Grade I Slap Lesion: A Conservative Treatment Approach

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GRADE I SLAP LESION:
A CONSERVATIVE TREATMENT APPROACH

by

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Bachelor of Science: Physical Education and Exercise Science
University of North Dakota May 2007

A Scholarly Project Submitted to the Graduate Faculty of the
Department of Physical Therapy
School of Medicine
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in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy

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This Scholarly Project, submitted by Joseph Klatt in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Signatures)

(Graduate School Advisor)

(Chairperson, Physical Therapy)
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Date 9/29/09
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ABSTRACT

Background and Purpose: This case report describes the examination, intervention, and outcome of a patient with a grade I SLAP lesion using non-surgical physical therapy intervention. Detailed conservative strategies have not been previously described in the literature. Case Description: The patient was a 39 year old male with a grade I SLAP lesion of the left shoulder with a significant history of shoulder pain since he pitched in the minors at age 23. Prior to formal physical therapy intervention the patient had pain rated at 7 out of 10 and could not perform overhead activities and ADLs such as combing hair, reaching for his wallet, and sleeping on his left side. Intervention: The patient underwent comprehensive treatment that targeted increasing glenohumeral internal rotation, scapular stabilization, minimizing substitution patterns, and returning normal functional abilities. Outcomes: Following eight weeks of formal physical therapy intervention the patient was able to return to pre-injury level of function with no pain in the left shoulder with 69 degrees of passive glenohumeral internal rotation. Discussion: An intervention that focused on returning glenohumeral internal rotation, scapular stabilization and normal movement patterns can lead to successful outcomes in patients with a grade I SLAP lesion.
CHAPTER I

BACKGROUND AND PURPOSE

The labrum is a fibrocartilaginous rim around the glenoid fossa that serves to deepen the socket providing stability to the shoulder complex for motion in all planes\textsuperscript{1}. Superior Labrum Anterior Posterior (SLAP) lesions are often caused by repetitive activities, acute trauma, or injuries in which the patient falls on an outstretched arm (FOOSH)\textsuperscript{2}. The incidence of SLAP lesions is highest in baseball pitchers, overhead athletes, and those who participate in activities or occupations that require repetitive movement. Research shows that the position of abduction and maximal external rotation, such as that of a pitcher's windup, produces a torsion force, or "peel back" mechanism at the origin of the biceps tendon\textsuperscript{3}. The torsion or twisting motion is thought to cause degenerative fraying of the labrum\textsuperscript{3}. Eccentric force on the bicep tendon during the deceleration and follow through component of a throw is another potential mechanism of injury. The repetitive motion causes micro trauma that serves to weaken the labrum making it more susceptible to failure and degeneration\textsuperscript{2}.

Typical symptoms of a SLAP lesion include a catching sensation in the shoulder during range of motion (ROM) and/or pain with motions such as pitching or overhead activities that initially caused the injury. Deep pain within the shoulder is often described by those with SLAP lesions and can be located anteriorly or posteriorly, depending on the involved structures and severity of the lesion.
SLAP lesions can be categorized as grades I through IV. Grade I consists of isolated degenerative fraying of the superior labrum without involvement of the long head of the bicep tendon. Current evidence suggests that a majority of the active population have mild and asymptomatic fraying of the superior labrum. Grade II lesions are classified by the detachment of the superior labrum and the long head of the bicep tendon from the glenoid rim, which results in shoulder instability\(^2,4\). Grade II SLAP lesions are most common and are categorized as anterosuperior, posterosuperior, or a combination anterior superior lesion\(^5\). Grade III lesions consist of a bucket handle tear of the labrum with the bicep tendon still intact\(^2,4\). A bucket handle tear consists of a tear around the rim of the glenoid causing the central portion, the bucket handle, to displace in the joint space\(^6\). Bucket handle tears are often present as a lock or click in the shoulder during ROM. Grade IV lesions consist of a bucket handle tear of the bicep tendon at its origin on the glenoid labrum. See figure 1 for SLAP lesion grades.

![Figure 1. SLAP Lesion Grades\(^5\)](image)

Mileski and Snyder\(^7\) found that SLAP lesions are associated with rotator cuff tears 40% of the time and associated with Bankhart lesions 22% of the time. Therefore, special tests are performed to confirm the diagnosis of a SLAP lesion, meanwhile ruling out other shoulder pathology.
There are a number of special tests that physical therapists utilize to diagnose a SLAP lesion including Obrien’s test, Crank test, Resisted Supination External Rotation, and Bicep Load test II. However, current evidence suggests no special test that can isolate a SLAP lesion diagnosis, so further imaging is necessary for accurate diagnosis.

Diagnostic arthroscopy is considered the gold standard for diagnosing a SLAP lesion, since MRI lacks the sensitivity and specificity to detect small degenerative changes and tears associated with SLAP lesions. A study performed by Kautzner, revealed that MRI for the diagnosis of SLAP lesions had a sensitivity of 44% and specificity of 89% when compared to arthroscopy for comparison.

Current research suggests that conservative management should be utilized prior to surgical intervention for suspected SLAP lesions. There is not much evidence to support the use of conservative treatment and non-surgical interventions for the rehabilitation of grade I SLAP lesions. Blaine et al. reported that an initial trial of conservative treatment can result in pain relief and improved function when compared to surgical intervention and should be considered for patients with isolated SLAP lesions. According to Park HB et al. conservative treatment should focus on returning normal strength and ROM prior to returning to sport or previous level of activity.

