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ORIGINAL ARTICLE

Outcome of Arthroscopic Repair of Type II SLAP Lesions in Worker's Compensation Patients

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Abstract *Purpose:* Arthroscopic stabilization has become the accepted treatment for type II superior labral anterior and posterior (SLAP) lesions. Short-term results using a variety of techniques were promising, but most reports focus on motivated athletes. The purpose of our report is to evaluate the results of arthroscopic fixation of type II SLAP lesions in 21 patients who suffered a work-related injury and are receiving workers' compensation. The hypothesis was that in patients with a single event trauma who were receiving workers' compensation, clinical results would be inferior to those previously reported. *Methods:* Twenty-two consecutive workers' compensation patients with type II SLAP lesions underwent arthroscopic stabilization between October 1994 and December 1996. All patients received suture anchors with nonabsorbable suture secured around the labrum for definitive fixation. Average age at surgery was 43 and average follow-up time was 27.9 months. Seventeen patients (89%) had an acromioplasty at the time of labral stabilization. Outcome was assessed by analysis of visual analog pain scale, simple shoulder test (SST) and general health status questionnaire (SF-36), subjective patient satisfaction, and ability to return to work. *Results:* Visual analog pain scales improved by an average of 3 points although all patients had significant complaints of pain at follow-up. Simple shoulder test responses showed improvement in 9 out of 12 categories. The SF-36 results showed significant improvements only in the bodily pain category and role: physical category. Five patients required reoperation for persistent pain. However, only seven patients (437%) returned to work at their previous functional level, nine patients (47%) returned to work but at less strenuous jobs, and three patients (16%) did not return to work. *Conclusions:* Currently recommended treatment for type II SLAP lesions is arthroscopic stabilization. When this procedure is performed in workers' compensation, patients a with single event trauma to the shoulder, objective parameters, and patient self-assessment surveys do show improvement. However, results are inferior to those previously reported in the literature.

Key words labrum · SLAP · shoulder

Introduction

Injury to the superior labrum in shoulders was first described by Andrews et al. [1] in 1985. In his original paper, he noted tears of the superior labrum near the biceps tendon insertion in 73 baseball pitchers. He postulated that the mechanism of injury in these cases was tension of the biceps tendon at its insertion occurring during the follow-through phase of the throwing motion.

This injury pattern was further described by Snyder et al. [2] in 1990. He retrospectively reviewed more than 700 shoulder arthroscopies over a 3-year period and described injuries to the superior labrum in 27 of these patients. He termed this injury pattern "SLAP" lesions (superior labrum anterior and posterior). He then went on to classify these injuries into four types. Type I involves fraying of the superior labrum with a degenerative appearance. Type II involves an unstable separation between the superior labrum biceps anchor and the glenoid. Type III is described as a bucket handle tear of the labrum with an intact biceps tendon. Type IV tears involve a bucket handle tear of the labrum with extension into the biceps tendon.

Superior labrum anterior and posterior lesions are a relatively uncommon cause of internal shoulder derangements. Most studies report an incidence between 4–6% [2–4]. In his original article, Snyder describes the most common SLAP tears as type II injuries with an overall

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incidence of 41% of all SLAP tears [2]. Multiple studies since that time have confirmed this finding. He also described two distinct mechanisms of injury. The first is a direct compression force applied to the shoulder, usually as a result of a fall on an outstretched arm. The second is a traction force on the arm, either as a result of a sudden pull on the arm or as a result of repetitive overhead sports activities. In his results, however, he did not describe a difference in outcomes with regard to overhead athletes or patients with single-event traumatic injuries.

The treatment of this problem has also changed over the last 10 years. At the time of the initial description, tissue fixation devices other than arthroscopic metal staples were not readily available. Therefore, most lesions were treated with debridement alone. However, with the advent of suture anchors, bioabsorbable tissue fixation devices, and specialized instruments, the treatment recommendations have evolved. Current recommendations include debridement and definitive fixation with either suture anchors or less commonly, a tissue tack device.

