From a clinical perspective:

High amount of **SLAP diagnoses** in overhead sports (throwers, gymnasts, javelin throwers, pole vallers…)

Until recently many **SLAP repairs**, with moderate to excellent success and return to play

**BUT**: surgeons obviously tend to shift from immediate repair to conservative treatment as initial management in some cases….
SLAP lesions: who is responsible for the pain and dysfunction?

- **Neural receptors** found in labrum, possibly causing pain and loss of proprioception (Vangsness 1995)

- **Abnormal GH translations** in SLAP lesions in ABER (MRI-findings)

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SLAP lesions: who is responsible for the pain and dysfunction?

- Biceps has **depressor function** in shoulders with tears of the RC (Kido JBJS 2000)

  “using the shoulder without LHB is like playing basketball with 4 in stead of 5 players: possible but difficult” (Kibler, Doha, nov 2013)

  “if player number 5 is a very bad one, you are better off without him” (course participant, Doha, Nov 2014)
SLAP lesions: update on clinical examination

Clinical Utility of Traditional and New Tests in the Diagnosis of Biceps Tendon Injuries and Superior Labrum Anterior and Posterior Lesions in the Shoulder

W. Ben Kibler, MD, Aaron O. Solocraci, MS, ATC, NSCA-CPT, NS, Peter Hostar, MD, David Dome, MD, ATC, and Calie Jacobs, PhD, ATC

From the Shoulder Center of Kentucky, Lexington, Kentucky

<table>
<thead>
<tr>
<th>Lesions</th>
<th>Test(s)</th>
<th>Predictability, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps</td>
<td>Upper cut</td>
<td>77.8</td>
</tr>
<tr>
<td></td>
<td>Upper cut and Speed's test</td>
<td>80</td>
</tr>
<tr>
<td>Labrum</td>
<td>DLS</td>
<td>84.4</td>
</tr>
<tr>
<td></td>
<td>DLS and O'Brien's</td>
<td>84.4</td>
</tr>
</tbody>
</table>

(Kibler AJSM 2009)
SLAP lesions in the overhead athlete: decision making in treatment options?

<table>
<thead>
<tr>
<th>Conservative</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural damage unclear</td>
<td></td>
</tr>
<tr>
<td>Functional deficits on clinical exam (ROM, RC strength, scapular stability)</td>
<td></td>
</tr>
<tr>
<td>Chronic throwing related shoulder pain</td>
<td></td>
</tr>
<tr>
<td>Large structural deficit</td>
<td></td>
</tr>
<tr>
<td>Traumatic event</td>
<td></td>
</tr>
<tr>
<td>Failed rehabilitation</td>
<td></td>
</tr>
</tbody>
</table>

SLAP lesions in the overhead athlete: outcome of treatment?

<table>
<thead>
<tr>
<th>Conservative</th>
<th>Surgery</th>
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<tbody>
<tr>
<td>Edwards et al. AJSM 2010</td>
<td></td>
</tr>
<tr>
<td>Fedoriw et al. AJSM 2014</td>
<td></td>
</tr>
<tr>
<td>Provencher et al. AJSM 2013</td>
<td></td>
</tr>
<tr>
<td>Lim et al. AAM Sing 2008</td>
<td></td>
</tr>
<tr>
<td>Kanatli et al. AOTS 2011</td>
<td></td>
</tr>
<tr>
<td>Abbott et al. AJSM 2009</td>
<td></td>
</tr>
<tr>
<td>Oh et al. AJSM 2009</td>
<td></td>
</tr>
<tr>
<td>Friel et al. JSES 2010</td>
<td></td>
</tr>
<tr>
<td>Gorantla Arthr 2010</td>
<td></td>
</tr>
<tr>
<td>Sayde WM CORR 2012</td>
<td></td>
</tr>
<tr>
<td>Systematic Reviews</td>
<td></td>
</tr>
</tbody>
</table>

