

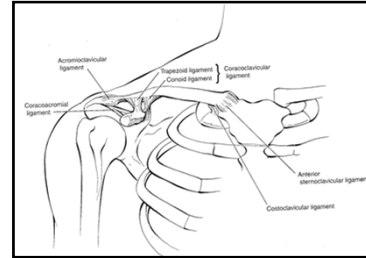
The Rotator Cuff & Biceps Anchor

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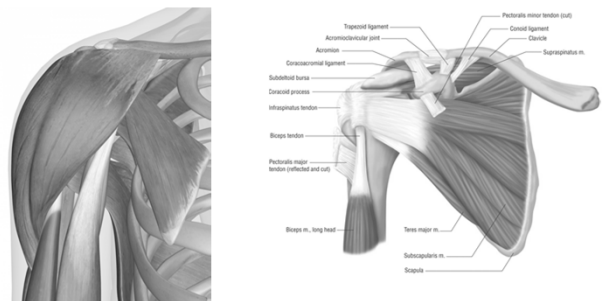
Anatomy

- Shoulder is really 4 articulations

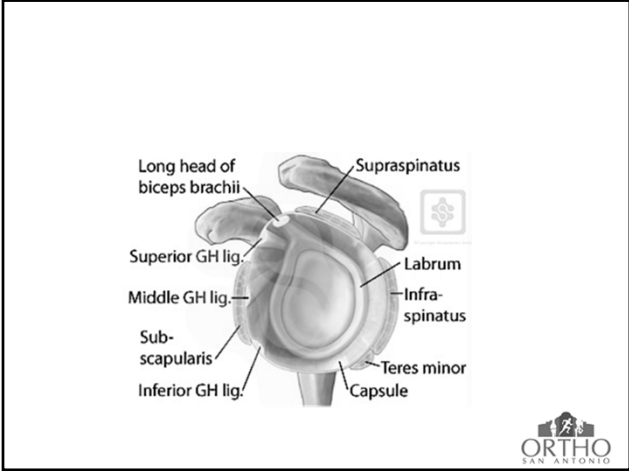
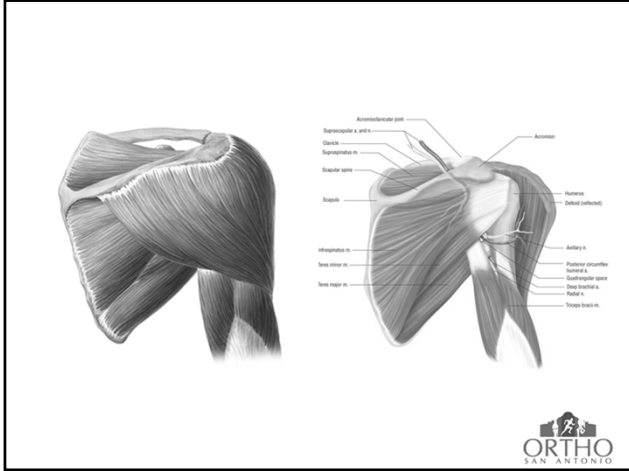


Anatomy

- 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

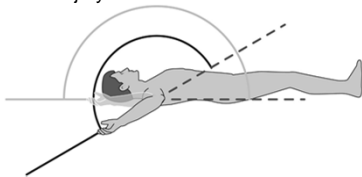
- Pain
 - Posterior (impingement)
 - Anterior (biceps)
- Weakness
- Loss of velocity
- Subjective Instability

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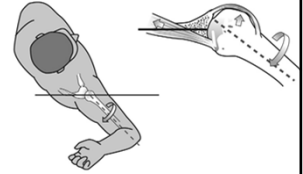
Anatomical Adaptations

- GIRD
 - 180deg 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



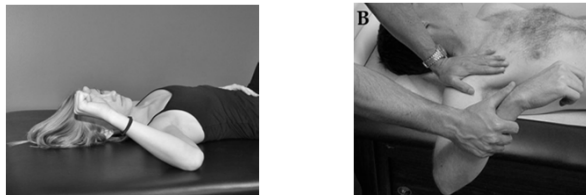
Internal Impingement

- In maximum ER and Abduction
 - Posteriosuperior 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



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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 pitchers shoulder, order an MRI"
- Evaluate rotator cuff and labrum
- Arthrogram



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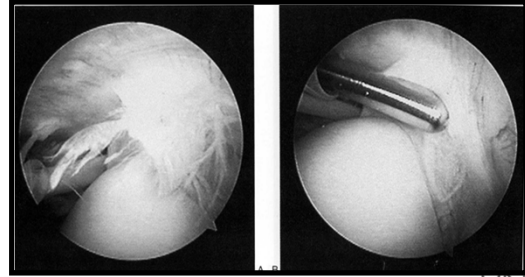
Surgery

Rotator Cuff Surgery in the Athlete



Surgery

- Cuff Debridement



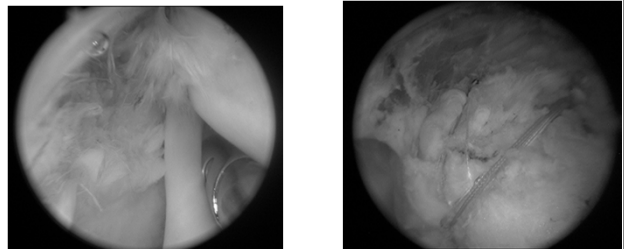
Surgery

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



Surgery

- Cuff Repair



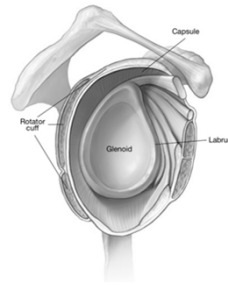
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Surgery