The purpose of this case report is to describe the evaluation, treatment, and outcomes for a patient receiving outpatient physical therapy for a non-operative SLAP lesion of the left shoulder. By expanding the physical therapy based intervention options, patients will be more likely to avoid surgery and have optimal short and long term results, making physical therapy the first line of treatment for these complex shoulder injuries.

Key Terms: SLAP (superior labrum anterior posterior), shoulder, overhead athlete, ROM
CHAPTER II
CASE DESCRIPTION

The patient was a 39-year-old male, who was left hand dominant and worked as an investor. He was referred to outpatient physical therapy due to left shoulder pain and abnormal scapular rhythm. The patient reported that he injured his shoulder while throwing a football during the follow through. After the injury occurred, the patient attempted to self-treat for 3 months with rest, ice, compression and elevation (R.I.C.E.), general exercise, and nonsteroidal anti-inflammatory drugs, but was unsuccessful so he sought medical advice. Within a week, following a physician visit in September 2008, the patient was referred to physical therapy with orders to evaluate and treat.

Prior to the injury, the patient was a minor league pitcher for 5 years, and had extensive history of shoulder pain since age 20, but no formal therapy was performed to address shoulder pain or abnormal scapular rhythm. At the age of 23, the patient retired from minor league pitching due to an ankle sprain, that led to altered pitching mechanics and ultimately led to increased shoulder pain. At that time, the patient treated his left shoulder with R.I.C.E. The patient stated that the shoulder pain from baseball retirement to the current onset was minimal, with no noticeable reduction in strength or function. Past medical history included two left knee scopes in 1981 and 1984, both for partial medial menisectomies, but had no relevance on his current condition or rehabilitation process.
The patient lived in a split-level home with his wife and two sons, ages 7 and 10. He stated that he had difficulty performing a number of different activities of daily living (ADL’s) such as combing his hair, reaching for his wallet, and performing weighted arm motions that involve movement past the midline of the body or overhead. The patient also stated that he was limited in leisure activities such as horse-back riding, playing baseball or football with his kids, coaching baseball, and golfing due to shoulder pain. The patient had concerns over the reduction in his functional independence and feared becoming progressively weaker, which would lead to increased difficulty with ADL’s.

At initial visit, the patient’s chief complaint was pain in his left shoulder that radiated into his left arm and resulted in an inability to perform overhead movements and complete job tasks, such as taking clients golfing. The patient’s pain was rated at a 3 with rest, on the 0 to 10 scale (0 being no pain, 10 representing worst pain experienced), and 7 with overhead motions or resistance. Pain was described as being located deep in the shoulder, radiating into the lateral side of the arm to the level of the elbow. Decreased pain levels were noted with stretching and rest and increased with active motion of the shoulder, especially with motions involving horizontal adduction across midline and overhead flexion and abduction.

The patient hoped to return to his prior level of function with no pain or strength deficits in his left shoulder following physical therapy. He also wished to resume his occupational tasks and bring clients golfing, while avoiding surgical intervention. His motivation to achieve these goals resulted in cooperation with physical therapy intervention strategies and plan of care, making him a good candidate for this case study.
Examination, Evaluation, and Diagnosis

Informed consent was obtained from the patient prior to performing the examination and evaluation. Posture observation revealed a forward head and rounded shoulders, with the left shoulder slightly lower than the right, which is normal since the patient is left hand dominant. Bilateral shoulder active range of motion (AROM) was performed in standing and revealed a significant upper trapezius substitution pattern during left shoulder abduction and flexion. The patient was able to achieve 90 degrees of active shoulder abduction limited due to pain at 7/10 throughout the motion. The normal glenohumeral scapular rhythm of two degrees of humeral motion to every one degree of scapular motion was also compromised, due to scapular laxity and tight glenohumeral musculature. The scapula accounted for a majority of motion during arm elevation with moderate scapular winging. Full AROM was present in the patient’s right, uninvolved, shoulder with all motions. Passive range of motion (PROM) was also performed and compared to the uninvolved shoulder. A major deficit was found in left shoulder internal rotation when compared the uninvolved side. Internal rotation deficits are a common occurrence in throwing athletes. All measurements were taken with a goniometer as described by Norkin and White\textsuperscript{11}, examination results can be found in tables 1 and 2.
Manual muscle testing (MMT) was performed in the seated position using the break test (0=absent, 1=trace, 2=poor, 3=fair, 4=good, 5=normal). Resistance was applied proximal to the next distal joint (elbow for shoulder motions and wrist for elbow motions) and held for a count of five seconds to determine flexion, scaption, elbow flexion/extension, and wrist strengths. Resistance was not applied in motions of abduction and external/internal rotation due to the patient’s inability to move through the full range of motion in anti-gravity positions. The gravity eliminated position was used for testing abduction strength in which the patient was placed supine on the plinth to test and identify the appropriate muscle strength grade. The patient also had a weak left serratus anterior at 3/5 with noted scapular winging. All motions of the uninvolved shoulder tested 5/5 without pain. See Table 3.
Table 3.  
Shoulder/Elbow Manual Muscle Testing during Initial Evaluation

<table>
<thead>
<tr>
<th>Movement</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>5/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Abduction</td>
<td>5/5</td>
<td>2+/5</td>
</tr>
<tr>
<td>Scaption</td>
<td>5/5</td>
<td>3/5</td>
</tr>
<tr>
<td>ER</td>
<td>5/5</td>
<td>3/5</td>
</tr>
<tr>
<td>IR</td>
<td>5/5</td>
<td>3/5</td>
</tr>
<tr>
<td>Elbow Flexion</td>
<td>5/5</td>
<td>4/5</td>
</tr>
<tr>
<td>Elbow Extension</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Grip Strength</td>
<td>5/5</td>
<td>5/5</td>
</tr>
</tbody>
</table>

Peripheral joint scan, consisting of active ROM, was performed to the neck, elbow, and wrist in order to clear these joints of involvement for this pathology. The patient did not report any pain during movement, at end range, or with repeated movement during peripheral joint scan.

