Rehabilitation Following SLAP Repair Surgery
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Rehabilitation SLAP Lesions
Key Points:
- Rehab must match the surgery
- Non-Operative Rx can often be attempted first and with success
- Team approach to Rx is key
- SLAP pain generator?
- Rehab – think dynamic stabilization
- Normalize motion, strength & biomechanics

Case Study 4012016
• 26 yr old professional baseball pitcher with right shoulder (throwing side) pain
• Intermittent pain for past 3-4 yrs but now is worse – pain is located front & back of shoulder
• Pain with late cocking phase of throwing but some pain in deceleration phase too
• Attempted rehab with team, no throwing but can’t get better – only hurts with throwing – exercises do not hurt

Case Study 4012016
• Shoulder PROM: R L
  » ER at 90° abduction: 139° 131°
  » IR at 90° abduction: 43° 63°
  » TROM: 182° 195°
• Strength: all normal except following:
  » ER 4/5 slightly painful, full can 4/5 slightly painful
  » LT 4/5 no pain but weak, MT/Rhomb 4/5 painful
• Palpation: posterior cuff joint line
• Special tests: + internal impingement, +biceps load, + clunk test, + O’Brien Sign. Core weakness
Case Study 4012016

MRI Results:
- Posterior superior glenoid labrum tear
- Partial tear of rotator cuff
- Humeral head cystic changes (posterosuperior)

What Should the Treatment Be?

Case Study 1212014

- 15.5 yr old high school baseball pitcher & shortstop with right shoulder (throwing side) pain
- Intermittent pain for past 3-4 mos but now is worse – pain is located front & back of shoulder
- Pain with late cocking phase of throwing but some pain in deceleration phase too
- Attempted rehab with team, no throwing but can’t get better – only hurts with throwing – exercises do not hurt

Case Study 4012016

Shoulder PROM:
- ER at 90° abduction: 148° 123°
- IR at 90° abduction: 29° 61°
- TROM: 177° 184°

Strength: all normal except following:
- ER 4/5 slightly painful, full can 4/5 slightly painful
- LT 4/5 no pain but weak, MT/Rhomb 4/5 painful
- Weak core (very weak)

Palpation: posterior cuff joint line

Special tests: + internal impingement, + clunk test

Non Operative Rx SLAP Lesion (II)
Individualized Rx

- Active Rest
- Injection (Physician decision)
- Stretch & Normalize motion
  - Especially posterior shoulder, end range elasticity
  - Establish TROM within ±5° (ER+IR=TROM)
  - Enhance dynamic stabilization (GH & ST joints)
  - Improve hips, core and total body strength
  - Enhance endurance
  - Restore proper throwing mechanics
  - Gradual return to play

Incorporate Shoulder & Hips

- Gradual return to play
- Enhance dynamic stabilization (GH & ST joints)
- Improve hips, core and total body strength
- Enhance endurance
- Restore proper throwing mechanics
Treatment For SLAP Tears in Throwers

Treatment Options

• Non-Operative Rehab
  ✓ No throwing for a period of time
  ✓ Rehab to normalize motion & strength
  ✓ Improve dynamic stabilization
  ✓ Correct any biomechanical faults
  ✓ Educate

• Surgery Options
  ✓ Repair if repairable
  ✓ Debridement

Best Rx Option !?

Andrews, Wilk, Reed et al: Spring Trn ‘00

• 31 asymptomatic professional baseball pitchers tested at onset spring training
• MRI of glenohumeral joint (ABDER)
• 28/31 (90%) abnormal glenoid labrum
• 27/31 (87%) abnormal rotator cuff appearance
• 12/31 (39%) humeral head changes
• All pitchers were pain-free at time of study
• All MRI scans assessed by radiologist

Miniaci et al: AJSM ‘02

• Examined 14 asymptomatic professional pitchers
• Performed MRI & clinical examination
• 79% exhibited abnormal glenoid labrum
• 79% exhibited changes of the supraspinatus tendon
• Humeral head changes were seen in 36% (cystic changes)