- Edwards et al. AJSM 2010
- Fedoriw et al. AJSM 2014
- Provencher et al. AJSM 2013
- Lim et al. AAM Sing 2008
- Kanatli et al. AOTS 2011
- Abbott et al. AJSM 2009
- Oh et al. AJSM 2009
- Friel et al. JSES 2010
- Gorantla Arthr 2010
- Sayde WM CORR 2012
- Systematic Reviews
N=50/371 questionnaires - retrospective
SLAP diagnosis based on O’Brien, pain in bicipital groove and MRI
SF36, VAS, ASES, SST

Physical therapy:
- Stretching posterior capsule
- Scapular and core stability training
- RC training

50% failure → surgery
50% success → symptom improvement + return to sports similar to surgery (only 66% to previous level)

Conclusion: Using validated, patient-derived outcome instruments, the present study shows that successful nonoperative treatment of superior labral tears results in improved pain relief and functional outcomes compared with pretreatment assessments. Although 20 patients (51%) in this group elected surgery and may be considered nonoperative treatment failures, those patients with successful nonoperative treatment had significant improvements in pain, function, and quality of life. Return to sports was comparable with patients with successful surgical treatment, although return to overhead sports at the same level was difficult to achieve (66%). 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 those patients where pain relief and functional improvement is not achieved, surgical treatment should be considered.
Fedoriw et al. AJSM 2014

- Case series 68 baseball players with type II SLAP lesions, retrospective design conservative vs surgery
- 30% completed non-surgical treatment with success, RTP low for both treatments
- 40% RTP, however RPP 22%

“Nonsurgical treatment correcting scapular dyskinesia and GIRD had a reasonable success rate in professional baseball players with documented SLAP lesions.”

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Systematic Review

The Outcome of Type II SLAP Repair: A Systematic Review

Kedjan Gorantia, M.S., Corey Gill, M.D., and Rick W. Wright, M.D.


Purpose: The purpose of this study was to systematically review the literature regarding the outcome of arthroscopic repair of type II SLAP lesions in order to assess the effectiveness of current methods of treatment. Methods: We performed a systematic review of the results of repair of type II SLAP lesions. Inclusion criteria included outcome studies of repair of type II SLAP lesions with minimum 2-year follow-up and Level IV evidence or higher published in the English language in peer-reviewed journals. Results: There is no Level I or II evidence for SLAP repair outcome. Regarding the general outcome after type II SLAP repair, the percentage of good and excellent results ranged from 40% to 94%. Return to previous level of play ranged from 20% to 94%. Overhead athletes are the most challenging to return to the previous level of performance for this diagnosis, and their return rate reflects this. Five studies reported these results, and the rate of return ranged from 22% to 64% for baseball players. Conclusions: Arthroscopic repair of type II SLAP tears results in overall excellent results for individuals not involved in throwing or overhead sports. The results of type II SLAP repair in throwing or overhead athletes are much less predictable. Future studies should be prospective in nature and at least use a longitudinal prospective cohort design to determine predictors of outcome. Level of Evidence: Level IV, systematic review of Level III and IV studies.
what is the best treatment for overhead athletes with SLAP lesion?

General guidelines for the rehabilitation of SLAP lesions

Conservative treatment: treatment goals and guidelines
(Knesek et al. AJSM 2012)

Postoperative rehabilitation: protection of surgery site and timing
(Burkhart et al. Arthr 2003, Verborgt & Van Riet, 2012)
Conservative treatment: restore...

- muscle strength and endurance
- normal GH and ST motion
- proprioception, stability, neuromuscular control
- massage therapy
- passive and active assisted exercises
- stretching posterior capsule
- from closed chain to open chain

Post-operative treatment:

- 0-3 w: sling + /p/ ROM within limits of pain
- 3-6w: ROM improvement and /a/ ass exercises
- 6w: scapular muscle and RC strengthening
- 8w: biceps training
- 14w: plyometrics, ecc biceps training, isokinetics
- 4m: throwing exercises
- 6m: return to train
- 7m: return to play
"Throwing program"

Biceps load ??