A variety a special tests were performed in order to rule in or rule out specific diagnoses. During Obrien’s test the patient reported deep pain in the shoulder and clicking while the arm was in maximal internal rotation (IR) and reduced when the arm was in full external rotation (ER). The Crank test also elicited deep pain in the shoulder greater upon external rotation than internal rotation. Speed’s test elicited pain but was not consistent with a positive test resulting with pain in the bicipital groove. The empty can test showed weakness of the supraspinatus with pain of 5/10. Overall results of special testing revealed that the patient had a SLAP lesion of unknown grade with possible rotator cuff involvement. Table 4 shows the tests performed and the results.
<table>
<thead>
<tr>
<th>Test Performed</th>
<th>Test Indicates</th>
<th>Right Results</th>
<th>Left Results</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>+ Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>O’Briens SLAP lesion</td>
<td>-</td>
<td>+ significant pain</td>
<td>47-99%</td>
<td>31-98%</td>
<td>0.8-61.1</td>
<td></td>
</tr>
<tr>
<td>Speed’s (Bicep Test)</td>
<td>Bicipital tendonitis or SLAP lesion</td>
<td>-</td>
<td>painful</td>
<td>9-98%</td>
<td>14-98%</td>
<td>0.4-3.3</td>
</tr>
<tr>
<td>Empty Can</td>
<td>Supraspinatus tear or suprascapular nerve pathology</td>
<td>-</td>
<td>Weak and painful</td>
<td>63-95%</td>
<td>55-65%</td>
<td>1.4-2.7</td>
</tr>
<tr>
<td>Neer</td>
<td>Supraspinatus, bicep tendon involvement, or overuse injury</td>
<td>-</td>
<td>-</td>
<td>50-63%</td>
<td>40-52%</td>
<td>1-1.1</td>
</tr>
<tr>
<td>Apprehension</td>
<td>Glenohumeral joint instability, subluxation, or anterior dislocation</td>
<td>-</td>
<td>-</td>
<td>15-30%</td>
<td>63-77%</td>
<td>0.7-0.8</td>
</tr>
<tr>
<td>Labral Crank</td>
<td>SLAP lesion</td>
<td>-</td>
<td>+</td>
<td>53-91%</td>
<td>56-93%</td>
<td>1.1-13.6</td>
</tr>
</tbody>
</table>

Key: ( - ) Negative result, pathology doesn’t exist, (+) positive result, pathology could exist. All special tests were performed as described by Magee^{13}
Fingertip palpation of the left shoulder complex was performed and revealed tenderness over the anterior and posterior joint space. Mild atrophy was also noted in the deltoid and rotator cuff musculature, and mild muscle hypertrophy was evident on the left upper trapezius. Sensation was intact with no deficits, and the patient reported no sensation loss through the course of his injury.

With the results of the initial examination it was concluded that the patient had a SLAP lesion of unknown grade, with possible rotator cuff involvement. During the fourth week of formal physical therapy treatment, an MRI was performed that revealed a grade I SLAP lesion, that consisted of degenerative and overuse fraying. Results of the MRI concluded the SLAP lesion was isolated and no rotator cuff injury/component was present.

With these results the patient was fit into the model of orthopedic dysfunction. This is an orthopedic model that focuses on treating the cause or the internal tissue response instead of the symptoms\(^{14}\). The initial stimulus of the patient's pathology was thought to be due to the ankle sprain that led to altered pitching mechanics and eventual shoulder injury at age 23. Deficits in left glenohumeral internal rotation with decreased shoulder and scapular strength and substitution patterns of the upper trapezius also resulted from injury and repetitive over activity. Functionally, this resulted in the patient's restriction or inability to perform normal activities of daily living including reaching for his wallet, combing hair, having trouble sleeping on left side, decreased arm swing during gait, and having difficulty with overhead activities. The pain and ROM limitations in the left shoulder led to the patient's inability to take business clients golfing.
Problems that were addressed based on the examination findings included scapular substitution patterns, glenohumeral internal rotation deficit, increased pain, inability to perform ADLs, and muscle weakness and atrophy. Reevaluation was performed identically to the process described above.

The Guide to Physical Therapy Practice classifies this case as pattern 4D: Impaired joint mobility, motor function, muscle performance, and range of motion associated with connective tissue dysfunction, ICD-9 code 840, sprains and strains of the shoulder and upper arm.15 The patient had impairments and functional limitations in ROM, strength, and endurance, due to prolonged inactivity.

Prognosis and Plan of Care

Based on the problem list, goals were set to eliminate substitution patterns, return strength to 5/5 in all motions, increase left shoulder internal rotation to 60 degrees, and be able to perform all work and home ADL's to include combing hair and reaching for wallet, in six weeks. Goals were designed to be challenging, yet obtainable provided the patient’s high motivation and past experiences. These goals were designed to emphasize function and return to work and other desired activities. All goals were measurable: ROM was measured with a goniometer and shoulder strength was measured with MMT by the same PT who performed measurement in order to minimize inter rater error.

