Rehabilitation Following SLAP Repair in the Overhead Athlete: A Case Report

Ashley Pearsall, SPT; Bill Andrews, PT, MS, EdD, NCS
Elon University – Elon, NC

ABSTRACT

Study Design: Case report. Objectives: The purpose of this case report is to outline the treatment course prescribed to a collegiate tennis player following arthroscopic repair of a superior labral anterior posterior (SLAP) lesion.

Background and Methods: The incidence of SLAP tears has been rising in overhead athletes. Conservative management was historically the treatment-of-choice, but recent evidence suggesting poorer outcomes in overhead athletes compared to their non-overhead athlete counterparts has led to an increased frequency of arthroscopic SLAP repairs. However, there is currently no standard treatment protocol guiding the rehabilitation of such athletes following surgery. In this study, the efficacy of a post-surgical program prescribed to a 21-year-old female collegiate tennis player who presented to physical therapy ten days status/post right shoulder SLAP repair was analyzed. Initial examination of the patient revealed limited right shoulder active and passive range of motion (ROM). The patient also presented with shoulder pain and disability measured via the Numeric Pain Rating Scale and QuickDASH outcome survey, respectively. As ROM restrictions were lifted during recovery, further examination revealed significant strength deficits in scapular stabilizing and rotator cuff musculature. To address these deficits, the patient’s interventions focused on regaining right shoulder mobility and strength via therapeutic exercise, manual therapy, the Thrower’s Ten home program, and pain management modalities to promote the athlete’s return to sport. Outcomes: Following intervention, the patient presented with improved right shoulder active and passive ROM, 5/5 gross strength in all right shoulder musculature, and decreased pain and disability. At discharge, the patient was restricted until six months post-operatively from a full return to competitive tennis, but she could compete in partial range hitting and throwing. At follow-up 3.5 years later, the patient reported competing in recreational tennis play, though she experienced pain after matches and did not feel she could achieve prior levels of serving velocity. Otherwise, the patient performed non-overhead sports and activities of daily living symptom-free. Conclusion: Due to the favorable outcomes observed in this patient, employing a post-surgical program with staged ROM and strengthening goals warrants consideration in the rehabilitation of SLAP repairs in overhead athletes.

Background

The superior labral anterior posterior (SLAP) lesion is described via a ten-type classification system\(^1\). Its incidence has been rising in recent years due to increased demands on overhead athletes; consequentially, arthroscopic repair of such lesions, particularly the most commonly-seen Type II lesions involving detachment of the superior labrum and biceps tendon anchor from the superior glenoid rim, is also steadily rising\(^1\). However, there remains much debate over their optimal management.

Management is complicated by the fact that SLAP tears are frequently accompanied by associated pathology\(^6\). Initially, conservative management is often recommended and generally includes a course of rest from pain-provoking activities, nonsteroidal anti-inflammatory drugs (NSAIDs), cortisone injections, and strengthening and endurance exercise pending pain resolution\(^7\). Additionally,
because of the probability that altered shoulder kinematics contributed to the injury, rehabilitation is designed to address the retraining of shoulder complex motion and neuromuscular control. Finally, conservative management emphasizes stretching of the posterior joint capsule to increase internal rotation, secondary to the commonly-observed pattern of glenohumeral internal rotation deficit (GIRD) seen in overhead athletes. Generally, nonoperative treatment is sufficient for non-overhead athletes but often fails in their overhead counterparts.

When patients fail conservative care, arthroscopic repair of the SLAP lesion is indicated. However, even with surgery, not all athletes are able to return to their prior level of play. A 2012 study reporting on patient satisfaction levels of 506 athletes who underwent arthroscopic repairs of Type II SLAP lesions found that 83% reported “good-to-excellent results”, and 73% were able to return to play at their prior level of function. However, when considering overhead athletes independently of the larger group, only 63% regained their prior level of function. These findings support those in other studies in which researchers have concluded that returning overhead athletes to their preinjury levels is more difficult and less successful than the outcomes observed in non-overhead athletes.

Following surgery, patients initiate a months-long physical rehabilitation program. While evidence does not currently support a specific optimal treatment protocol, numerous guidelines have been published to guide the plan of care. The purpose of this case report is to document the effects of an established SLAP repair protocol emphasizing shoulder range of motion (ROM) and strengthening to address pain, weakness, and functional limitations in a collegiate tennis player seeking to return to her sport.