Rehabilitation Exercises for Athletes With Biceps Disorders and SLAP Lesions

A Continuum of Exercises With Increasing Loads on the Biceps

A Cools SLAP 2015
Target muscle group: scapulothoracic (5)

Target muscle group: Glenohumeral (6)
Target Muscle Group: Biceps Brachii (3)

Target Muscle Group: functional diagonals (2)
<table>
<thead>
<tr>
<th>No.</th>
<th>Exercise</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forward flexion in side-lying position</td>
<td>Dumbbell</td>
</tr>
<tr>
<td>2</td>
<td>Prone extension *1, 42</td>
<td>Dumbbells</td>
</tr>
<tr>
<td>3</td>
<td>Seated rowing *1, 13, 20, 31-22</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>4</td>
<td>Serratus punch *13</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>5</td>
<td>Knee push-up plus *13, 27-34, 42</td>
<td>Body weight</td>
</tr>
</tbody>
</table>

*1 Mild pain during positioning
*2 Severe pain during positioning

Table 2: Description of the 15 exercises performed by the subjects in the study, with four main training targets: ST - supraspinatus muscle training, CT - contractile training, GM - ground movement, GM - ground movement.
<table>
<thead>
<tr>
<th></th>
<th>Exercise Description</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Forward flexion in external rotation and forearm supination&lt;sup&gt;30-32, 38&lt;/sup&gt;</td>
<td>Dumbbell</td>
</tr>
<tr>
<td>7</td>
<td>Full can&lt;sup&gt;9, 31-32, 38&lt;/sup&gt;</td>
<td>Dumbbell</td>
</tr>
<tr>
<td>8</td>
<td>Internal rotation in 20° abduction&lt;sup&gt;30, 32, 38, 42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>9</td>
<td>External rotation in 20° abduction&lt;sup&gt;30, 32, 33, 38, 42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>10</td>
<td>Internal rotation in 90° abduction&lt;sup&gt;32, 42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>11</td>
<td>External rotation in 90° abduction&lt;sup&gt;32, 33, 42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Exercise Description</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Forearm supination&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>13</td>
<td>Elbow flexion in forearm supination&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>14</td>
<td>Uppercut&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Dumbbell</td>
</tr>
<tr>
<td>15</td>
<td>Internal rotation diagonal&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
<tr>
<td>16</td>
<td>External rotation diagonal&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Pulley apparatus</td>
</tr>
</tbody>
</table>
EMG-measurements

1. UT
2. MT
3. LT
4. SA
5. AD
6. PD
7. BB
8. TB

A Cools SLAP 2015

(Cools et al. AJSM 2014)
Exercise: select exercises for the following goals:

1. Training of MT with low biceps load
2. Training of SA with low biceps load
3. High load biceps exercise with low load UT

(Cools et al. AJSM 2014)
Results?

Effects of these exercises in patients with biceps related pathology?

High level activity in biceps during exercises (Master thesis 2013-2015)
Increasing loading capacity

Loaded shoulder flexion component
- Uppercut-exercise

Increasing loading capacity

Loaded shoulder flexion component
- Ball control with biceps loading
Increasing loading capacity

**Eccentric exercises**
- 1-2-3 exercise shoulder flexion

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A Cools SLAP 2015

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Increasing loading capacity

**Eccentric exercises**
- “punching” exercise with elastic band

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A Cools SLAP 2015
Increasing loading capacity

Eccentric exercises
- “hanging” exercises

A Cools SLAP 2015
Take home messages

Trend towards conservative treatment in sportsrelated SLAP lesions in the overhead athlete
Therefore a need for a science based exercise program to restore strength, mobility and function.
Low to moderate load on the biceps should protect the injury in early stage of rehab
Future research is needed for outcome of conservative treatment