Restricted IR AROM, loss of left shoulder strength, and scapular substitution pattern were the major factors targeted during the intervention process. Given the patient’s age, health status, prior level of activity, and motivation, he had a good prognosis for a full recovery following participation in PT set at 2-3 times per week for 6 weeks. Short term goals were set to increase IR and minimize substitution pattern use.
prior to initiating strengthening at two weeks. Long term goals were to resume prior
level of function at home and work, regain 60+ degrees of IR, and achieve full strength
bilaterally in six to eight weeks. The ultimate goal of conventional physical therapy was
to avoid surgical intervention.
CHAPTER III
INTERVENTION

The interventions for this pathology were based on specific examination and evaluation findings and could be broken down into three phases: Phase I focused on minimizing substitution patterns through scapular stabilization exercises, phase II focused on gaining strength, and phase III focused on returning to throwing and independence with all ADLs. These three phases have significant overlap without clear time boundaries. The patient participated in 20 interventions sessions, each approximately 50 minutes long. Therapy sessions took place two to three times per weeks and spanned the course of eight weeks.

Phase I interventions targeted proper lifting mechanics in order to minimize substitution patterns and increase left glenohumeral internal rotation. Increasing glenohumeral internal rotation is a key component of early SLAP lesion intervention since the posterioinferior capsule tightness is thought to cause a pathologic cascade leading to a SLAP lesion. Capsular tightness develops in response to the loads that act on the capsule during the follow-through phase of throwing. According to Kvitne, the first step in shoulder rehabilitation for overhead athletes is to recognize and target glenohumeral instability. By targeting glenohumeral instability, conservative treatment was found to be effective for many chronic overuse injuries. Additional research by Burkhart et al. focused on interventions based on the rules of the S.I.C.K scapula: S- Scapular malposition on the rib cage, I- Inferior medial border winging from weak
middle and lower trapezius muscles, C- Coracoid pain and malposition from the 
attachment of a tight pectoralis minor muscle pulling on the bone, K- Scapular dyskinesia 
from alterations in muscle recruitment patterns found during the examination process. 
According to Burkhart\textsuperscript{17}, the major emphasis for overcoming S.I.C.K. scapula is exercise 
in which the scapula is retracted during frontal and sagittal plane exercises. In phase I of 
treatment, these exercises consisted of regaining control of the scapula in protraction, 
retraction, depression, elevation, and rotation. All treatment sessions began with an initial 
warm-up of five minutes on the upper body ergometer (UBE). Specific exercises of 
shrugs, sitting press-ups, wall push-ups, no moneys, bent over dumbbell row, upright 
dumbbell row, lateral raises, IR/ER with tubing, empty/full can, scapular clocks, internal 
rotation stretching and posterior shoulder glides were performed. Scapular clock 
exercises were emphasized in order to obtain dynamic stability of the scapula in all 
planes of movement. Figure 2 contains picture demonstration of this exercise Internal 
rotation sleeper stretch was also of special importance so that the patient could perform 
stretching a home (4-5 times per day 30-60 second holds) in order to reduce 
glenohumeral internal rotation deficit (G.I.R.D.). See appendix A for additional phase I 
exercises and descriptions.
Figure 2.
Scapular Clock Exercise using a mirror\textsuperscript{16}

Figure 3.
Sleeper Stretch in side lying to increase shoulder internal rotation\textsuperscript{17}
Phase II intervention focused on strengthening the glenohumeral and scapulothoracic joints and was initiated once scapular substitution patterns were minimized. Key muscles strengthened included the upper, middle, and lower trapezius, deltoid, rotator cuff (infraspinatus, supraspinatus, subscapularis, teres minor), rhomboids, and shoulder internal/external rotators. Maintaining internal rotation to stretch the posteroinferior capsule was still important throughout therapy and was necessary in returning the patient to the pre-injury level of function. Exercises in phase I were continued with the addition of more weight to increase strength and difficulty. Phase I and II exercises were geared toward optimal scapular muscle activation, and increasing glenohumeral stability.

In a normal throwing athlete, scapular musculature is activated prior to the rotator cuff, which allows a stable base for the rotator cuff musculature to perform\textsuperscript{19}. Improper muscle activation can cause scapular dykinesis which leads to shoulder pathology\textsuperscript{20}. According to Kibler\textsuperscript{19}, substitution patterns are the result of scapular dykinesis; the most common substitution pattern is upper trapezius over-activation. Upper trapezius dominance with shoulder motions is responsible for lower trapezius and serratus anterior weakness all of which were evident with this patient\textsuperscript{20,21,22}. According to current research, it is important to target scapular musculature to promote optimal scapular strength and alignment\textsuperscript{19}. Exercises that isolate scapular musculature aid in maintaining proper rotator cuff tensions, improving force production, and decreasing energy requirements during ADLs and throwing\textsuperscript{23,24}. In order to achieve isolation of scapular musculature Blackburn exercises were performed (Figure 4 provides picture demonstration). These exercises were effective in initiating and strengthening scapular
retractors and posterior rotator cuff musculature. Additional exercises added in phases II targeted the scapular retractors, lower trapezius, and serratus anterior to return to normal scapulohumeral movement patterns and functional abilities. Exercises and descriptions performed during phase II are outlined in appendix A.