Case Description

Patient Demographics

The patient was a 21-year-old female right-hand dominant collegiate tennis player who reported to outpatient physical therapy (PT) on post-operative day ten following a repair of a SLAP lesion of the right shoulder. The patient described a 6-month history of right shoulder pain that was most apparent during overhead tennis strokes, particularly serving. Five months prior to surgery, the patient underwent a magnetic resonance arthrography (MRA), the gold standard for diagnosing SLAP tears; the MRA revealed a Type II lesion. Because the patient was preparing for her senior season, the orthopedic surgeon administered one cortisone injection and prescribed a course of NSAIDs and conservative PT management in an effort to delay surgery until after the season.

The patient received a 4-week course of conservative treatment emphasizing rotator cuff and scapular stabilizer muscle strengthening, but moderate to severe pain persisted with overhead motions. Ultimately, the patient was able to compete in 32 singles and doubles matches and managed the pain with ice and rest as able. Surgery was recommended immediately at season’s end.

Examination/Evaluation

The patient underwent an arthroscopic repair of the right glenohumeral labrum. Three knotted suture anchors were used to secure the structure to the glenoid rim, a commonly-used procedure and the technique of choice advocated and described by Dodson and Altchek. The patient reported to outpatient PT on post-operative day ten.
The patient had no significant past medical history and did not drink or smoke. Stated goals included to be able to achieve a pain-free return to all prior activities, particularly emphasizing a return to playing competitive tennis at the patient’s prior level of performance.

Due to surgical restrictions, an examination of right upper extremity strength was contraindicated at the time of the initial evaluation. Outcomes able to be assessed included right shoulder passive ROM, numeric pain rating scale (NPRS) scores, and a patient-reported QuickDASH score. The NPRS is an 11-point scale on which patients rank their pain from 0 (no pain) to 10 (worst imaginable pain). It has been cited to have good validity and reliability and a minimally clinically important difference (MCID) of 2.17 points in patients with shoulder pain. The QuickDASH is an 11-question functional outcome survey that documents the functional status of the upper extremity. It has been cited to have 79% sensitivity, 75% specificity, and a MCID of 8.0 points. Each of the initial outcomes is presented in Table 1 below. Passive ROM was limited by patient apprehension and pain.

The patient was deemed to have good rehab potential. ROM was initially limited by pain, and it was not determined if capsular restrictions existed. Similarly, strength was unable to be tested, but it was communicated that the patient would need a high degree of strength and endurance training in order to return to tennis play at her previous level. Based on therapy notes from the month-long conservative care administered five months prior, the patient had previous weakness of 4/5 in most scapular stabilizing and rotator cuff musculature. Therefore, the therapist surmised that such limitations were likely even greater due to the injury’s chronicity and the resultant surgery. ROM was the initial point of emphasis, with a gradual incorporation of strength training as the patient progressed through the appropriate stages of healing.

**Intervention**

Based on the aforementioned list of impairments, the clinician hypothesized the initial injury was likely the result of overuse complicated by weakness in the scapular and rotator cuff musculature. Therefore, a plan of care focusing on regaining ROM followed by extensive strengthening of these muscles was implemented in an effort to return the patient to her prior level of play and prevent future re-injury.

**Phase I (Post-op day 1 to week 6)**

The first phase of rehabilitation stressed protecting the surgical site, allowing the inflammatory stage to run its course, and gradually promoting increased ROM and dynamic stability. Though absolute immobilization was historically prescribed, more recent findings have suggested that immediate post-operative passive ROM within limited ranges is safe and appropriate. For this patient, relative immobilization in which she basically only discontinued sling use during therapy was prescribed for 4 weeks. Formal therapy began on post-op day 10 at which time the patient was prescribed limited supine passive ROM. Flexion was initially restricted to 60°, external rotation to 10°, and internal rotation to 45°, limitations generally matching those recommended in other published protocols. The patient also performed supine active-assisted ROM with a wand into internal and external rotation in the scapular plane, pendulum exercises, and submaximal isometric strengthening for shoulder flexion, extension, abduction, and internal and external rotation. Throughout phase I, passive ROM was increased weekly by roughly 10° in each direction because...
regaining ROM too quickly is believed to be deleterious to the integrity of the repair. At week three, supine rhythmic stabilization drills were added and required the patient to resist flexion, extension, internal and external rotation. Such a form of strengthening is useful in promoting “dynamic stabilization, joint proprioception, and neuromuscular control”. Resistance training exercises were first introduced in week four and gradually progressed. At this time, the patient began performing yellow resistance band internal and external rotation in standing with the arm positioned in 0° of abduction with a towel roll wedged between the patient’s side and flexed elbow. These exercises were deemed appropriate secondary to their low activation of the infraspinatus, supraspinatus, teres minor, and posterior and middle deltoid based on percentage of maximal voluntary isometric contraction (MVIC) values determined through electromyographic analyses. At week 6, further strength training was added to include proprioceptive neuromuscular facilitation (PNF) techniques against manual resistance, as well as unweighted prone rowing, prone horizontal abduction, and full can exercises.

