Current Concepts in The Recognition and Treatment of SLAP Tears

Brian Schiff, PT, OCS, CSCS

Background

- Supervisor - EXOS @ Raleigh Orthopaedic
- Practiced since 1996 in outpatient sports/ortho clinics
- S & C coach for MLS - Columbus Crew 2002-2006
- Owned my own training facility 2000-2010
- FMS certified, board certified orthopaedic clinical specialist (OCS), credentialed in dry needling
- Write for PFP Magazine
- PT consultant for Carolina Hurricanes

www.apcraleigh.com
Objectives

- Review signs and symptoms of SLAP tears
- Discuss relevant clinical tests and differential diagnosis
- Address non-surgical and post-op rehab treatment plans
- Cover surgical intervention including debridement, labral repair, biceps tenotomy and biceps tenodesis
- Provide return to play guidelines and current outcome data

Labrum - Fun Facts

- Functions to deepen glenoid by 50%
- Poor blood supply & vascularity arises from branches of suprascapular, circumflex scapular, and posterior circumflex humeral arteries thru capsular and periosteal vessels, not bone
- Neural supply from suprascapular and axillary nerve w/no mechanoreceptors
What is a SLAP tear?

By definition - superior labrum anterior and posterior coined by Snyder

There are 4 common tears described known as type I, II, III and IV tears

Classifying SLAP Tears

Type I - associated cuff pathology

Type II - older patients had rotator cuff pathology & younger patients had anterior instability

Type III & IV - associated w/traumatic instability

Type V - anteroinferior Bankart-type labral lesions in continuity with SLAP lesions

Type VI - biceps tendon separation with an unstable flap tear of the labrum

Type VII - extension of the superior-labrum biceps tendon separation to beneath the middle glenohumeral ligament
SLAP I
- Frayed superior labrum
- Intact biceps anchor
- Degenerative and probably a normal finding

SLAP II
- Stripping of the biceps anchor and superior labrum off glenoid
- Chondral changes and reactive synovium
- Meniscoid labrum can be mistaken for SLAP II

SLAP III
- Bucket handle superior labral tear with intact biceps tendon attachment
- Treatment consists of debridement of the bucket handle
SLAP IV

- Bucket handle tear of the superior labrum with extension into the biceps tendon
- Biceps anchor can be unstable requiring repair

Type II SLAP Tear is Most Common Injury

- Involves disruption of the proximal biceps anchor
- First reported by Andrews and seen in overhead athletes (“peel back” injury)
- Late cocking (max ABD & HER) is an at-risk position

The “Peel Back” MOI

- Contributing factors include:
  - Contact between the rotator cuff and posterosuperior labrum during maximal abduction and external rotation (ABER)
  - Anterior instability
  - Load on the biceps in late cocking
Biceps Tendon Function
- Stabilize the glenohumeral joint
- Depress the humeral head
- Limit external rotation at 90 degrees of ABD/ER

Type II Tear Subclassification
- Anterior, Posterior and Combined Lesions
- Prevailing thought is the tear causes microinstability which may lead to articular sided lesion specific partial thickness cuff tears
- Anterior SLAP tears = anterior cuff tears
- Posterior SLAP tears = posterior cuff tears

Classification - Type II

Anterior     Posterior     Ant. to Post.

Morgan & Burkhart Arthroscopy 2003
Signs & Symptoms

- Pain along the anterior, superior or posterior shoulder
- Increased pain with throwing or repetitive overhead activity
- Instability and/or weakness
- Clicking/popping/snapping in the shoulder
- Soreness along the biceps

Clinical Exam

- Take a thorough history
- Need to rule out differential diagnoses such as RC pathology, bicipital tendonitis, primary and secondary impingement, etc
- Throwers often note soreness in late cocking as well as inability to throw as hard or long without marked pain and limitation (dead arm feeling)

Clinical Exam Errors

- Always be on lookout for other issues
- Screen the C-spine
- Observe any marked atrophy that could signal possible nerve compression
- Don’t forget about brachial plexus
Clinical Exam

- Begin with AROM & PROM
- Perform MMT for shoulder/scapular muscles
- Rule out RC involvement prior to doing labral specific testing to avoid false positives
- Keep in mind while sensitivity may be good, the specificity of many labral tests is lower than desired

Specific Labral Tests

- Active compression test (O’Brien)
- Compression rotation test or Grind test
- Speed’s test
- Resisted supination external rotation test
- Pronated load test (Wilk)

Testing Accuracy

- Sensitivity = proportion of patients with a disorder who also have a positive clinical test
- Specificity = proportion of patients without the disorder who have a negative clinical test
O’Brien Test

- Popular test - O’Brien reported this maneuver to be 95% specific and 100% sensitive for detecting labral pathology but others have reported less success.

