Shoulder Pathology in the Overhead Athlete

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Disclosures

Speakers bureau/paid presentations for Arthrex

Relevant Disclosures

- Coagulation ???
- I like baseball
- I like shoulders
- I grew up in NY
- My childhood insecurity
My WBC 2013
“living like a kid again!”

International Baseball
The case

• Pre-Game Day 1
• SHOWTIME!: Venezuela vs Dominicana
• Team Venezuela
• The day after Hugo Chavez dies
• 23 yo male MLB pitcher @ WBC
• Shoulder pain x 5-6 days

Outline

• Overhead Athlete
• Shoulder Anatomy
• Pathology of Throwing Athlete
  – Musculoskeletal – “horses”
    • Labrum
    • Rotator Cuff
  – Neurovascular/Vascular Problems – “zebras”
    • Neurologic – 95%
    • Venous – 4%
    • Arterial – 1%

OVERHEAD ATHLETES

– Throwers
– Tennis Players
– Volleyball players
– Team handball
– Water polo
– Javelin
– Badminton
– Boxing
– Weightlifting
– Mountain climbing
Factor Contributing to Stability

• Static
  – Osteology
  – Capsule & Labrum
• Dynamic
  – Rotator Cuff
  – Periscapular Muscles

Static Restraints

• Articular Version
• Articular Conformity
• Glenoid Labrum
• Negative Intraarticular Pressure
• Capsuloligamentous Structures

Articular Version
Osteology

- Glenohumeral Mismatch

![Glenohumeral Mismatch Image](Image)

Labrum

- Increased surface area = Increased Stability

![Labrum Image](Image)

Negative Intraarticular Pressure

- Vacuum effect
- Adhesion-cohesion

![Negative Intraarticular Pressure Image](Image)
**Capsuloligamentous Structures**

**Glenohumeral Joint Stability**
*Selective Cutting Studies on the Static Capsular Restraints*

_Leigh Ann Carl, MD; and Russell F. Warren, MD*

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**Superior Glenohumeral Ligament**
- Present in >90% of people
- Reinforces the rotator interval
- Limits inferior translation
- Limits ER
  - Adduction
- Limits posterior translation in
  - Flexion
  - Adduction
  - IR

*Warner et al, 1992*

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**Middle Glenohumeral Ligament**
- Present in 60-80% of people
- Variable presentation
- Limits inferior translation
  - Adduction
- Limits ER
  - Adduction
- Limits AP translation in
  - Abducted (45°)
  - ER

*Warner et al, 1992*
Inferior Glenohumeral Ligament Complex

- Anterior Band
- Posterior Band
- Axillary Pouch
- Functions in Abduction >45°
  - Anterior translation in ER
  - Posterior translation in IR

Warner et al, 1992

IGHL “Hammock”

- Reciprocal tightening and loosening of the IGHLC

Posterior Capsule

- Thinnest portion (<1mm thick)
- Limits posterior translation in:
  - Flexion
  - Adduction
  - IR
Dynamic Restraints

- Concavity-Compression Effect
  - Head centralization via cuff and biceps
- Rotator Cuff
- Periscapular Stabilizers
- Long Head of the Biceps
- Proprioception

Periscapular Muscles

Anatomy

- Rotator cuff
  - subscapularis
  - supraspinatus
  - infraspinatus
  - teres minor
Function of Rotator Cuff

- humeral head position control
- glenohumeral joint stability

Biomechanics

- Force couple
  - maintain humeral head within glenoid
    - compressive forces
    - elevation and rotation
  - Rotator Cuff Tear
    - disruption of the force couple
    - abnormal and unstable mechanical
      - elevation with translation

Neuroanatomy
Overhead / Throwing Athlete

Population at Risk

- Overhead athletes
  - Throwers
  - Tennis Players
  - Volleyball players
  - Team handball
  - Water polo
  - Javelin
  - Badminton
  - Boxing
  - Weightlifting
  - Mountain climbing

Pathophysiology
Pathophysiology

History

• What?
• When?
• How?
• Where?
• Why?
Musculoskeletal Injury

- Labrum
  - Instability
  - SLAP Tear

- Rotator Cuff Disease

Labral Tear - Instability
Labral Tear - Instability

- Onset
  - Acute
  - Chronic exertional
- Symptoms:
  - Subluxation/dislocation
- Signs:
  - Apprehension

Instability Physical Exam

Ligamentous Laxity
Ligamentous Laxity

Sulcus Sign
dimpling

External Rotation Apprehension Test

Tennent, 2003
Jobe Relocation Test

Accuracy: Pain = 50%  Apprehension = 80%

Speer et al., 1994

Anterior Release Test

Sillanpaa & Hawkins, 1995

Load & Shift Test
Load & Shift Test

Faber, 1999

Load & Shift Test Grading

Hawkins, 1990

Posterior Apprehension

Warner et al, 1992
Labral Tear - Instability

• Treatment
  – Physical Therapy
  – Surgery
  • Repair

Labral Tear - Instability

• Diagnostic Tests:
  – X-Ray
  – MRI

Imaging
X-RAY

• Trauma views
  – AP, Scapular-Y, Axillary
• Instability Series
  – True AP, West Point Axillary, Stryker Notch

West Point Axillary View

West Point Axillary View
Stryker Notch View

Hill Sachs Lesion

Hill Sachs Lesions

MRI
SLAP Tear

- Onset
  - Acute
  - Chronic exertional
- Symptoms:
  - Joint Line Pain
- Signs:
  - Adduction Compression
  - Shear maneuver

Internal Impingement

- Posterosuperior Glenoid impingement
  - Symptomatic contact between the deep surface of the rotator cuff tendons and the posterosuperior glenoid