1. Blackburn exercises

Figure 4.
Blackburn Exercises for scapular stabilization and retraction¹⁶
Phase III of treatment focused on returning to throwing while maintaining strength gains and ROM. Plyometrics in phases III were initiated once glenohumeral joint stability was achieved. Exercises from previous phases were still performed, emphasis still on sleeper stretching and Blackburn exercises, to maintain ROM and strength gains. Technique was the most important aspect of phase III to return to throwing. According to Heiderscheit\textsuperscript{25}, plyometric training can be incorporated into the intervention plan of care once scapular stabilization is achieved. Plyometric exercises are the most effective method in promoting power development and are based on the concept of the stretch shortening cycle where a powerful eccentric contraction is followed by an immediate concentric muscle contraction\textsuperscript{26}. Exercises incorporated as part of phase III are outlined in appendix A along with a full description of plyometric and pre-throwing exercises that were incorporated into phase III of therapy.
CHAPTER IV
OUTCOMES

Following eight weeks and 20 physical therapy intervention sessions, the patient was discharged. The first PT goal was to increase left shoulder IR PROM to 60 degrees, which the patient met with a final measurement at 69 degrees. ROM and strength had improved significantly with no substitution patterns.

The second physical therapy goal was to regain shoulder strength to 5/5 in flexion, abduction, scaption, ER, and IR. MMT was performed in the same manner as initial evaluation and revealed strength graded 5/5 in all motions. No pain was reported with the Obrien’s test and the patient reported that he was able to perform all pre-injury activities without any limitation. The patient was able to perform overhead activities, reach for his wallet, comb his hair, sleep on his left side, golf, ride horse and bring the arm with 5 pounds of weight across the midline of the body without pain or discomfort.

The patient was allowed to return to throwing activities with special warm-up instructions. Warm-up throws incorporated proper body mechanics with a complete follow through. The patient was instructed to throw 30-40 times at close range with minimal exertion to adequately warm-up. After this initial warm-up, the patient was instructed to perform the internal rotation stretch outlined in his home exercise program (HEP) for a 30 second hold. Upon completion of stretching, the patient was instructed to use his discretion on whether or not to continue. Initial throwing session after warm-up consisted of 25 throws up to 60 feet at 50% effort. Instructions were to stop if throwing
became painful or if he became fatigued. Throwing was also limited to every other day and weight training exercises outlined in the HEP were to be performed on the off days. Complete HEP is included in the appendix.

HEP placed major emphasis on the shoulder rotators and well as scapular stabilizers. Exercises included in the HEP were shoulder internal/external rotation with tubing, scapula push-ups on forearms, sitting press ups, shoulder shrugs, upright rows, lateral raises with three pounds, blackburns with one to two pounds, bicep curls, and empty/full cans with five pounds. All of these exercises had been performed previously during therapy and were explained in a chapter III. The patient was sent home with black tubing for internal rotation and red for external rotation. Exercises were to be performed 3 times per week with weight increased at the patient’s discretion. The patient was instructed to call with any questions or concerns that arose.

No formal follow-up was performed, but the patient was contacted at 6 and 12 weeks post discharge to monitor improvements. In both phone interviews, the patient reported that he was able to perform all desired activities and was pain free. He reported that he completed his HEP 3-4 times per week and had no further questions. The progression of left shoulder IR PROM and left shoulder MMT are outlined in figures 5 and 6, while Table 8 contains a comparison of initial to final outcomes.
**Table 5.** Initial and Final Measurements of the Left Shoulder

<table>
<thead>
<tr>
<th>Test/Measurement</th>
<th>Initial Measurement</th>
<th>Final Measurement (8 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obrien's</td>
<td>+ pain</td>
<td>(-) No pain elicited</td>
</tr>
<tr>
<td>Shoulder IR PROM (at 90 degrees of abduction)</td>
<td>40°</td>
<td>69° (Normal 70°)</td>
</tr>
<tr>
<td>Shoulder ER PROM (at 90 degrees of abduction)</td>
<td>Tender at 110°</td>
<td>106° (Normal 90°)</td>
</tr>
<tr>
<td>Shoulder Flexion strength</td>
<td>3/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Shoulder Abduction strength</td>
<td>2+/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Shoulder Scaption strength</td>
<td>3/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Shoulder IR strength</td>
<td>3/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Shoulder ER strength</td>
<td>3/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Scapular Protraction</td>
<td>3/5</td>
<td>5/5</td>
</tr>
</tbody>
</table>

**Figure 5.**
Left Internal Rotation PROM Progression throughout course of treatment
Figure 6.
Left Shoulder Strength Progression as Determined by MMT
CHAPTER V
DISCUSSION

The patient’s history, examination findings, and positive Obrien’s and crank tests were significant factors in the diagnosis of this case. Examination and evaluation findings were consistent with the MRI results of a grade I SLAP lesion diagnosis; however, these findings also suggested that the rotator cuff might have been involved, which the MRI results proved otherwise.

In general, literature suggests that surgery is the best intervention strategy for the treatment of SLAP lesions; however, in active patients with grade I lesions, conservative treatment could be investigated further to avoid surgery. Specifically, interventions that focus on normal scapular rhythm and muscle activation with retraction could benefit from further research.