- Altchek reports that pain with a pronated grip that is relieved in supination is a positive sign, but NOT pain in the posterior shoulder or isolated to the AC joint.

Videos

*Compression Rotation Test*

*O’Brien Test*

*Speed’s Test*
Resisted Supination External Rotation Test (video)

Pronated Load Test

Specificity of Tests

An Evaluation of the Provocative Tests for Superior Labral Anterior Posterior Lesions

- Sensitive: O'Brien, Hawkins, Speed, Neer, Jobe
- Specific: None
- "There is no single maneuver that can accurately diagnosis SLAP lesions"
Imaging
- Plain films include - A-P, axillary and scapular Y and Stryker notch views
- X-rays are usually benign but may reveal bony abnormality (e.g. Hill-Sachs lesion)
- MRI is gold standard but MRA (using intra-articular gadolinium) has become the preferred choice for many
- Noncontrast MRI in ABER position works well according to Altchek

Diagnosis - Imaging
- MRI - 50% Sensitive
  - Kim, JBJS, 2007
- Arthro MRI
  - 92%- 100% Sensitive
  - 84%-88% Specific
  - 92% Accuracy
    - Berrardino, 2001; Applegate, 2004
MRA vs. MRI

- 150 patients (50 and under) reviewed who underwent arthroscopy
- In this series, MR arthrography showed statistically significant increased sensitivity for detection of partial-thickness articular surface supraspinatus tears, anterior labral tears, and SLAP tears compared with conventional MRI at 3 T


Surgical Intervention

- Who needs surgery?
- Failed rehab
- Function vs. pain
- Repair vs. debride
- Associated pathology

Interobserver and Intraobserver Variability in the Diagnosis and Treatment of SLAP Lesions Amongst Experienced Shoulder Arthroscopists

- Hypothesis: The diagnosis and treatment of SLAP tears by “expert” arthroscopists will vary significantly
- Materials and Methods
  - 300+ surgeons from ASES, AANA and AOSSM
  - 23 Video vignettes of SLAP lesions
  - Surgeons asked to classify and recommend treatment
  - 73 responded at t=0 and again at 12 months
How Good are MD’s?

<table>
<thead>
<tr>
<th>Lesion Type</th>
<th>Diagnosis Correct</th>
<th>Treatment Decision</th>
<th>Tx &amp; Dx Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>68%</td>
<td>70% No Tx</td>
<td>67%</td>
</tr>
<tr>
<td>Type I</td>
<td>64%</td>
<td>63% Debride</td>
<td>60%</td>
</tr>
<tr>
<td>Type II</td>
<td>54%</td>
<td>54% Repair</td>
<td>52%</td>
</tr>
<tr>
<td>Type III</td>
<td>42%</td>
<td>27% Debride</td>
<td>23%</td>
</tr>
<tr>
<td>Type IV</td>
<td>81%</td>
<td>19% Tenodesis</td>
<td>18%</td>
</tr>
</tbody>
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Surgical Algorithm

- Debridement for SLAP I and III
- Repair of detached labrum for SLAP II
  - Bioabsorbable Tacks
  - Suture anchors
- Repair or debridement for SLAP IV (often with tenodesis/tenotomy)

Bioabsorbable Tack
Suture SLAP II Repair

Biceps Tenodesis
- Alters attachment point for biceps anchor
- More aesthetically pleasing
- Good option for active younger population
- Predictable pain relief

Biceps Tenotomy
- Releases the biceps anchor
- Popeye deformity
- Good option for older population (>45 y/o)
- May happen naturally later in life
Post-op Complications

- Persistent pain
- Limited ROM
- Weakness
- Decreased throwing velocity

Nonoperative Rehab

- Line of 1st defense
- Strengthen cuff and scap stabilizers
- Emphasize stability
- Avoid “at-risk” position
- Resolve GIRD
Dangerous Exercises

- Wide grip pull-ups
- Below 90 bench, dips, flies & push-ups
- Snatches
- OH squats
- Heavy loads on biceps (e.g. dead lifts)

Exercise Modifications

- Use a more narrow grip
- Caution with ABER positions
- No deeper than 90 degrees at elbow and in line with body
- Long levers w/biceps load = BAD
- May need to eliminate OH work
“Go To” Exercises