Pathophysiology

- Contact occurs during the late cocking/early acceleration phase of throwing with the arm abducted and externally rotated
Pathophysiology

“Subtle” anterior translation allows further rotation (”hyperangulation” - Jobe) and impingement

Possible sources
- RC weakness (Subscap)
- IGHL failure (Bankart, Capsular stretch)
- SLAP lesions

Cuff and Labral Tears

Range of Motion
Classic Clinical Presentation

- Loss of IR
- Loss of Cuff strength
- Atrophy
- Scapular dyskinesis

SICK Scapula

“Impingement Signs”
Posterior Impingement Sign

- Late cocking position
  - 90-100 degrees of ABD
  - 10-15 degrees of FF
  - Maximal ER
- + when reproduces posterior pain
- 90% sensitive for tears of posterior labrum or partial thickness RC

SLAP Tear

- Diagnostic Tests:
  - X-Ray
  - MRI*
  - Arthroscopy

MRI Findings

- Undersurface Partial Cuff Tear
- Labral Tear/ Detachment
- Cyst
SLAP Tear

- **Treatment**
  - Activity Modification
    - volume
    - technique
  - Physical Therapy
  - Surgery
    - Repair

Arthroscopic Pathology

- **Contact (100%)**
- **Articular-sided partial thickness tears of the supraspinatus and sometimes infraspinatus tendons (76-93%)**
- **Posterosuperior labral tears (71-88%)**
  - John, Arthroscopy 1993;11:530-536
  - Walsh G, JSES 1992;1:238-245
  - Poly M (Jobe), Arthroscopy 2000;16:57-40

Associated Pathology
Repair Unstable SLAPs

SLAP Tear

3 - Anchor Repair
SLAP Repair

Partial Tears

- Controversial - debridement vs repair

PASTA REPAIR
Full Thickness Cuff tear

* Left Shoulder *
View from lateral portal

NeuroVascular Injury

Neurologic Injury

- Cervical
  - HNP
  - Cervical Spondylosis
  - Burner/Stinger
- Peripheral
  - Ulnar neuritis
  - Thoracic Outlet Syndrome*
Cervical Radiculopathy

• Onset
  – Exertional
  – Post exertional
• Symptoms:
  – dermatomal
• Signs:
  – Radicular

Cervical Radiculopathy

• Diagnostic Tests:
  – X-Ray
  – MRI

Cervical Radiculopathy

• Treatment
  – NSAIDs
  – Physical Therapy
  – Corticosteroid injection
  – Surgical decompression/fusion
Ulnar Neuritis

- Onset
  - Exertional
  - Post exertional
- Symptoms:
  - Ulnar nerve distribution
- Signs:
  - Tinel’s

Ulnar Neuritis

- Diagnostic Tests:
  - EMG/NCS

Ulnar Neuritis

- Treatment
  - NSAIDs
  - Physical Therapy
  - Surgical decompression/transposition
Vascular Injury

- Arterial
  - Arterial Thoracic Outlet Syndrome
  - Quadrilateral Space Syndrome (PCHA entrapment)

- Venous
  - Effort Thrombosis: Venous Thoracic Outlet (Paget Schroetter syndrome)

Arterial TOS

- Onset
  - Overuse related
  - Position dependent

- Symptoms:
  - Vague pain
  - Claudication
  - Paresthesias

- Signs:
  - Diminished radial pulse
  - BP and/or delayed capillary refill

Arterial Anatomy

- Sites of Compression
  - A: interscalene triangle
  - B: costoclavicular space
  - C: infraspinotal region
  - D: humeral head
  - E: quadrilateral space
Arterial Anatomy

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Adson Maneuver

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Wright Maneuver
Arterial TOS

• Diagnostic Tests:
  – Positional Contrast Angiography
  – Positional MRA

• Treatment
  – Thrombectomy & surgical repair
  – Surgical decompression (cervical ribs common)
Quadrilateral Space Syndrome

- **Onset**
  - Due to repetitive abduction & external rotation

- **Symptoms:**
  - Position dependent shoulder pain
  - Paresthesias that may refer distally

- **Signs:**
  - Axillar neuropraxia
  - Inotolerance to sustained ABER

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Quadrilateral Space Syndrome

- **Diagnostic Tests:**
  - Positional arteriography
  - EMG/NCS

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Quadrilateral Space Syndrome

- **Treatment**
  - Biomechanical modification of overhead skills
  - Surgical decompression of quadrilateral space

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McAdams and Dillingham

The American Journal of Sports Medicine

Volume 36, Number 3
Venous TOS (Paget Schroetter syndrome)

- Onset
  - Post exertional
- Symptoms:
  - Diffuse, poorly localized
  - Arm heaviness
- Signs:
  - Swelling
  - Venous distention

Virchow’s Triad

- Stasis
- Endothelial Injury
- Hypercoagulability

Venous TOS

- Diagnostic Tests:
  - Doppler ultrasound
  - Contrast venography
Venous TOS

- Treatment
  - Anticoagulation
  - Surgical decompression
  - First rib resection
Case Outcome

- Treatment
  - Air Transport to FL
  - Anticoagulation
  - Surgical thrombectomy
  - Subclavian vein reconstruction
  - First rib resection
  - RTP in 2013

Summary

- Pathology of Throwing Athlete
  - Musculoskeletal – “horses”
    - Labrum
    - Rotator Cuff
  - Neurovascular/Vascular Problems – “zebras”
    - Neurologic – 95%
    - Venous – 4%
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My WBC 2013

“living like a kid again!”

- Coagulation ?
- I like baseball
- I like shoulders a lot
- I “spend to much
time in the US and
need to come home
and learn to speak
Spanish !!!”