Major emphasis for exercise intervention was place on minimizing substitution patterns and returning normal scapular kinetic\textsuperscript{21,22}. Additional focus was placed on normalization of normal shoulder biomechanics since scapular dynkinetics often results in shoulder injuries, such as SLAP lesions. In order to return normal biomechanics, focus was placed on reducing upper trapezius over activation and returning proper rotator cuff balance\textsuperscript{20,21,22}.

The interventions utilized for this patient resulted in reduced shoulder pain, increased ROM, improved shoulder or scapular stability, improved functional independence sufficient to return to all desired activities. It was assumed that the patient
experienced greater deficits because of the longevity between the onset of symptoms and therapy. Major intervention emphasis focused on reducing the amount of scapular winging and improving the lack of scapular control that was present at initial examination.

Grade I SLAP lesions are a common injury sustained by an active population, especially that of overhead athletes, but the course of management for these injuries is not well defined. Internal rotation deficits are characteristic of the throwing population, so returning this motion was crucial to a successful outcome. Additional intervention selection was based on examination findings and literature that suggested targeting scapular stabilization. Outcomes met all the goals set for therapy, so no additional interventions were needed besides an HEP (see appendix B). Dessaur investigated additional special tests that can be utilized to determine a SLAP lesion including the Bicep Load Test II and Resisted Supination External Rotation test. In future shoulder examinations these tests would be beneficial in order to rule in or out a SLAP lesion diagnosis. The Bicep Load Test II is performed with the patient is laying supine with the shoulder abducted to 120 degrees in maximal external rotation. The arm is flexed to 90 degrees with the forearm supinated followed by resisted elbow flexion at the wrist. This test is thought to put direct force to the superior labrum and has a sensitivity of 90% and specificity of 97%.

The Resisted Supination External Rotation test is performed with the patient supine and the scapula near the edge of the table. For the starting position the patient’s shoulder is abducted to 90 degrees with the elbow flexed to 65-70 degrees and the forearm in neutral. The patient then attempts to supinate with maximal effort while the
examiner gently externally rotates the shoulder to its maximal point\(^8\). A positive test is indicated by clicking/catching, deep/anterior pain in the shoulder, or reproduction of symptoms that occurs during throwing\(^8\). According to Dessaur\(^8\) this test has a sensitivity of 83% and specificity of 82%.

Limitations of this case report included lack of evidence supporting intervention for SLAP lesions with a lesion more severe than grade I. It is imperative to expand the research involving conservative therapy for grade I SLAP lesions; especially for younger and/or active patients. Another limitation of this case report was the lack of long term follow-up since follow-up was only completed at 6 and 12 weeks where the patient reported no limitation of activity.
REFLECTION

If I were to see a similar patient in the future with a similar diagnosis and presentation of symptoms I would do a number of things different. The major change I would make is to utilize a functional assessment. For this patient I could have used the DASH or SF-36 among others. By performing a functional assessment I would not only be able to gauge the patient's increase in function but I would also be able to reflect upon my individual performance. By performing a functional assessment I would also be able to chart the effectiveness of my chosen interventions.

Another change I would make is to be more thorough in my taking the patient's history. It would have been beneficial to learn more about the patient's symptoms that he had prior to returning from pitching. With this information I would be able to make a stronger link to the initial onset. Information such as athletic training reports or team physician documentation would also have been beneficial to get a better understanding of the patient's shoulder history.

I feel like I completed a thorough examination which allowed me to make a working diagnosis of a SLAP lesion of unknown grade. One of the only aspects of the examination that I would change is the use of the resisted supination external rotation test and the bicep load test II. It would be interesting to observe these tests on a patient with a grade I SLAP lesion.

Alternations that I would make in the plan of care and intervention strategies would be to incorporate the Blackburn exercises more often. While researching for this
case study I found many evidence based articles that all supported the use of these exercises.

The only referral that was made for this patient’s case was for a MRI. Beyond the MRI I wouldn’t make any additional referrals.

Looking back at the case presentation and intervention process, I found that there are many different options and reasoning behind selecting a specific intervention strategy. In the future I will continue to utilize these same intervention strategies and constantly reflect on their effectiveness for patients with similar pathologies.
## APPENDIX A

### Phase I exercises

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resisted Shoulder Shrugs (Shoulder Elevation)</td>
<td>Description outlined in Appendix B of HEP, CERVICAL SPINE-22B</td>
</tr>
<tr>
<td>Sitting Press-Up (Shoulder Depression)</td>
<td>Description outlined in Appendix B of HEP, UPPER EXTREMITY-12</td>
</tr>
<tr>
<td>Wall Push-ups (Shoulder Protraction)</td>
<td>In push-up position against a wall. Press shoulders up then sag upper body toward the wall to start position keeping elbows straight through the entire ROM. Perform 3 sets of 10-15 repetitions progress to push-up position on floor. Appendix B of HEP UPPER EXTREMITY-9</td>
</tr>
<tr>
<td><strong>Shoulder Retraction</strong></td>
<td></td>
</tr>
<tr>
<td>No Money</td>
<td>Standing with arms at their sides and elbows bent to 90 degrees. With resistance tubing between hands the patient externally rotates and retracts shoulders, holding for five seconds at end range. Perform 3 sets of 5-10 repetitions, increase resistance as tolerated.</td>
</tr>
<tr>
<td>Bent Over Dumbbell Row (Single Arm)</td>
<td>Description outlined in Appendix B of HEP, BACK:LATS-2</td>
</tr>
<tr>
<td>Upright Dumbbell Row</td>
<td>Description outlined in Appendix B of HEP, BACK:TRAPS-1</td>
</tr>
<tr>
<td>Rear Deltoid Raise: Sitting</td>
<td>Description outlined in Appendix B of HEP, SHOULDERS-18</td>
</tr>
<tr>
<td>Posterior Shoulder Glide</td>
<td>As described by Kilsner and Colby Therapeutic Exercise 5th Edition. Grade I distraction with grade 1-4 glides.</td>
</tr>
<tr>
<td>Internal Rotation with resistance tubing</td>
<td>Description outlined in Appendix B of HEP, SHOULDERS-44</td>
</tr>
<tr>
<td>External Rotation with resistance tubing</td>
<td>Description outlined in Appendix B of HEP, SHOULDERS-43</td>
</tr>
<tr>
<td>Empty Can/Full Can</td>
<td>Description outlined in Appendix B of HEP, SHOULDERS-74</td>
</tr>
<tr>
<td>Scapular Clocks (Thumb Tacks)</td>
<td>Performed in front of a mirror so the patient can observe shoulder movement. Motions performed include (A) Protraction, (B) retraction, (C) elevation and retraction, (D) depression and retraction, (E) internal rotation and elevation, and (F) external rotation and depression. See Figure II pg. 15</td>
</tr>
</tbody>
</table>
### Phase II Exercises