During the protective phase, all biceps strengthening was contraindicated. Additionally, all motions were to be pain-free. Cryotherapy was occasionally applied at the end of sessions as needed.

**Phase II (Post-op weeks 7-14)**

The second phase of rehabilitation emphasized continued restoration of full ROM and strength. Aggressive stretching and joint mobilizations were not indicated since the patient was progressing well toward full ROM. However, during this phase, the patient did begin reporting posterior shoulder pain, so a sleeper stretch was added to promote increased laxity of the capsule. The sleeper stretch is performed with the patient in sidelying on the involved side with the shoulder and elbow flexed to 90 degrees. The patient uses the uninvolved

<table>
<thead>
<tr>
<th>Primary Outcome</th>
<th>Scores</th>
<th>Interpretation of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPRS Scores</td>
<td>0/10 pain at best; 3/10 dull aching pain at worst (usually experienced at the end of pain medicine intervals or upon waking in the morning); 1/10 pain at time of initial evaluation</td>
<td>Mild symptom severity at start of physical therapy regimen.</td>
</tr>
<tr>
<td>Right Shoulder passive ROM</td>
<td>Flexion 52°; Abduction 57°; Internal Rotation (IR) 30°; External Rotation(ER) 10°</td>
<td>All PROM measured in scapular plane due to movement restrictions. Painful end-range in all directions. Left shoulder passive range of motion grossly observed WNL in all directions.</td>
</tr>
<tr>
<td>QuickDASH</td>
<td>75%</td>
<td>The higher the value, the greater the patient’s perceived disability.</td>
</tr>
</tbody>
</table>
hand to facilitate shoulder internal rotation to stretch the contracted posterior capsule. More aggressive resisted training exercises with bodyweight, resistance bands, or one to two pound dumbbells was initiated. Strengthening exercises included wall push-ups, resisted full cans, resistance band scapular retractions and supine “around the worlds”, standing D1/D2 diagonals, and sidelying external rotation. Additionally, the home strengthening program beginning at week ten followed the Throwers Ten protocol. The Throwers Ten program is a 10-exercise resistance training protocol commonly prescribed to baseball players to increase throwing velocity through the training of strength, power, and endurance of the major upper extremity musculature involved in overhead motions. It has been shown to be effective in as little as six weeks for both healthy athletes and those undergoing rehabilitation for shoulder dysfunction.

At the start of post-op week ten, the patient was also able to participate in rebounder chest passes with a light weighted ball, Total Gym pull ups, prone Is/Ts/Ys, and chair dips. At the start of post-op week 12, the patient participated in short tennis ball overhand tosses. This initiation of throwing began slightly before the 14- to 15-week mark cited in other protocols. Endurance exercise utilizing the body blade, a tool proposed to help in training the shoulder girdle stabilizing muscles by forcing them to react to rapid positional changes, was also prescribed.

At the end of phase II, the patient had not achieved full active right shoulder ROM in all planes. However, because motion matched that of the non-operated left upper extremity, further ROM gains were no longer emphasized and only continued on a periodic basis at home.

Phase III (Post-op weeks 14-20)

The patient attended PT through post-op week 18. During this last phase of supervised intervention, emphasis was directed toward promoting further strength, power and endurance and incorporating functional activities. In accordance with these goals, the patient continued many of the aforementioned exercises with increased resistance, but also began performing longer tennis ball tosses, weighted overhead throws against the rebounder, partial tennis swings via Wii Tennis, stability ball circles and “dribbling” against the wall for endurance, wall quadrant walking, and upper extremity push-up position steppers. Additionally, the patient began participating in restricted sports activities including tennis volleying against a backboard and chip-and-putt golf.

