Glenohumeral Capsule Tears in Baseball Pitchers

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Disclosure
1. Basic Science Support
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   b. Lead Player Publishing
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   1. Baseball Health Network
   2. Sports Science Institute of America

Anterior Capsule
Capsule (ligament) tensile properties
Failure mode
- 40% at glenoid labrum
- 35% intrasubstance
- 25% at humeral insertion

Bigliani et al JOR 1992
Adaptive Glenohumeral Rotation
Anterior Capsule

Internal Impingement
Anterior Capsule
Hyperangulation

Shoulder Injuries in Baseball
Adaptive Changes
Soft Tissue Adaptation
Anterior capsular laxity
• Stretched ant capsule creates greater ER
• 3 mm inc AP glenohum translation in pitchers’ dom vs non-dom

Sethi et al, et al AJSM 2004
Internal Impingement

Pathophysiology
• More likely to occur with anterior translation
• Normal posterior translation in ABD ER position

Jobe CM Arthroscopy ’95

Internal Impingement Continuum

Hyperangulation
Hyper external rotation

Instability
Microtrauma
Post capsular contracture

Muscle weakness
Scapular dyskinesis
Kinetic chain problem
Poor mechanics

Subluxation

RTC tear/SLAP

Impingement

Relocation Test

Max external rotation, abduction 110-120 deg more sensitive

Hamner et al, JSES 2000
Internal Impingement

Surgery
Anterior Capsulolabral Reconstruction (ACLR)
Utilized for capsular laxity

Surgery
Open ACLR
Rubinstein, Jobe et al JSES 1992

- 33/36 (92%) baseball players returned to previous level
- 20 professional players

Arthroscopic Capsular Plication for Microtraumatic Anterior Shoulder Instability in Overhead Athletes
Kristofer J. Jones, MD, Cynthia A. Kahlenberg, BA, Christopher C. Dodson, MD, Denis Nam, MD, Riley J. Williams, MD, and David W. Altchek, MD 2012

- 20 overhead athletes
- Arthroscopic capsular plication
- Follow-up of 3.6 yrs
- 90% pts returned to overhead sports
- 85% at their preinjury level
- No significant diff in ROM

Capsular Stretch Throwers

Capsule is stretched
- Where to do the plication?
- How much plication?
"The number of sutures and degree of capsular tightening was determined according to the amount of observed capsular redundancy in each individual case. In our experience, additional sutures are placed until the drive-through sign is eliminated and capsular tension is restored."

Biomechanical Effects of Arthroscopic Capsulorrhaphy in Line With the Fibers of the Anterior Band of the Inferior Glenohumeral Ligament
Todd A. Shapiro, MD, Akash Gupta, BA, Michelle H. McGarry, MS, James E. Tibone, MD, and Thay Q. Lee, PhD

- 6 cadavers
- Intact, Anterior instability, Plicated
- Instability model – stretch 20% in ER
- 10-mm plication in line with AB IGHL
- Reduces capsular laxity without overconstraining the joint

2018 Technique
CASE

Knotless fixation can still be problematic

18 yo softball pitcher
- Pain in senior year
- End of season arthroscopy
- Extreme pain and stiffness
Capsular Stretch Computer Model

Challenge
• How much to plicate?
• Where to do the plication

Solution: utilize computer modeling to study GH instability

• Patient-specific modeling
Accurate representation pathology

Capsular Stretch Computer Model
Stress Analysis

External Rotation
Capsular Stretch Computer Model
Stress Analysis

Simulate plication

Figure 2. An example of a computed stress analysis showing the normal load and obtaining the resulting contact pattern during a plication procedure.
Capsular Stretch Computer Model
Stress Analysis

Future
• Patient specific models
• Simulate surgery
• Develop biomechanical strategy for optimal technique and results

Capsular Tears

CASE 1
• Pro Pitcher
• Anterior shoulder pain
• Initial Diagnosis
• Subscapularis strain
Shoulder Injuries in Baseball

Subscapularis

- During late cocking, momentum ext rotates humerus
- Subscap is stretched when contraction begins to initiate internal rotation
- huge eccentric contraction

Mechanism

Subscapularis generate 1030 N (200 lbs)

Case 2

Pitcher
Ant shoulder pain
Subscap Strain

Case 2
MR Arthrogram

Subscap strain = Obtain arthrogram
CASE

History
• Pro catcher
• 2 years of right shoulder pain
• Localized ant and anterior inferior aspects
• Treated PRP injections

PHYSICAL EXAMINATION
• Pos app-relocation for an shoulder pain

Scope Treatment
Capsular Tear

- Mechanism unclear
- End-stage internal impingement
- Increased age
- Prior thermal capsulorrhaphy
Anterior shoulder capsular tears in professional baseball players

Lawrence V. Guiotta, MD*, Daniel Lobatto, MD, Demetris Deles, MD, Struan H. Coleman, MD, PhD, David W. Altchek, MD

JSES 2014

• 5 professional baseball players
• Mean age 33 years
• All with ant shoulder pain and the inability to throw
• 3 arthroscopic repair, 2 underwent open repair
• 80% returned to their preinjury level by a mean of 13.3 months

HAGL Lesion

CASE

HISTORY

• 20-year-old collegiate RHP
• Acute shoulder pain throwing
• Failed trial of rest and progressive return to throwing

PHYSICAL EXAMINATION

• + Apprehension-relocation test for pain
Diagnosis

HAGL LESION
Humeral Avulsion
Glenohumeral Ligament
Final Repair

Humeral Avulsion of the Glenohumeral Ligament

Indications for Surgical Treatment and Outcomes—A Systematic Review

Anthony Bousti, MD, Colby Ollivere, MD, Patrick Thomley, MD, James Yan, MD, Anthony Hatzi, MD, Daniel J. Hopkin, FRCS, George S. Ashwood FRCS, and Oldem R. Ayers, FRCS

- 18 studies, 118 patients
- Ave Age 22 years
- No differences in open versus arthroscopic
- All but 2 patients RTP
- Included Olympians and professional athletes

Challenges