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>External Rotation (Single Arm Dumbbell)</td>
<td>Description outlined in Appendix B of HEP, SHOULDER-22</td>
</tr>
<tr>
<td>Internal Rotation (Single Arm Dumbbell)</td>
<td>Description outlined in Appendix B of HEP, SHOULDER-23</td>
</tr>
<tr>
<td>Curl: Standing Alternating Dumbbell</td>
<td>Description outlined in Appendix B of HEP, ARMS: BICEP-9</td>
</tr>
<tr>
<td>Marshals</td>
<td>Description outlined in Appendix B of HEP, MARSHAL EXERCISE</td>
</tr>
</tbody>
</table>

**Prone Scapular Exercises**

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackburns</td>
<td>Initiated to strengthen scapular retractors and posterior rotator cuff musculature. Consist of 6 positions (all in prone), 6 repetitions in each position with a 6 second hold at end range of each repetition. Position A- arms are positioned at 90 degrees of abduction with elbows straight and palms down. Move the scapulae into retraction and the shoulder into horizontal abduction. Position B- Arms same as position A except thumbs point to the ceiling. Position C- Arms are positioned in 110 degrees of abduction elbows extended, palms down. Position D- Same position as C except thumbs pointing towards ceiling. Position E- Arms positioned in 90 degrees of abduction with elbows bent to 90 degrees. Retract scapula and raise thumbs to the ceiling (externally rotate shoulders). Position F- Place palms on floor beside hips keeping elbows straight. Raise your hands as high as you can and retract the scapula. See Figure IV pg. 17</td>
</tr>
<tr>
<td>Up, Up, Down, Down (UUDD)</td>
<td>Patient prone on bench with arms hanging towards floor elbows extended. Patient retracts and horizontally abducts shoulders. Elbows are now bent at 90 degrees. Next the patient will externally rotate the shoulders pointing thumbs towards ceiling (similar to Blackburn position E). Return to starting position by performing steps in reverse order. Perform 3 sets of 10 repetitions, increase weight as tolerated.</td>
</tr>
</tbody>
</table>

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Internal Rotation Stretching (Sleeper Stretch)

Lying on the involved side, shoulder flexed to 90 degrees and elbow flexed to 90 degrees. The patient then pushes the forearm toward the table which results in a stretch of the posteroinferior capsule. See Figure III pg. 15
Up, Out, In, Down (UOID)

Starting position same as UUDD. Patient retracts scapula and extends arms bringing them even with hips, palms down. Next the patient abducts arms to 90 degrees keeping the elbows extended. Return to starting position by performing steps in reverse order. Perform 3 sets of 10 repetitions, increase weight as tolerated.

Flexion, Scaption, Horizontal Abduction (IYT)

Three part exercise starting position same as UUDD and UOID.
1) Prone Flexion (I) - Lie face down on bench with arm hanging towards the floor. Keep elbows straight and flex both shoulders to 180 degrees with thumb up and scapular retraction. Slowly return to starting position
2) Prone Scaption (Y) - Lying prone on bench flex arm in scapular plane to 180 degrees keeping elbow straight with thumb up with scapular retraction. Slowly return to starting position.
3) Prone Horizontal Abduction (T) - Lying prone on bench horizontally abduct arm with elbow extended and thumb pointing toward ceiling.
Performing each exercise one time is equal to one repetition. Perform 3 sets of 10 repetitions, increase weights as tolerated.