- Prone I, Y and T’s
- S/L ext. rotation, scaption and serratus work
- Closed chain work for stability
- Core work (focusing on shoulder and hip stability as well)
- IR mobility (provided no active cuff inflammation)

Cuff & Scapular Ex’s

Scapular Control
Advanced Core/CKC Ex’s

Integrated Closed Chain Shoulder Exercises (video)

Unstable CKC Shoulder Training (video)

Post-op Rehab

- Know your surgeon’s preferences
- SLAP repair or SLAP repair w/associated procedures (RC, decompression, biceps tenodesis)
- Pain and stiffness are common
- Modalities per PT discretion throughout
Phase I (0-4 Weeks)

- Sling immobilization at all times except for showering and rehab under guidance of PT
- Heat before/ice after Rx
- Range of Motion – AAROM→AROM as tolerated
- Restrict motion to 140° of Forward Flexion, 40° of External Rotation and Internal Rotation to stomach
- No Internal Rotation up the back/No External Rotation behind the head

Phase I Exercises

- Wrist/Hand Range of Motion
- Grip Strengthening
- Isometric Abduction, Internal/External Rotation exercises with elbow at side
- No resisted Forward Flexion/Elbow Flexion (to avoid stressing the biceps origin)

Phase II (4-6 Weeks)

- Discontinue sling
- Gentle joint mobilization
- Range of Motion – Increase Forward Flexion, Internal/External Rotation to full motion as tolerated
- Advance isometrics from Phase I to use of a theraband within AROM limitations
- Continue with Wrist/Hand ROM and Grip Strengthening
- Begin Prone Extensions and Scapular Stabilizing Exercises (traps/rhomboids/levator scapula)
Phase III (6-12 Weeks)
- Range of Motion – Progress to full AROM without discomfort
- Therapeutic Exercise – Advance theraband exercises to light weights (1-5 lbs)
  8-12 repetitions/2-3 sets for Rotator Cuff, Deltoid and Scapular Stabilizers
- Continue and progress with Phase II exercises - may begin UE ergometer

Phase IV (3-6 Months)
- ROM goal – Full without discomfort
- Advance exercises in Phase III (strengthening 3x per week)
- Sport/Work specific rehabilitation
- Return to throwing at 4.5 months
- Return to sports at 6 months if approved

Biceps Tenodesis
- Attachment of biceps relocated on humerus
- More predictable pain relief?
- Good choice for older active population and heavy workers
- Avoid stress on biceps in early phases
- Modalities at PT discretion
Phase I (0-4 Weeks)

- Sling immobilization to be worn at all times except for showering and rehab under guidance of PT
- Range of Motion – PROM->AAROM->AROM of elbow as tolerated w/o resistance (allows biceps tendon to heal into new insertion on the humerus without being stressed). AROM of shoulder (no restriction)
- Goals: full passive flexion/extension at elbow and full shoulder AROM
- Encourage pronation/supination without resistance & grip strengthening

Phase II (4-12 Weeks)

- Discontinue sling immobilization
- Begin AROM of elbow with passive stretching at end ranges to maintain/increase elbow/biceps flexibility
- Therapeutic Exercise - begin light isometrics with arm at side for rotator cuff and deltoid – can advance to bands as tolerated
- May begin light biceps strengthening at 8 weeks

Phase III (3-6 Months)

- Range of Motion – Progress to full AROM of elbow without discomfort
- Continue and progress with Phase II exercises
- UE ergometer & sport-specific rehabilitation
- Return to throwing at 3 months
- Throwing from a mound at 4.5 months
- Return to sports at 6 months if approved
Return to Play

- Ensure proper scapular control is present
- Observe unilateral CKC stability
- Utilize interval throwing programs
- FMS trunk stability push-up and shoulder mobility may be viable tools

Videos

UQYBT
Outcomes

- Combined RC tear and Type II Slap tear
  - Over age 45 w/ a minimally retracted rotator cuff tear and associated SLAP lesion, arthroscopic repair of the rotator cuff with combined debridement of the type II SLAP lesion may provide greater patient satisfaction and functional outcome in terms of pain relief and motion (had significantly better overall UCLA scores)
  - ROM and pain relief not as good in concomitant Slap and RC repair group


Type II Repairs

- Arthroscopic repair of type II SLAP tears results in overall excellent results for individuals not involved in throwing or overhead sports.
- Results of type II SLAP repair in throwing or overhead athletes are much less predictable with rate of return for baseball players 22-64%