Glenoid Labral Lesions

Introduction

• Common injury -
  difficult to diagnose
• May occur in isolation or in combination
• SLAP lesions:
  Snyder: Arthroscopy ‘90
  Andrews: AJSM ‘85
• Difficult to diagnose
  » subtle symptoms, pain, popping
  » can cause disability
  » prolonged symptoms
  O’Brien: AJSM ‘98

Glenoid Labral Lesions

Introduction

• Common injury -
  Can lead to functional limitations
  Functional disability
  Can’t perform at a high level
  Wilk, Reinold: JOSPT ’05
• Often pain is limiting factor
  Maffet, Gartsman: AJSM ‘95
  ✓ Mechanical pain alleviated with rest
  ✓ Pain during specific movement
  ✓ Throwing, lifting overhead, etc
  Wilk, Reinold: JOSPT ’05
Classification of SLAP tears

Andrews & Carson: AJSM '85
Snyder: Arthroscopy '90 (Type I –IV)
Maffet et al: AJSM '95 (Type V- VIII)
Powell et al: Op Tech Sppts Med ’04 (Type VII- X)
Tokish et al: JBJS '09 (circumference tear)

Often not an isolated lesion

SLAP Classification (I-X)

Neri et al: AJSM ’11
• SLAP type II repairs in overhead athletes
  ✓ 57% returned to pre-injury level
• Patients with cuff pathology poorer outcome

Neumann et al: AJSM ’11
• SLAP type II repairs in overhead athletes
  ✓ 84% returned to pre-injury level
• Mixed subject pool of various sports
Glenoid Labral Lesions
Clinical Outcomes

**Sayde et al: CORR ’12**
- Systematic review SLAP type II repairs
- 14 studies & 506 patients
  - Overall 83% good – excellent results
  - 63% overhead athletes returned to sports
  - 7% returned to pre-injury level
  - Anchor repairs did the best

**Gorantla et al: Arthroscopy ’10**
- Systematic review SLAP type II repairs
- No level I or II studies
  - Overall 40-94% good – excellent results
  - 22-64% overhead athletes returned to sports
  - Overhead athletes most challenging

**AJSM ’14**
*Laughlin, Fleisig et al: AJSM ’14*
- Pitching biomechanics following a SLAP repair
- 13 college & professional baseball pitchers with history of SLAP repair were compared to 52 age-matched pitchers w/o SLAP repair
- Significant differences were found:
  - Pitchers SLAP sign less horizontal abduction (11°)
  - Pitchers SLAP less ER in late cocking (10°)
  - Pitchers SLAP throw more upright posture (4°)

**Outcomes of Non-Operative Rx SLAP**
*Based on these findings, a trial of nonoperative treatment may be considered in patients with the diagnosis of isolated superior labral tear.
In overhead athletes and in those patients where pain relief and functional improvement is not achieved (by rehab), surgical treatment should be considered.*
### Glenoid Labral Lesions
#### Clinical Outcomes

**Fedoriw, Linter et al: AJSM ’14**
- Return to play after Rx of SLAP on professional baseball players:
  - Non-Op compared to Surgery
  - 119 consecutive patients retrospective review
  - 40% Pitchers return to play & 22% return to previous play with non-operative Rx
  - 48% Pitchers return to play & 7% return to previous level after SLAP repair
  - Position players: non-op (39% & 26%) SLAP repair (85% & 54%)

**Erickson, Harris, Fillingham, Cvetanovich, Bush-Joseph, Bach, Romeo, Verma: Arthroscopy ’16**
- 30 team Orthopaedic surgeons (41%) responded – mean experience 9.7 yrs
- Treatment opinions: in MLB Pitcher
  - 93% would repair a Type II SLAP tear
  - 1 surgeon would debride the tear
  - None would perform a concomitant biceps tenodeses