Phase IV (Post-op weeks 20-26)

Because the patient had been discharged from PT with all goals met, phase IV proceeded as a home/gym program. At this time, the patient continued the Throwers Ten program and initiated machine weights including latissimus dorsi pulldowns, chest press, pectoral flies, shoulder press, seated rows, biceps curls, and triceps push-downs.

Phase V (Post-op 6 months+)

Although no formal consensus exists, a gradual return to sport is generally allowed after six months. However, this timeframe is highly variable, particularly for overhead athletes. Ultimately, “athletes must be symptom free and should not return to sport until they have demonstrated appropriate ROM, strength, control, endurance, and power necessary for their particular sport or activity.” During this phase, the patient participated in full golf swings and nine-hole rounds, full tennis strokes and light serving, and frequent basketball shooting. The patient did not resume competitive tennis match play until
one year post-operatively, but the patient reported such a lengthy layoff was more related to the busyness of a new school schedule and lack of training time, rather than a physical limitation to compete again.

Outcomes

In total, the patient completed twenty-seven PT visits over the course of roughly three months. The patient was discharged with all therapy goals met and independent compliance to an ongoing home program of strengthening and stretching. A full return to unrestricted sports activity was contraindicated until at least six months post-operatively and depended upon medical clearance by the orthopedic surgeon.

The three main outcomes tracked on three different occasions from the time of the initial evaluation to discharge included NPRS scores, right shoulder passive ROM, and QuickDASH scores. NPRS scores reduced consistently throughout therapy from 3/10 dull aching at initial evaluation to pain-free at rest at the time of discharge. Throughout therapy, the patient indicated up to 6/10 pain with exercise, particularly in the posterior capsule, but this pain was absent at discharge. Passive ROM advanced per protocol restrictions and was indicated as pain-free and within functional limits in all planes at the time of discharge. QuickDASH scores also consistently decreased throughout the course of treatment, indicating a decreased perception of disability by the patient. Initial scores of 75% disability reduced to 13.64% at discharge, a change that well exceeds the MCID of 8.0 points.11,12

As therapy progressed, the patient’s active right shoulder ROM and strength were able to be assessed and monitored as protocol restrictions were gradually lifted. At the time of discharge, the patient had achieved right shoulder active ROM within functional limits in all planes with noted end-range stiffness, particularly when moving into abduction. At this time, the patient had also achieved pain-free gross manual muscle testing strength of 5/5 in the right upper extremity, though early fatigue and trembling was observed.

The patient was contacted for follow-up 3.5 years later. She reported she was able to perform all daily activities, continued to focus on rotator cuff and scapular stabilizer muscle strengthening, and was competing occasionally in recreational tennis play. She still experienced mild right shoulder pain with initial serving in matches, a perception of taking a long time to warm up, and moderate to severe posterior joint pain when trying to serve during matches played on consecutive days. The patient also indicated she participated in non-overhead athletics and daily activities with no symptoms. While she was 90% satisfied with her recovery process, she did feel she lacked full recovery of her prior level of serving velocity and felt it was unlikely she would ever serve or even throw at the paces she could achieve before surgery secondary to perceived ROM restrictions and onset of pain.

Discussion

This case report outlines the initial examination, evaluation, intervention, and outcomes observed in a college-aged female tennis player status/post right shoulder SLAP repair. While there continues to be disagreement in the literature related to conservative management versus surgical repair for SLAP lesions, this patient responded favorably to a post-surgical program with staged ROM and muscle strengthening goals.7,8 Though this patient’s recovery extended beyond the anticipated six to nine months necessary for full recovery outlined in many protocols, the patient did achieve nearly complete recovery and the ability to generally return to her
prior level of function. These findings are similar to those in other studies in which overhead athletes continue to experience mild impairments often not seen in their non-overhead athlete peers. Generally, patient satisfaction scores following SLAP repairs tend to average around 80%-90% success rates, but a return to full prior level of sports-specific function lags behind in overhead athletes. This is especially apparent when the etiology of the injury is, as it was with this patient, overuse rather than a specific traumatic event. However, because this patient’s college career had ended at the time of her surgery, she consequently did not try to compete as often and competitively as she previously would have. As a result, it is difficult to draw conclusions about her true potential to have returned to her prior level of sport function and frequency of training following intervention.