<table>
<thead>
<tr>
<th>Phase III Plyometric and Pre-throwing exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
</tr>
<tr>
<td><strong>Sport Cord</strong></td>
</tr>
<tr>
<td>Punch</td>
</tr>
<tr>
<td>Flexion, Scaption, Horizontal Abduction (IYT)</td>
</tr>
<tr>
<td>Hugs</td>
</tr>
<tr>
<td>Abduction (Circles, ZIG ZAG)</td>
</tr>
<tr>
<td><strong>Plyometrics</strong></td>
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<tr>
<td><strong>Rebounder</strong></td>
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<tr>
<td><strong>Pre-throwing Exercises</strong></td>
</tr>
<tr>
<td><strong>90/90 external and internal rotation with tubing</strong></td>
</tr>
<tr>
<td><strong>Internal/External Rotation Jump Outs</strong></td>
</tr>
<tr>
<td><strong>Ball tap on wall</strong></td>
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<tr>
<td><strong>Bench Partner Ball Toss</strong></td>
</tr>
<tr>
<td><strong>Supine Medicine Ball Chest Pass</strong></td>
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<tr>
<td><strong>Medicine Ball Toss and Catch</strong></td>
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<tr>
<td><strong>Sideways Medicine Ball Wall Toss</strong></td>
</tr>
<tr>
<td><strong>Wobbles</strong></td>
</tr>
<tr>
<td><strong>Figure Eights</strong></td>
</tr>
<tr>
<td>Ball Toss Up Against Wall</td>
</tr>
<tr>
<td>Ball Stability</td>
</tr>
</tbody>
</table>
**SHOULDERS - 22**  **External Rotation: Single Arm**  
(Dumbbell)

Lay with involved arm up, keep towel roll between arm and ribs. Rotate upward keeping elbow bent 90 degrees.  
Do **3** sets of **10** repetitions.

**ARMS: TRICEPS - 1**  **Kickback: Bent Over – Single Arm**  
(Dumbbell)

Straighten arm, keeping elbow as high as possible.  
Do **3** sets.  
Complete **10** repetitions.

**SHOULDERS - 23**  **Internal Rotation: Single Arm**  
(Dumbbell)

Lay on involved side, rotate arm in toward stomach while keeping elbow bent to 90 degrees.  
Do **3** sets of **10** repetitions.

**SHOULDER - 59**  **Scapular Exercises: Flexion in Prone**

Keeping biceps close to head, raise both arms from floor. Keep elbows straight through entire motion.  
Do **6** sets of **10** repetitions  
**6 second hold**

**SHOULDER - 76**  **Prone Horizontal Abduction with External Rotation**

Raise arms straight out to sides, bringing shoulder blades closer together. Keep elbows straight and THUMBS UP.  
Do **6** sets of **10** repetitions.  
**6 second hold**

**SHOULDER - 65**  **Progressive Resisted Exercises: Extension (prone)**

Keep arms as straight as possible, and close to hips. Raise up from floor while pinching shoulder blades together.  
Do **6** sets of **10** repetitions.  
**6 second hold**
SHOULDER - 47
Strengthening Activities: Active Resisted External Rotation

Attach tubing about hip height and place a rolled towel at your side. Keep elbow bent to 90 degrees and pull outward and slightly upward away from your stomach.

Repeat ___ times.     Do ___ sessions per day.
3 x 15

UPPER EXTREMITY - 12
Sitting Press-Up

Sitting on chair or weight bench with palms flat, slide hips forward off bench, keep elbows straight and push up as high as possible. Keep shoulder blades pinched together throughout motion

Do ___ sets of ___ repetitions

SHOULDER - 77
Prone Horizontal Abduction with Internal Rotation

Raise arms straight out to sides, bringing shoulder blades closer together. Keep elbows straight and THUMBS DOWN

Do ___ sets of ___ repetitions. ___ second hold

ARMS: BICEPS - 9
Curl: Standing Alternating (Dumbbell)

Knees slightly bent, hold weights at sides, palms in. Curl arm toward shoulder rotating to palm up while beginning curl. Repeat with thumb up and palm down.

Do ___ sets.    Complete ___ repetitions.

SHOULDER - 77
Rear Deltoid Raise: Sitting (Dumbbell)

Elbows slightly bent, palms in, raise arms to pinch shoulder blades together. Pause, then lower slowly. Concentrate on top range of motion.

Do ___ sets. Complete ___ repetitions.

MARSHALL EXERCISE
Supine Shoulder External/Internal Rotation in Abduction

With upper arms parallel to floor and elbows bent at right angles, alternately rotate arms upward then downward as far as possible without pain.

Repeat 50-100 times, or do for 4-5 minutes. Do ___ sessions per day.
**SHOULDER - 44**

**Strengthening Activities: Active Resisted Internal Rotation**

Attach tubing about shoulder height and place a rolled towel at your side. Keep elbow bent to 90 degrees and pull inward and slightly down toward your stomach.

Repeat __ times.
Do __ sessions per day.

**BACK: LATS - 2 Row: Bent Over - Single Arm (Dumbbell)**

In bent over position with chest level, start by pulling shoulder blade back first, then lift weight with arm, keep elbow close to body, pull up without rotating chest.

Do __ sets.
Complete __ repetitions.

**BACK: TRAPS - 1 Row: Upright (Dumbbell)**

Knees slightly bent, lift weights to chin, leading with elbows, dumbbells close together. Watch shoulders for symmetry.

Do __ sets.
Complete __ repetitions.

**SHOULDER - 74**

**Supraspinatus Strengthening**

Raise arm diagonally (45 degrees) from hip to parallel with floor. Keep elbow straight and thumb pointing down.

Perform thumb up and down.

Do __ sets of __ repetitions.

**CERVICAL SPINE - 22B**

**Strengthening (Phase II): Resisted Shoulder Shrugs**

Using dumbbells, shrug shoulders up as high as possible, then back and down. Keep neck upright throughout motion.

Repeat __ times.
Do __ sessions per day.

**UPPER EXTREMITY - 9**

**Push-Up Position Press-Up**

In push-up position, press shoulders up. Then sag down to start position. Keep elbows straight through entire motion.

Do __ sets of __ repetitions.
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