To date, results of repair of type II SLAP lesions were favorable. However, studies have included mixed groups of patients, including repetitive overhead athletes and patients with single-event trauma. Furthermore, the results of treatment of type II SLAP lesions in patients receiving workers' compensation were not reported. Our experience with these patients was that results are inferior to those previously reported. The purpose of our report is to evaluate the results of arthroscopic fixation of type II SLAP lesions in 21 patients who suffered a single-event trauma to the shoulder as a work-related injury and are receiving workers' compensation.

Methods

A total of 45 patients underwent surgical treatment for type II SLAP lesions between May 1994 and December 1996 by the senior author. Patients with work-related injuries and workers' compensation claims were included in this study. All patients' occupation involved some form of manual labor. Patients' charts were retrospectively reviewed and data were collected. Information retrieved included demographic data, date of injury, date of surgery, previous and subsequent surgeries, and preoperative and postoperative SST (simple shoulder test), SF-36, visual analog pain scores, and return-to-work (RTW) status. If all information was not present, the patient was contacted for a return office visit or phone interview.

A total of 19 patients and 21 shoulder injuries were included. There were 17 men and 2 women, with an average age of 43 (range 32–60 years), and average follow-up of 28 months (7–51 months, median 30). In 15 patients the right shoulder was involved, in 4 patients the left shoulder was involved, and in 2 patients there was bilateral involvement. In 17 patients, the shoulder of the dominant upper extremity was involved.

Five patients had previous surgeries on the involved shoulders. One patient had bilateral distal clavicle resections. One patient had an arthroscopic debridement and rotator cuff tear repair. One patient had a subacromial decompression and SLAP debridement, and two patients had undergone a previous arthroscopic acromioplasty. In one patient, an open rotator cuff repair had been performed on the opposite shoulder.

The presenting symptom was pain in all patients. The pain was usually described as deep within the shoulder, typically on the anterior aspect of the shoulder. All patients complained of pain that interfered with their daily activities and sleep at night. Additional symptoms included catching, clicking, or popping. A complete physical examination was performed on all patients. The majority of patients also reported significant functional deficits with the involved extremity, such as inability to lift 8 lb to the level of their shoulder and difficulty with any above shoulder activities.

Radiographic evaluation included anteroposterior and lateral radiographs in the scapular plane, and an axillary lateral view. All radiographs were normal. Magnetic resonance imaging was not part of the standard workup. The course of conservative therapy was often limited by the worker's compensation situation, where the need for an expedient definitive diagnosis and treatment is high, and thus the average time between presentation and surgery was 2 months. If the history and exam findings were consistent with superior labral pathology and the patient did not respond to initial conservative management, arthroscopy was recommended.

Results were assessed by visual analog pain scale, SST, SF-36, patient satisfaction, and patient RTW. The mechanism of injury in all cases was a single-event trauma to the affected extremity. Two cases involved falls onto the outstretched extremity. Two cases involved direct blows to the shoulder. In the remaining cases the mechanism of injury was a traction event to the involved extremity.

After examination of the shoulder under anesthesia, the arthroscope was placed into the joint via a standard posterior portal. An anterior portal, lateral to the coracoid, was used for the introduction of instruments. The diagnosis of type II SLAP tear was established using a probe through the anterior portal. The evaluation of the labral included fraying or other evidence of labral tearing, ability to displace the labral away from the underlying glenoid, and exposure of underlying glenoid bone. Definitive stabilization was accomplished with the use of bone anchors, which were inserted through a lateral portal. A lateral cannula was not used; anchors were placed percutaneously using the drill trochar. Metal anchors with nonabsorbable sutures were used in every patient. There were 5 patients with one anchor, 11 with two anchors, and 4 with three anchors. In 19 shoulders, concomitant subacromial decompression was performed. No patients underwent additional procedures.

Postoperatively, a sling was used, and elbow, wrist, hand, and Codman's exercises were initiated in the second postoperative week. Only passive range of motion (ROM) was allowed for the first 6 weeks. At this point, the sling was discontinued and active ROM was initiated. Strengthening was restricted for 3 months. Active biceps strengthening with less than 5 lb was started at postoperative week 4, and no heavy biceps activity was allowed for 3 months.