Pro Baseball Pitchers

- 68 athletes were identified with SLAP lesions
- 21 pitchers successfully completed the nonsurgical algorithm and attempted a return
- RTP rate was 40% and their RPP rate was 22%
- RTP rate for 27 pitchers who underwent 30 procedures was 48% and RPP rate was 7%
- 10 position players treated nonsurgically & RTP rate was 39% while RPP rate was 26%
- RTP rate for 13 position players who underwent 15 procedures was 85% with an RPP rate of 54%

Fedro et al. AJSM 2014
Failed Slap Repairs

- Simple failure of the prior SLAP repair will rarely be the cause of persistent pain.
- Use of tacks is especially worrisome, and suture anchor repair is preferable.
- Articular cartilage injuries because of either bioabsorbable or metal hardware will often create significant residual disability.
- Recent literature suggests that older patients (>40) may be better served by primary biceps tenodesis rather than SLAP repair.


Support for Tenodesis

- Surgeons are not sure of the post-op pain generating mechanism. Boileau et al (AJSM 2009) reported better results with biceps tenodesis than with SLAP repair and treated 4 failed SLAP repairs successfully with tenodesis (average age was 52 in this study).
- Subpectoral biceps tenodesis is a viable Rx for type II and IV SLAP tears (Gottschalk et al. AJSM 2014).

Failed Slap

- 10% of surgeons will operate on normal labrums.
- Biceps tenotomy and/or tenodesis is preferable over re-repair esp. in older patients.
- Keep in mind acute, traumatic injuries fare better with repairs.
- Leading surgeons prefer to leave biceps alone if it is normal.

Type II Revision from Kerlan-Jobe Clinic

- The mean age at the time of revision arthroscopic type II SLAP repairs was 32.6 years (range, 19-67 years) with a mean follow-up of 50.5 months (range, 8-81 months). There were 5 workers' compensation patients and 6 overhead athletes. Pain was the chief complaint at the time of initial and revision SLAP repairs.
- The mean ASES score was 72.5, patient satisfaction level was 6.4 (scale of 0-10), mean return to work was at 57.7% of the previous level, and mean return to sports was at 42.2% of the previous level.
- In overhead athletes, mean return to sports was at 41.3% of the previous level, and none of the 4 baseball players returned to pre-injury level.


Long Term Data

- Long-term Results After SLAP Repair: A 5-Year Follow-up Study of 107 Patients With Comparison of Patients Aged Over & Under 40
  - 107 subjects (36 women, 71 men) with mean age of 43.8 years underwent repair of isolated SLAP tears
  - Rowe score improved from 62.8 (SD, 11.4) preoperatively to 92.1 (SD, 13.5)
  - Satisfaction was rated excellent/good for 90 patients (88%) at 5 years
  - No difference for those over/under 40
  - Post-op stiffness and pain was reported by 14 patients (13.1%) at 5 years

Arthroscopy. 2012 May 18. [Epub ahead of print]

Prospective Type 2 SLAP Repair Study

- Over a 4-year period, 225 patients with a type 2 SLAP tear were prospectively enrolled
  - Two sports/shoulder fellowship-trained orthopaedic surgeons performed repairs with suture anchors and a vertical suture construct
  - Patients were excluded if they underwent any additional repairs, including rotator cuff repair, labrum repair outside of the SLAP region, biceps tenodesis or tenotomy, or distal clavicle excision.

Prospective Type 2 SLAP Repair Results

- 179 of 225 patients who completed the follow-up for the study (80%) at a mean of 40.4 months (range, 26-62 months)
- Arthroscopic SLAP repair provides a clinical and statistically significant improvement in shoulder outcomes.
- However, a reliable return to the previous activity level is limited as 37% of patients had failure, with a 28% revision rate.
- Age greater than 36 years was associated with a higher chance of failure


Biceps Tenodesis for Failed SLAP Repair

- 42 of 46 military patients w/failed SLAP completed study
- Synovitis of RC interval, loose suture loops & lack of healing at glenolabral interface were identified in 94% of revision cases
- Subpectoral tenodesis performed
- 34 (81%) returned to active duty & significant improvements in outcome scores and ROM postoperatively for Flex/ABD

McConnochie AJSM 2014

Questions
References

Contact Info

- Brian Schiff, PT, OCS, CSCS
- www.BrianSchiff.com
- info@BrianSchiff.com