### SLAP Lesions
#### What causes the Pain?

- SLAP symptoms are difficult to pinpoint – Are SLAP lesions painful
- Pain generator:
  - SLAP?, Cuff?, Biceps?
- Rotator Cuff “Real Problem”
- Biomechanics of the Biceps/labral complex are Very Poorly understood

### SLAP Lesions
#### What Have We Learned

- SLAP lesions (II) are common in overhead athletes
- Many are asymptomatic
- Symptoms may be from rotator cuff, biceps, synovium/capsule
- SLAP repairs in pitchers often difficult to return to play
- SLAP repairs throwers – often complain & exhibit tightness “shoulder feels tight, can’t get back there”
- SLAP repairs in young active patients high success rates
- SLAP lesions in older patients – tend is with less repairs & more biceps tenodeses

### SLAP Lesions & Treatment
#### What Have We Learned

- Return to play after treatment of labral tears in professional hockey players
- 11 NHL players (13 shoulders) avg age 29
  - 3 SLAP repairs, 3 Bankarts, 2 posterior labral repairs, 3 anterior & posterior, 2 panlabral tears
- 100% All players returned to play – avg 4.2 mos
- Time on Ice (TOI) no significant change
Rehabilitation Following SLAP Surgery

**SLAP Lesions**

**Surgical Treatment**

- **Type I:** Debride back to stable rim
- **Type II:** Reattach superior labrum to glenoid, stabilize biceps anchor
- **Type III:** Torn fragment resected, leave remaining stable tissue
- **Type IV:** Treatment based on extent of biceps tear
  - Less than 30%: torn tissue resected
  - Greater than 30%: biceps tenodesis (age) or tenotomy

- **Type V:** Repair Bankart lesion & reattach superior labrum SLAP II
- **Type VI:** Excise or debride unstable flap tear & reattach superior labrum detachment SLAP II
- **Type VII:** Repair anterior capsule (MGHL) and reattach superior labrum

**SLAP Lesion Rehab**

**Type I & III Debridement**

- Immediate motion
- AAROM, PROM to tolerance:
  - ER / IR scapular plane @ 45° abd
  - Flexion ROM to tolerance
  - ER / IR @ 90 deg. Abduction
    - Usual at day 4-5
  - Full ROM 10-14 days*
  - Thrower’s Motion
    - 115° ER at 90 abd
Diminish Pain & Inflammation

SLAP Lesion Rehab
Type I & III Debridement

- Sling for comfort 3-5 days
- Isometric (all planes) 7 days
- Immediate ROM exercises
  » Full ROM 10-14 days
- Isotonic strengthening day 8
  » Wt resistance increase 1 lb/wk
  » Light biceps for 2-3 wks
  » Scapular strengthening

Type I & III Debridement

SLAP Lesion Rehabilitation
Normalize Motion & Stretching

- Consider the “total motion concept”
- Caution when stretching into ER !!!
  ✓ Posterior Shoulder Stretch
  ✓ Cross body stretch
  **Critical to successful rehab STRETCH !!!
- Adjust intensity of stretch to player’s laxity & inflammation!!

Cross Body Stretch

Modified Side-Lying Cross Body Stretch

Wilk et al: JOSPT ‘13
Modified Sleeper’s Stretch

Wilk et al: JOSPT ’13

SLAP Lesion Rehab
Progress Strengthening Program

• Emphasize muscular balance
• Manual resistance drills
• Rhythmic stabilization drills @ end range
• Isotonic strengthening
• Trunk and leg training
  » Core stabilization

Re-establish Dynamic Humeral Head Control

SLAP Lesion Rehab
Establish Muscular Balance

• Emphasize muscular balance
  » ER/IR ratio: 62-72%
  » ER/ABD ratio: 64-69%
  » ABD/ADD ratio: 66-72%
• Emphasize ER & scapular muscles

