceps anchor of the shoulder, which can be diagnosed only arthroscopically and may be treated successfully by arthroscopic techniques in a high percentage of patients. We believe our results have been improved recently by using an absorbable fixation tack to reattach the superior labrum to the underlying abraded bone of the glenoid neck. The one complication in our series was in a patient in whom staple fixation was attempted, and we do not recommend the use of staples for fixation.

There have been few previous studies of superior labral pathology (2,3). Andrews and Carson (2) reported on a group of athletes who had tears of the anterosuperior labrum not extending posterior to the biceps. Of these, 9.7% patients also had a partial biceps tear. At 13.5 months follow-up, 88% were rated as good or excellent after arthroscopic debridement of the lesion. The authors felt that this injury pattern was due to repetitive traction of the biceps tendon on the labrum as a result of repeated throwing motions. The labral pathology they described differs from a SLAP lesion since it does not extend to the posterior labrum.

In our study, a subset of patients gave a history of a traction injury of the shoulder. Unlike Andrews' patients, this traction injury was a single event and was not due to repetitive traction stresses from throwing. But the most common mechanism of injury in our patients was compression loading of the shoulder in a flexed and abducted position. It is postulated that the superior labral injury was caused by a combination of compression force on the superior joint surface and a proximal subluxation force on the humeral head (Fig. 5). The labrum and biceps tendon would then be pinched between the humeral head and the glenoid, causing a traumatic disruption of these structures and possible compression fracture of the superior humeral head. If the proximally directed forces continue, the traction stresses may tear the rotator cuff. If the arm externally rotates at impact, the tear may propagate anteriorly, and anterior instability may result. Further abduction of the arm during compression loading of the joint may cause Type III and Type IV lesions. Strong reflex contraction of the biceps or rotator cuff may magnify the effects of the traction injury.

It should be emphasized that the results in our study are preliminary, involving a small number of patients with short-term follow-up. But, the superior labral lesions detailed in our study caused significant disability, were diagnosable only by arthroscopic examination, and were treated successfully in a high percentage of cases by arthroscopic techniques. It is hoped that by describing the SLAP lesion, we can help shoulder surgeons be aware of it in their differential diagnoses, and continue to explore possible options for treatment without overlooking a potentially disabling type of treatable shoulder pathology.

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