The Rotator Cuff & Biceps Anchor

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Anatomy
- Shoulder is really 4 articulations

Anatomy
- Dynamic Stabilizers
  - Rotator cuff
  - Scapulothoracic muscles
  - Long Head Biceps
- Static Stabilizers
  - Glenohumeral articulation
  - Labrum
  - Joint capsule (Glenohumeral Ligaments)

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History of Cuff Injury

- Typically repetitive microtrauma
- Repetitive nature of throwing
- High velocity/large forces
- Extremes of motion
- Year round participation
- Occasionally single event

History

- Pain
  - Posterior (impingement)
  - Anterior (biceps)
- Weakness
- Loss of velocity
- Subjective Instability
Anatomical Adaptations

- GIRD
  - 180° normal arc of motion
  - Shifted posteriorly in throwing arm
    - Due to osseous and soft tissue adaptations
    - More external rotation/Less internal rotation
  - Puts posterosuperior labrum and articular rotator cuff at risk for injury

Internal Impingement

- In maximum ER and Abduction
  - Posterosuperior labrum contacts articular cuff
  - Can occur in absence of symptoms
  - Recurrent microtrauma
    - Shoulder girdle muscle fatigue
    - Scapular dyskinesis
    - Over-throwing
  - High association with GIRD
  - Leads to SLAP & articular cuff tears

Exam of Throwing Athlete

- Visual: atrophy/asymmetry
- Winging/scapular dyskinesis

- Range of Motion
  - Supine
  - MUST compare to contralateral shoulder

Exam

- Strength
  - Empty can
  - Subscap Tests

- Stability
  - Apprehension
  - Multidirectional Instability
  - COMPARE!

- Special Tests
  - Impingement
  - Internal Impingement (Jobe)
  - Obrien’s Test
Nonoperative Treatment

- Typically 3-6 months
- Rest
  - Pitch count
  - Year round schedule
- Injections?

Nonoperative Management

- Rehabilitation
  - Phase I
    - Decrease inflammation
    - RICE
    - Restore ROM
  - Phase II
    - When ROM normalizes
    - Sleeper Stretch
    - Strengthening
      - Scapula/Cuff/Core

Nonoperative Management

- Rehabilitation
  - Phase III
    - No pain, minimal ROM deficits, adequate cuff/scapular strength
    - Intense strengthening
    - Plyometrics
    - Interval Throwing Program
  - Phase IV
    - Continue strengthening & neuromuscular training
    - Advanced position-specific throwing program
- 3-6 MONTHS!

MRI

- Andrews “if you want to find something wrong with a pitcher's shoulder, order an MRI”
- Evaluate rotator cuff and labrum
- Arthrogram
Surgery
Rotator Cuff Surgery in the Athlete

- Cuff Debridement

- Rotator Cuff Debridement < 50% thickness
  - 65-75% return to sport
  - But only 55% return to previous level

- Cuff Repair
Surgery

- Rotator Cuff Repair > 50% thickness
  - Most recreational athletes are able to return
  - 12% of athletes return after mini-open repair
  - Even with advanced arthroscopic techniques
    - Only 50% competitive athletes return to prior level of play
    - Worse prognosis for professional athletes
    - and pitchers

Biceps Anchor/Superior Labrum

Anatomy

- Superior portion of the labrum inserts directly into the biceps tendon distal to its insertion on the supraglenoid tubercle
- More meniscal in nature and mobile than inferior labrum

Vascular anatomy

- Similar to knee meniscus, vascularity is limited to peripheral margin
  - Limited vascularity of anterosuperior region
  - Renders superior labrum susceptible to injury
  - Impaired healing ability after repair

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Anatomy

- Considerable variability in superior labrum and LHB (about 10-15%)
- Sublabral recess
- Sublabral foramen
- Buford complex – thick MGHL and absence of AS labrum

| Anatomy | Description | Incidence
|---|---|---
| Normal | Sclerotic labrum attached to anterosuperior glenoid rim | 85.82%
| Superior sublabral recess | Sulcus located under the biceps tendon | 7.17%
| Sublabral foramen | Outflow between anterosuperior labrum and the anterior glenoid | 7.67%
| Buford complex | Abundant labrum – thick, cord-like ligament | 4.86%

Biomechanics

- Cadaveric biomechanical studies
  - LHB has stabilizing effects on the glenohumeral joint in all directions.
- In vivo studies have yet to establish this stabilizing effect.
- LHB does not serve as a humeral head depressor
- EMG studies show little or no activation when the elbow is immobilized.

