Internal Impingement in the Overhead Athlete: A Correlation of Findings on MRI and Arthroscopic Evaluation

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Thrower’s shoulder is stressed by external rotation and angular velocities

Schickendantz, MRI Clin N Amer 1999
Shoulder Injuries

Significant shoulder injuries occur in 50% of professional pitchers during their careers

Jobe, Ortho Clinics N Amer
Internal Impingement

Posterior shoulder abnormalities found in overhead athletes including baseball players, volleyball players and waterpolo players

Giombini, J Sports Med Phys Fitness 1997
Halbrecht, Arthroscopy, 1999
Internal impingement is recognized by lesions in the posterior, superior aspect of the shoulder.

Walch, JSES, 1992
Internal Impingement

Articular-sided RTC normally contacts the posterosuperior glenoid with the shoulder in the abducted, externally rotated (ABER) position.

Contact between the RTC and posterior glenoid rim contact was found in 85% of individuals with diagnoses other than internal impingement.

McFarland, EG, JSES 1999
Internal Impingement

- Contact is considered normal between these structures
Internal Impingement

- Pathological condition
- ABER shoulder causes pain
- Late cocking phase of throwing
- Posterosuperior Glenohumeral pain
- Relocation with posteriorly directed force relieves the discomfort (Jobe)
Relocation Test (Jobe)
Internal Impingement

Arthroscopic View with Relocation
Internal Impingement

- Changes include labral tears, paralabral cyst formation, RTC tears
- Changes may represent adaptive change
- At a certain point symptomatology begins and Internal Impingement occurs
- Changes occur in throwing vs nonthrowing shoulders in throwing athletes
  » Halbrecht, Arthroscopy, 1999
Anatomy of Internal Impingement
Location of RTC Tears

Supraspinatus

Infraspinatus

Horizontal extension into infraspinatus
Internal Impingement Theories

- Postulated that posterior contact in the ABER position occurs physiologically but may become pathological in overhead athletes
- No anterior instability

- Combination of hyperangulation and anterior instability.
- Fatigue in the RTC leads to increased time, frequency and force between the RTC and posterior superior glenoid

Walch, JSES, 1992
Knvitne Clin Ortho 1997
Internal Impingement Theories

- RTC fatigue causes muscles to decrease firing, microtrauma occurs in RTC and subscapularis and subsequently there is anterior capsule and Anterior IHGL stretching
Internal Impingement

• Shoulders with instability often have “Dead Arm Syndrome”
• This may differentiate Internal Impingement with and without anterior instability

Schickeletz, MRI Clin N Amer, 1999
Jobe’s Stages of Internal Impingement

- **3 Stages:**
  1) Stiffness- RTC irritation with prolonged warm-up
  2) Posterior shoulder pain with relocation test. Subluxation of the humeral head
  3) Persistent symptoms despite rehabilitation
Objective

Determine the correlation between preoperative shoulder MRIs and arthroscopic findings in throwing athletes with the diagnosed with Internal Impingement
Methods

• Retrospective review of 769 arthroscopic shoulder procedures from 1997-2000

• Nine cases isolated of Internal Impingement in throwing athletes
Methods

• Preoperative MRI examinations were obtained each athlete

• The operative report and pictures were available for each patient
Methods

- Each patient had a history of no prior acute trauma to their throwing shoulder
- Physical exam included a positive relocation test of Jobe
Methods

Each subject failed minimum of three months of physical therapy

Posterior stretching

Scapular and RTC strengthening
Methods

- MRI read by a musculoskeletal radiologist blinded to original office, MRI and operative reports
- Seven gado-arthrogram MRIs
- Two MRIs without dye
Methods

- Labrum graded: normal, mildly or moderately degenerated or torn

- Biceps tendon and Rotator Cuff graded: normal, mild tendonopathy, advanced tendonopathy/partial tear or complete tear
Methods

• Glenoid and humeral head cartilage graded: normal, abnormal

• Subchondral bone graded normal, cystic or sclerotic
Methods

• Systematic arthroscopy evaluated the anterior, superior, posterior labrum, glenoid, articular-sided rotator cuff, biceps tendon and humeral head

• Each operative report and intraoperative pictures evaluated
MRI Results

Posterosuperior labrum abnormal in 9/9

Anterior labrum abnormal in 2 of 9

Biceps tendon minor tendonopathy in 2, advanced in 2 (including IV SLAP)
MRI Results

Supraspinatus in 3 of 9 cases

Infraspinatus abnormal in all with mild in 7 and moderate in 2

Subscapularis tendon with mild tendinopathy in 2 cases
MRI Results

Glenoid Subchondral Bone
  – Posterosuperior sclerosis eight of nine athletes

Posterior glenoid articular cartilage
  Mild- 2
  Moderate-3
MRI Results

• Humeral head
  – One athlete with moderate central/posterior chondrosis
  – Cystic changes beneath the insertion of the infraspinatus tendon in 8 of 9
MRI
MRI

Subchondral Cyst
Arthroscopic Evaluation

• Articular sided RTC tears- five of nine
• SLAP in one patient
• Kissing articular lesions in 2
• Nine of nine with posterosuperior labral changes
  – 8 with labral fraying
  – 1 with a tear
Posterior Labral Changes

Posterosuperior Labral Fraying
Posterior Labral Changes
RTC Tendon Changes
Undersurface Rotator Cuff Tears
Humeral Head and Chondral Findings
Correlation of MRI and Arthroscopic Evaluation

• Posterosuperior labral lesions 9 of 9
• Articular-sided RTC lesions in 9 of 9
• Infraspinatus tendon lesion on MRI in 3 of 9 arthroscopic evaluations
Correlation of MRI and Arthroscopic Evaluation

- Glenoid lesions in 5 of 9 MRIs seen in one arthroscopy

- Humeral head chondral lesion seen on 7 of 9 MRIs seen partial thickness lesions
Discussion

- High correlation with RTC tears and labral injuries
- Low correlation in chondral injuries and intra-substance injuries such as tendonitis
- Limitation is that the gold standard is clinical diagnosis
Future Directions

• Prospective study evaluating radiographic differences between throwing athletes who respond to conservative therapy to those who do not respond

• EMG analysis of throwing athletes with and without Internal Impingement to evaluate differences in muscle firing patterns
Thank You