Wilk: AJSM ’93
Wilk: AJSM ’95
Wilk: PRM ’16
SLAP Lesion Rehab
Type I & III Debridement
• Isotonic strengthening weeks 3-8
• Progress to weight training weeks 4-6
• Plyometrics week 4 to 5
• Primary goal muscular balance &
dynamic stabilization
✓ Initiate Interval Sport Programs
  week 4-10:
✓ Interval Sport Programs
✓ Dependent on concomitant lesions
✓ Especial rotator cuff lesions (under)

Rehab Following Rotator Cuff Debridement
Critical Factors Influencing Success
✓ Concomitant Cuff Pathology
  • Depth of cuff lesion:
    » Small: 15% or less
    » Moderate: 15-40%
    » Significant: 40% or greater
  • Location of lesion:
    » Involved muscles
      • supraspinatus, infraspinatus
    » PASTA Lesions (Snyder ’03)

Rehab Following Rotator Cuff Debridement
Throwing Progression
• Interval Throwing Program
  • Progress gradually to ITP when
    appropriate
  • Specific criteria
    • Small tears: week 12-14
    • Moderate tears: wk 16-18
    • Significant tears: wk 18-20
    • Variable timeframes

Gradually Progress to Mound Throwing

Criteria to Progress to Throwing:
✓ Full Non-Painful ROM
✓ Satisfactory clinical exam
✓ Satisfactory isokinetic test
✓ Appropriate rehab progression
✓ Adequate healing timeframes
✓ Functional Test for Throwers

Gradually Progress to Throwing
SLAP Lesions Treatment
*Then & Now*

*Squeaking SLAP*

Rehabilitation Following SLAP Repair

**Overview**
- *Concern is to control forces/loads on repaired labrum*
- ER/IR motion usually *Not a problem*
- no excessive motion for 12 wks*
- Restoration of full arm elevation (flexion) sometimes difficult
- Determine extent of lesion*  
  » Number of suture anchors used
  » Location of lesion
- Ensure dynamic stability is present

**Precautions**
- Control forces for 6-8 weeks
- No overhead movements (above 90) for 3-4 weeks
- Need stable glenohumeral joint
- Emphasize dynamic joint stability  
  » Minimize GH translation
- No isolated biceps 8 weeks  
  » No heavy lifting
- No CKC exercise drills till 8 weeks post-operative
- No resisted movements above 90 degrees elevation for 8 weeks
- No heavy bench press, heavy lifting overhead till 3 months post-operative
Rehabilitation Following SLAP Repair

Range of Motion Progression

- Sling for 4-6 weeks
  - Sleep immobilizer 4 weeks
- Immediate "limited motion"
  - AAROM / PROM flexion to 70°
  - Weeks 2-4: flexion to 90°
- Motion above 90 begins week 4-5
- ER/IR @ 90 deg abd. Week 5
- Full "normal" ROM week 8
- Week 8-12: return to throwers’ motion – ER to 115 deg

Factors Influencing Rehabilitation

- Remove ROM restrictions
- Gradually increase ROM
  - Flexion to tolerance
  - ER/IR at 90° ABD
- Full ROM @ week 7-8
  - ER @90 abd to 95-105
  - in overhead athletes
- Progress isotonics
  - "thrower’s ten program"

Shoulder Elevation Scapular Plane

Wide Hand Placement
Rehabilitation Following SLAP Repair

- Full ROM by week 6-9
  - ER to 90° by week 6-7
  - ER to 105° by week 7-8
  - ER to 115° at week 10-12
- Plyometrics week 8
  » 2 hand plyos week 8-10
  » 1 hand plyos week 12
- No CKC drills for 8-10 weeks
- Isolated biceps: initiate week 8
  » Light & progress

Rehabilitation Following SLAP Repair

Muscular Training

- Isometrics immediately – sub program!!
- Active ROM week 3
- Light isotonics week 4-6
- No isolated biceps for 8 weeks
- No CKC exercises for 8 weeks
- Advanced strengthening wk 10-12
- Plyometrics week 12-14
- Interval throwing week 16 (toss)
- Interval mound throwing program 5-6mos
- Interval hitting program week 12-14