Biceps tendon

- Pathology
  - Rupture
  - Subluxation/Instability
  - SLAP Lesions
  - Tendinitis
  - Most LHB pathology is secondary
  - Associated degenerative or traumatic injuries
- Definite pain generator
- Impingement
- Rotator cuff pathology
- Exact role in biomechanics not clearly understood

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SLAP TEARS

- Injury mechanism
  - Direct Contact – Hyperangulation (Jobe)
  - Fall on outstretched upper extremity
  - Torsional – “Peel-Back” (Andrews, Burkhart)
  - Twisting of biceps
  - Repetitive pull on posterosuperior labrum

History & Exam

- Diagnosis
  - Difficult with nonspecific history and exam findings
  - High incidence of false-positive findings on imaging
  - Multiple co-existing injuries
    - 29% with partial thickness RCTs
    - 22% with Bankart lesions
- Exam
  - Assess ROM (GIRD)
  - Assess stability/hyperlaxity
  - Obrien’s Active Compression test

History and Exam

- Several Special Tests

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<th>Sensitivity</th>
<th>Specificity</th>
<th>PVP</th>
<th>NPV</th>
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<td>85.18%</td>
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• Imaging
  • Andrews "if you want to find something wrong with a pitchers shoulder, order an MRI"

Nonoperative Management
• Rest
• NSAIDS
• Cuff/Scapula Strengthening
• Injections

Operative Management
• SLAP Repair
  • High level of successful outcomes
  • BUT...Returning throwing athletes to pre-injury levels may be more difficult than previously reported
    • 44-69%

Biceps Tenodesis
• adsf

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Operative Management

- Mini-open Subpectoral Biceps Tenodesis

Arthroscopic Tenodesis

Operative Management

- SLAP repair versus Biceps Tenodesis for Type II
  Boileau 2009
  - SLAP repair
  - 20% return to previous level
  - Biceps Tenodesis
    - Higher satisfaction and functional scores compared to repair
    - 87% return to previous level of play

- Hawkins et al. 2007 - Tenotomy
  - No difference in elbow flexion or supination

International Trends

- France (Boileau) – Tenodesis
  - 87% RTP
  - Only 20% with SLAP repair

- Korea (Kim) –
  - Tenotomy with Rotator cuff repair far superior than SLAP repair

- U.S. - 2005-2009
  - SLAP repair 10% of all shoulder cases
  - Growing trend toward biceps tenodesis

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Postoperative Management

- SLAP repair
  - Sling 4 weeks
  - Immediate
    - Elbow and wrist rom
    - Scapula stabilizer exercise
  - 1 week - Controlled ROM in scapular plane
  - 6 weeks - Cuff strengthening
  - 12 weeks - AVOID extreme ABD & Ext Rot
    - Weight training
  - 16 weeks – throwing program for overhead athletes
  - 6 months – full release

Postoperative Management

- Biceps Tenodesis
  - Similar to SLAP repair, but accelerated
  - Sling for 2-3 weeks
  - **No isometric biceps for 4-6 weeks**
  - Cuff strengthening at 4 weeks
  - Active Shoulder flexion at 4 weeks
  - Throwing program at 12 weeks
  - Release at 4-6 months

Conclusions

- Adaptive Changes in the thrower’s shoulder leave it susceptible to injury
- Rotator Cuff Pathology
  - Rest and Therapy is 1st line management
  - After debridement or repair, return to play rates are about 50%
- SLAP Lesions
  - Less responsive to therapy
  - Biceps Tenodesis yields higher return to play and satisfaction rates than SLAP repair

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