While the patient experienced generally favorable outcomes, reviewing this case revealed several well-established aspects of shoulder rehabilitation that were not administered and could have potentially enabled the patient to achieve an even greater level of recovery. First, little emphasis was placed on posterior shoulder mobility, and at follow-up, the patient reported occasional continued incidences of posterior capsular tightness and pain with repetitive overhead activity, particularly in the late cocking phase of serving or throwing. Such complaints are common with decreased posterior shoulder mobility because of its contribution to increased humeral head migration and impingement between the supraspinatus tendon and the posterosuperior labrum. Research suggests the sleeper stretch and cross-arm adduction stretch should be performed judiciously in such cases, but the patient only occasionally performed a sleeper stretch.

Secondly, the patient never achieved full active right shoulder ROM, but because it only slightly lagged behind that observed in the left shoulder, such gains were not prioritized through the later stages of rehabilitation. At this point of recovery, researchers advocate cautiously applying low-load, prolonged stretching and joint mobilizations when previously prescribed ROM exercises have not allowed the patient to achieve the staged goals. In a randomized controlled trial, stretching combined with joint mobilizations was more effective at increasing glenohumeral joint mobility compared to stretching alone. With this knowledge and because this patient was right-hand dominant and participated in overhead athletics, one could argue that greater emphasis on right shoulder ROM was necessary and could have proven beneficial. Even though it did not vary much from the uninvolved side, the patient’s sport required high levels of right shoulder mobility to promote optimal performance, so a full restoration of ROM may have contributed to the most effective return to sport.

Thirdly, the patient’s tennis serving mechanics were never closely analyzed. Because the patient’s injury was not related to a specific traumatic event, it is likely that her serving mechanics and joint kinematics could have contributed to her injury. For instance, researchers have observed in baseball players the “thrower’s paradox”. This phenomenon relates to the fine line between possessing enough glenohumeral joint laxity to promote the extreme external rotation required in cocking while still maintaining adequate joint stability to prevent injury. The same paradox can relate to this tennis athlete in which her hyper-externally rotated service motion that previously allowed maximal serving velocity could have also predisposed her to the SLAP injury she sustained. Therefore, by neglecting to address these potentially
faulty mechanics, there is no guarantee that future injury would not recur if the patient returned to sport with the same serving mechanics she had always employed.

Fourthly, little attention was given to the patient’s scapular mobility and kinematics. Because full shoulder ROM is achieved via a synchronized relationship between scapular and glenohumeral joint mechanics, the movement of the scapula should not be overlooked in patients presenting with shoulder pathology. While there is no indisputable evidence that the patient did or did not have scapular dyskinesia, future evaluation and treatment of such a patient should consider this potential contributing factor to injury and therefore promote scapular motor control for prevention of re-injury\(^4\).

Finally, specific manual muscle testing of scapular stabilizer and rotator cuff musculature was not conducted in favor of gross resisted static testing. As a result, it is unclear if the patient completed rehabilitation with continued strength deficits in such musculature that could have contributed to a lack of complete recovery and full return to her prior sports performance levels. Much of the rehabilitation appropriately targeted resisted exercises for strengthening this musculature and followed appropriate intensity progression\(^13,14,17\). However, without specific grading of the strength exhibited in these individual muscles, there is no conclusive evidence that the patient had truly achieved an adequate level of strength to promote full return to sport without endangerment of re-injury due to persistent weakness and subsequent altered movement kinematics.

**Conclusion**

This case report recaps the physical therapy course implemented in the management of a right shoulder SLAP repair. The interventions applied in accordance with a prescribed protocol emphasizing both ROM and strengthening were seemingly effective in allowing an eventual nearly complete return to the patient’s prior level of athletic performance. However, the return to full-time sports participation was not able to be achieved during the three-month period of PT management outlined in this report. Therefore, the value of providing a patient, at discharge, with an effective home program with appropriate exercise progression and sport involvement cannot be overstated, as much of the recovery from a SLAP repair continues without supervision and relies heavily on patient compliance to an extended period of self-monitored exercise.

**Financial Disclosures and Conflicts of Interests**

No financial incentives or conflicts of interest were involved in the writing of this case report.

**References**