- 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

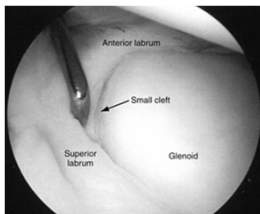


Biceps Anchor/Superior Labrum



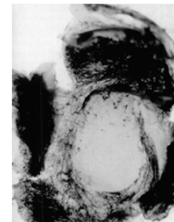
Anatomy

- 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

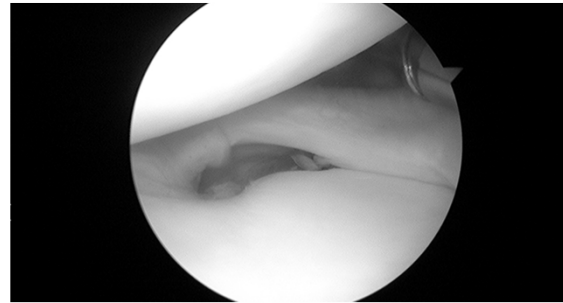


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Anatomy

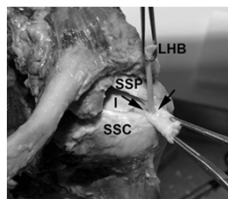
- Considerable variability in superior labrum and LHB (about 10-15%)
- Sublabral recess
- Sublabral foramen
- Buford complex – thick MGHL and absence of AS labrum

Illustration	Labrum anatomy	Description	Prevalence	Arthroscopic view
	Normal	Intact labrum attached to anterosuperior glenoid rim	593 patients 85.82%	
	Superior sublabral recess	Sulcus located under the bicipitalabral junction	17 patients 2.46%	
	Sublabral foramen	Orifice between anterosuperior labrum and the anterior glenoid	53 patients 7.67%	
	Buford complex	Absent labrum + thick, cord-like MGHL	28 patients 4.05%	



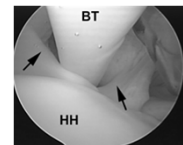
Biceps tendon

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



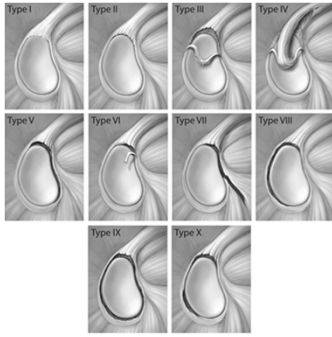
Biomechanics

- 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.



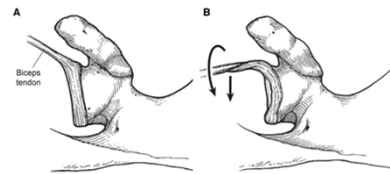
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SLAP TEARS



SLAP TEAR

- 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
 - O'Brien's Active Compression test



History and Exam

- Several Special Tests

TABLE 2
Summary of Clinical Tests to Diagnose SLAP Lesions With Reported Test Performance^a

Test	Sensitivity, %	Specificity, %	PPV, %	NPV, %
Active compression test	67-100	11.1-88.5	10-84.6	14.3-100
Anterior slide test	8-78.4	81.9-91.5	5-66.7	67.6-90
Biceps load test I	90.9	86.9	83	98
Biceps load test II	89.7	86.9	82.1	95.5
Crank test	12.5-91	56-100	41-100	29-90
Pain provocation test	15-100	90-99.2	49-95	70.9-100
Resisted supination-external rotation test	82.8	81.8	82.5	84.3
Rotation compression test	24-25	76-100	9-100	58-80
Forced abduction test	67	67	62	71



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- Imaging
 - Andrews "if you want to find something wrong with a pitchers shoulder, order an MRI"



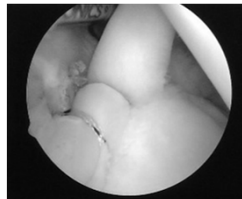
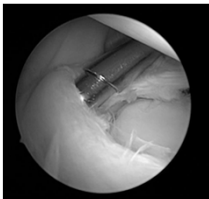
Nonoperative Management

- Rest
- NSAIDS
- Cuff/Scapula Strengthening
- Injections



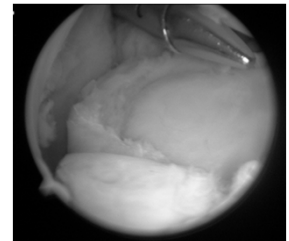
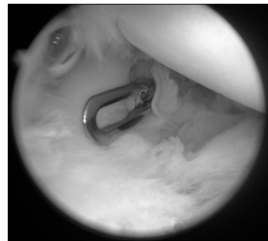
Operative Management

- 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

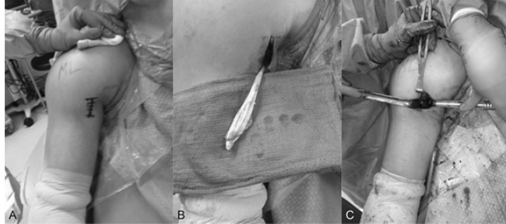
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Operative Management

- 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

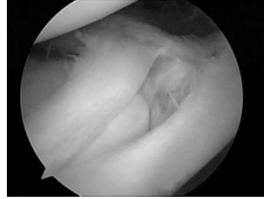
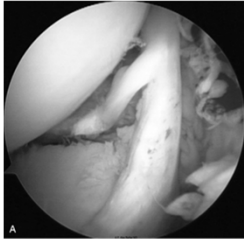


International Trends

- 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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