Results

Using the visual analog pain scale, the average pain rating reduced from 7.0 to 3.5. This was a statistically significant reduction, but patients often still had substantial complaints of pain, and pain scores were still trending downward up to 1 year after surgery.

There were significant improvements in almost every question on the SST, which was obtained preoperatively and postoperatively in all patients (Table 1). Whereas the ability to reach behind the back, lift 1 lb to shoulder level, and touch the top of the head were improved, these improvements were not statistically significant. Preoperative and postoperative SF-36s were obtained for 16 patients. On the SF-36, only the bodily pain category and role: physical category were significantly improved (Table 2).

Five patients in this study required revision surgery, all for persistent pain. Two patients underwent repeat arthroscopy, revision labral stabilization, and subacromial decompression at 16 and 17 months. One patient underwent revision subacromial decompression and coracoacromial ligament release at 24 months. One patient underwent revision subacromial decompression at 13 months followed by biceps tenodesis at 58 months. The last patient underwent labral debridement and biceps tenodesis at 19 months followed by revision biceps tenodesis at 50 months.

Overall, the rate of RTW for this study was 84%. Only 3 out of 19 patients did not return to some form of work. However, the rates for returning to work at the preinjury level were significantly lower. Only 8 out of 19 patients (42%) returned to work at the same level as before their injury. Eleven out of the 19 patients (58%) returned to work at a level lower than their preinjury status.

Discussion

Tears of the superior labrum, anterior or posterior, are a relatively uncommon cause of shoulder pain. In the original description by Snyder et al. [2], more than 700 shoulder arthroscopies were reviewed. Superior labrum anterior and posterior lesions were reported in only 27 of these patients (6%). Snyder further delineated the injuries into four specific types. The most common injury was a type II in which the labral-biceps anchor is unstable and arched away from the glenoid, which was present in 41% of the cases. This data was confirmed by Handleberg et al. [4] in 1998. In their study, they reviewed 530 shoulder arthroscopies and found slap lesions present in 32 (6%). Again, type II lesions were the most common, representing 53% of the lesions.

Table 1 Percentage of patients answering yes to questions on the SST before surgery (Pre) and at final follow-up (Post)

Category	Pre (%)	Post (%)	*P* Value
Work	5	33	0.001
Sleep	9	41	0.001
Wash opposite side	9	41	0.001
Throw underhand	13	61	0.001
Coin to shelf	36	95	0.001
Raise 8 lb	0	45	0.001
Comfortable at side	50	73	0.024
Throw overhand	5	19	0.002
Carry 20 lb	9	54	0.001
Reach back	41	73	0.08
Touch head	32	71	0.653
Raise 1 lb	27	81	0.213

Table 2 Average results of the SF-36 survey for all patients both preoperatively (Pre) and at final follow-up (Post)

Category	Pre	Post	*P* Value
Bodily pain	4.3	7.1	0.008
Role: physical	4	5.6	0.001
Physical function	23.1	22.1	0.003
General health	19.6	18.5	0.069
Role: emotional	4.3	4.8	0.109
Social function	5.9	8.1	0.523
Vitality	12.6	15.1	0.541
Mental health	20.4	23.2	0.779

The mechanism of injury for these injuries was described as twofold. In the initial description of Andrews et al. [1], SLAP lesions were noted in overhead throwing athletes. In the work done by Snyder, this group of patients was included in the traction injury group [2]. He felt that these injuries resulted from either a single-event pull on the arm or as a result of repetitive overhead throwing motion. The second and more common group involved a compression force applied directly to the shoulder. This usually involved a fall on the outstretched arm, with the shoulder positioned in abduction and slight forward flexion.

Morgan et al. [5] further subtyped type II lesions into an anterosuperior type, a osterosuperior type, and a combined anterior and posterior type. They looked at 102 patients treated arthroscopically for type II SLAP tears and divided them into two groups. Group I included 53 patients who were overhead-throwing athletes. Group II included 49 nonthrowers with single-event trauma. They found that posterior type II SLAP lesions were three times more common in overhead throwers whereas anterior lesions were three times more common in the trauma group.