Re-establish Dynamic Humeral Head Control

Wilk: JOSPT ’93
Wilk: JOSPT ’96
Improve Scapular Position, Posture, & Scapulothoracic Control

Incorporate Shoulder & Hips
Thrower’s Ten Program

Side Plank ER Strengthening

Kibler et al: AJSM ’08

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Average Amplitude EMG Activity All Subjects D1 = 390 by Exercise</th>
</tr>
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<tbody>
<tr>
<td>Exercise</td>
<td>Inferior Glute</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Upper trapezius</td>
<td>8.1 (5.9)</td>
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<tr>
<td>Lower trapezius</td>
<td>13.4 (16.8)</td>
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<tr>
<td>Serratus anterior</td>
<td>22.4 (18.6)</td>
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<tr>
<td>Posterior deltoid</td>
<td>4.8 (2.4)</td>
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<tr>
<td>Anterior deltoid</td>
<td>6.4 (3.6)</td>
</tr>
<tr>
<td>Between muscles</td>
<td>UT = all others</td>
</tr>
<tr>
<td>SA = UT, AD, PD</td>
<td>UT = AD</td>
</tr>
</tbody>
</table>

*Data are given in means (standard deviations). EMG, electromyography; R, reliability; L, between; SA, serratus anterior; UT, upper trapezius; AD, anterior deltoid; PD, posterior deltoid; UT, upper trapezius.
Rehabilitation of the Thrower’s Shoulder
Progress Strengthening Program

- Emphasize muscular balance
- Manual resistance drills
- Rhythmic stabilization drills @ end range
- Isotonic strengthening
- Trunk and leg training
  Core tone & stabilization

SB 10 Program

NM Control - Eyes Closed
Advanced Throwers Ten Program

Advanced Thrower’s Ten Program

Plyometrics
Rehabilitation Following SLAP Repair

Functional Activities

- Initiate throwing program week 16
  » ITP long toss: week 16
  » ITP mound program week 22-26
  » Competitive throwing: 7-9 months
  » Interval Golf week 14
- Athletes must continue ROM & strengthening program
- Return to sports:
  » Overhead sports: 6-9 months

Rehabilitation SLAP Lesions

Key Points:

- Rehab must match the surgery
- Non-Operative Rx can often be attempted first and with success
- Team approach to Rx is key
- SLAP pain generator?
- Rehab – think dynamic stabilization
- Normalize motion, strength & biomechanics
28 yr old professional football quarterback traumatic 330° SLAP with full thickness supraspinatus tear.

Case Study – 330° SLAP

Surgical Repair and Rehabilitation of a Combined 330° Capsulolabral Lesion and Partial-Thickness Rotator Cuff Tear in a Professional Quarterback: A Case Report

Rehab Following SLAP Repair with Concomitant Surgical Procedures
- SLAP repair with stabilization surgery
  - Thermal capsular shrinkage
    Wilk, Reinold, Andrews: JOSPT ‘05
  - Bankart repair (type V)
    Voos, Pearle, Mattern: AJSM ’07
  - Capsular shift or plication
- SLAP repair with cuff repair
  - Arthroscopic or open repair
    Voos, Pearle, Mattern: AJSM ’07
- SLAP repair with decompression
  - Coleman, Cohen, Drakos: AJSM ’07
- SLAP with debridement

SLAP Lesion Rehab

Summary
- Rehab must match surgery
- Repair vs debridement
- Type I & III, simple debridement
  - Rehab for dynamic stabilization
- Type II & IV, (V – VIII) control stresses
  - No overhead motion for 4 weeks
  - Control forces 8-12 weeks
  - Number of Suture anchor
- Team approach to treatment
  - Extent & location of SLAP lesion
  - Concomitant pathologies - Cuff

Thank You!!!