Burkhart and Morgan [6] later described the reason for an increased incidence of posterior lesions in overhead throwing athletes as the "peel back mechanism." They postulated that although an avulsion mechanism may be responsible for the initial lesion, the same lesion may be extended posteriorly by this "peel back" phenomenon. In this case, as the arm goes into extreme abduction and external rotation during the cocking phase of throwing, a torsional force is produced at the base of the biceps that is transmitted to the posterior labrum, causing progressive failure over time and enlargement of the lesion.

Although the mechanism for creation of a SLAP repair in older patients with single event trauma was not clearly defined, it likely involves injury to the biceps anchor either secondary to a direct traction event transmitted through the long head biceps tendon, or an axial load with superior displacement of the humeral head and direct injury to the superior labrum.

Results of repair of SLAP lesions in the current literature are limited [5, 7–11]. In most series, however, results of operative treatment for SLAP lesions are reported together for both groups of patients, with no distinction between mechanism of injury. In the study by Morgan et al. [5], the authors reviewed 102 patients with type II SLAP lesions. All patients underwent arthroscopic repair with suture anchors. At 1-year follow-up, they reported 84% excellent and 13% good results for the entire group. Three percent of patients had fair results, and no patients were in the poor group. All patients in the good and fair group had associated rotator cuff pathology. Similarly, Stetson et al. [11] reported on 130 SLAP lesions of all types treated with arthroscopic debridement or repair. Sixty-one patients (47%) had type II SLAP lesions. Using the UCLA shoulder rating scale, 79% had good and excellent results, 17% had fair results, and 4% had poor results.

Field and Savoie [9] reported a series of 20 patients, 15 with type II lesions, who were repaired with transosseous PDS suture. Sixteen patients reported a traumatic event as their mechanism of injury, 10 after a compression force to the shoulder, and 6 after a traction injury. Statistically significant gains in pain and function were seen, but not in motion, strength, or stability, although those did improve. They obtained 100% good or excellent results by the Rowe scoring system, and all 10 of their workers' compensation patients were able to return to work 6–18 months after surgery with restrictions that were gradually lifted.

The impetus for reporting the results of this study was the senior author's observation that patients with single-event injuries to the shoulder resulting in SLAP lesions had inferior outcomes to patients with injuries related to repetitive overhead activities. In this series, all patients had single-event traction injuries as their mechanism of injury, as opposed to the repetitive overhead athlete or the peel back mechanism described by Morgan et al. [5]. These patients clearly had inferior results with regard to relief of pain, subjective scoring scales, and RTW when compared to the results described above. Only the study by Field and Savoie [9] had similar patient demographics to this study with similar mechanisms of injury. However, our results are clearly inferior to theirs with regard to pain relief, reoperation rate, and RTW. The reason for this difference is unclear to us, and further study would be beneficial to clarify these results and risk factors for failure of repair.

In our study, patients noted significant subjective improvement with improved SST scores and SF-36 scores. Although pain scores decreased significantly, most patients still had significant complaints of pain at final follow-up. Furthermore, five patients (24%) required reoperation for persistent shoulder pain. Finally, in terms of return of activity, only 10 out of 21 patients (46%) were able to return to work at their preinjury level. Clearly, there are secondary gain issues in the workers' compensation patients, and nonphysical factors affect results of surgical interventions. Also, Illinois is a nonapportionment state, which means that if any part of the patient's injury is work-related, the patient is 100% compensated. Interestingly, the patients in this study scored lower preoperatively in the nonphysical categories of the SF-36 than a randomly selected group of the general population would have.

Although it involves patients with workers' compensation claim, this study suggests that patients with single-event traction type injuries may have different outcomes than the group of patients with injury secondary to overhead athletics. Most previous studies have grouped both types of patients together and reported 80–97% good to excellent results. This study is clearly a deviation from those numbers. At the very least, it indicates a need to study these two patient groups independently to determine whether similar treatment protocols, postoperative regimens, and postoperative expectations that currently exist are appropriate for each.

In addition, in this series, pain was the most significant complaint of patients who had SLAP lesions, with minimal complaints of instability. This is the opposite of what was reported for anteroinferior and posterior labral tears, where instability is a much greater complaint than pain. Maffet et al. [12] also described instability as a potential source of significant symptoms in patients with SLAP lesions. Furthermore, Andrews et al. [13] have suggested that subtle anterior instability may be associated with SLAP lesions in overhead athletes. We postulate that with its insertion into the superior labrum, the biceps tendon could be a strong contributor to the production of pain in patients with SLAP lesions secondary to single-event traction injuries. If so, biceps tenodesis in conjunction with labral repair may be the initial treatment of choice in selected patients, or a salvage procedure in patients who fail debridement and labral stabilization. Further delineation of patients who are at risk for poor outcomes after SLAP repair would be helpful in determining which patients would benefit from initial biceps tenodesis.

In conclusion, type II SLAP lesions occur with work-related injuries, usually with a different mechanism of injury than is seen in athletes. The results of operative labral stabilization in these patients are inferior to those obtained in athletes; pain relief is often incomplete postoperatively and only 42% return to work at their preoperative level. Furthermore, the reoperation rate in this group is much higher than has previously been reported. It is possible that with single event traction injuries, the biceps tendon itself plays a role as a pain generator in addition to the superior labral tear, and may be a reason for persistent pain after labral stabilization. Further studies are needed to elucidate the appropriate treatment regimen and expected results for this group of patients.

References

1. Andrews JR, Carson WG, Jr, McLeod WD (1985) Glenoid labrum tears related to the long head of the biceps. Am J Sports Med 13:337–341
2. Snyder SJ, Karzel RP, Del Pizzo W, Ferkel R, Friedman MJ (1990) SLAP lesions of the shoulder. Arthroscopy 6(4):274–279
3. Gartsman GM, Hammerman SM (2000) Superior labrum, anterior and posterior lesions. When and how to treat them. Clin Sports Med 19(1):115–124

4. Handleberg F, Willems S, Shahabpour M, Huskin J, Kuta J (1998) SLAP lesions: a retrospective multicenter study. Arthroscopy 14(8):856–862
5. Morgan CD, Burkhart SS, Palmeri M, Gillespie M (1998) Type II SLAP lesions: three subtypes and their relationship to superior shoulder instability and rotator cuff tears. Arthroscopy 14(6):553–565
6. Burkhart SS, Morgan CD (1998) The peel-back mechanism: its role in producing and extending posterior type II SLAP lesions and its effect on SLAP repair rehabilitation. Arthroscopy 14(6):637–640
7. Cordasco FA, Steinmann S, Flatow EL, Bigliani LU (1993) Arthroscopic treatment of glenoid labral tears. Am J Sports Med 21(3):425–431
8. Samani JE, Marsten S, Rodosky MW, Buss DD (1997) The arthroscopic stabilization of type II SLAP lesions using a biodegradable tack. Arthroscopy 13(3):376
9. Field LD, Savoie III (1993) Arthroscopic suture repair of superior labral detachment lesions of the shoulder. Am J Sports Med 21(6):783–790
10. O'Brien SJ, Allen AA, Coleman SH, Drakos MC (2002) The trans-rotator cuff approach to SLAP lesions: technical aspects for repair and a clinical follow-up of 31 patients at a minimum of 2 years. Arthroscopy 18(4):372–377
11. Stetson WB, Karzel RP, Bana MP, Costigan W, Snyder SE (1997) Long-term clinical follow-up of 140 patients with injury to the superior glenoid labrum. Arthroscopy 13(3):376,
12. Maffet MW, Gartsman GM, Moseley B (1995) Superior labrum-biceps tendon complex lesions of the shoulder. Am J Sports Med 23(1):93–98
13. Jazrawi LM, McCluskey GM, 3rd, Andrews JR (2003) Superior labral anterior and posterior lesions and internal impingement in the overhead athlete. Instr Course Lect 52:359–367