

Shoulder Impingement Syndrome in Athletes

See also Rotator Cuff Tear in Athletes

See also H&PE of the Shoulder in Athletes

See also Shoulder Rehabilitation

Background

1. Definition:
 - Literature describes 2 types: subacromial and internal.
 - Subacromial or external impingement-mechanical encroachment of soft tissue (bursa, rotator cuff tendons) in subacromial space between humeral head and acromial arch.¹
 - Internal impingement-encroachment of rotator cuff tendons between humeral head and glenoid rim.²
 - Impingement of rotator cuff by acromion, coracoacromial ligament or undersurface of AC joint
 - Usually occurs w/shoulder internally rotated/ flexed forward
 - Posterior shoulder pain being the most common complaint among patients with internal impingement.^{3,11}
2. First described by Neer in 1972⁴
 - 3 stage process
 - Stage 1: acute inflammation, edema, hemorrhage w/in rotator cuff
 - Age <25
 - Stage 2: rotator cuff tendon fibrosis, tendonitis
 - Age 25-40
 - Stage 3: mechanical disruption, osteophytosis of anterior acromion
 - Age >40

Pathophysiology

1. Physiology of disease
 - Primary:
 - Mechanical impingement of tendon
 - Secondary impingement:
 - Impingement secondary to functional decrease of supraspinatus outlet space
 - Caused by underlying glenohumeral joint instability
 - Most common cause in athletes
2. Incidence prevalence
 - Unknown
 - Occurs in athletes involved in repetitive overhead motion⁵
 - Baseball:
 - 34% had shoulder pain in prospective study of 476 child baseball pitchers during one season⁶
 - Tennis
 - Swimming
 - Volleyball
 - 8-20% of all volleyball injuries
3. Risk factors
 - Hooked acromion

- More strongly associated with rotator cuff injury than curved or flat acromion
 - Shoulder instability
 - Glenohumeral instability
 - Labral lesions
 - Muscle imbalance
 - Repetitive overhead activity
- 4. Morbidity/ mortality
 - Functional limitations
 - Inability to perform overhead exercises without pain
 - Psychological consequences: loss of sport
 - Severe cases may end athlete's career

Diagnostics⁷

1. History

- Symptoms
 - Onset: gradual increase in shoulder pain with overhead activity
 - Location: lateral, superior, anterior shoulder
 - Aggravating factors: increase pain in practice and competition
- Athletic activity
 - Sport: tennis, baseball, volleyball, swimming
 - Duration/frequency of practice and play
 - Level of play
 - High school
 - College
 - Professional

2. Physical exam

- Inspection of
 - Shoulder girdle
 - Scapular area
 - Muscle mass
- Active Range of Motion
 - Forward flexion
 - Abduction
 - External rotation
 - Internal rotation
 - Extension
 - Cross-body adduction test⁸
- Palpation
 - Acromioclavicular, glenohumeral joints
 - Humerus
 - Posterior joint line tenderness⁹
- Special tests¹⁰
 - Positive posterior impingement sign¹¹:
 - Deep posterior shoulder pain when arm brought into a position similar to that noted during the late cocking phase of throwing
 - Abduction to 90° to 110°, extension to 10° to 15°, and maximal external rotation.

- 95% sensitive and 100% specific
- Positive Neer sign:
 - Reproduction of pain when humerus is passively forward flexed to end range
 - 88.7% sensitive and 30.5% specific
- Positive Jobe sign:
 - Shoulder is elevated to 90° abduction with internal rotation
 - Examiner exerts downward force on arm (empty can test)
 - 86% sensitive and 50% specific
- Positive Hawkins sign:
 - Reproduction of pain with passive forward flexion to 90°, elbow at 90° and internal rotation
 - 92.1% sensitive
- Apprehension test:
 - Apprehension/pain with anterior force to proximal humerus when abducted 90° and externally rotated 90°
- Neurologic examination
 - Neck-C5-C6 radiculopathy
 - Innervates rotator cuff muscles
 - Upper extremity

3. Diagnostic testing¹²

- X-ray:
 - Rule out fracture/ arthritis
 - Anterior-posterior view of glenohumeral joint
 - Supraspinatus outlet view
 - Space <7 mm increased risk for impingement
 - Axillary view
 - Internal rotation view of humerus with 20° upward angulation
 - Stryker notch views¹³
- Ultrasound (U/S):
 - May demonstrate shoulder instability in real time
 - Best imaging study for suspected partial rotator cuff tear (SOR B)
- MRI:
 - Imaging of choice for shoulder pathology example full thickness rotator cuff tear (SOR B)
 - With contrast if suspect labral tear
- Arthrography: can also be used to diagnose rotator cuff tears
- Diagnostic arthroscopy: may be used for diagnosis and treatment

Differential Diagnosis

1. Key differential diagnosis

- Rotator cuff tear
- Calcific tendinitis
- Acromioclavicular arthritis
- Adhesive capsulitis (Frozen shoulder)
- Glenohumeral arthritis
- Suprascapular nerve entrapment
- Anterior instability¹⁴

- SLAP tear (superior labrum anterior and posterior)¹⁵
- Subacromial impingement
- Scapular dyskinesis¹⁶
- Glenohumeral internal Rotation Deficit¹⁵

2. Extensive differential diagnosis

- Septic arthritis
- Rheumatoid arthritis
- Biceps tendon rupture
- Gout
- Lyme disease
- Lupus
- Spondyloarthropathy
- Avascular necrosis
- Tumor
- Thoracic outlet syndrome
- Cervical radiculopathy

Therapeutics¹⁷

1. Relative rest

- Avoidance of repetitive overhead activities

2. Cryotherapy

3. Physical therapy

- Rotator cuff strengthening program
- Aggressive posterior and peri-capsular stretching¹⁸

4. Medication

- Nonsteroidal anti-inflammatory drugs
 - Some limited evidence supporting the use of nonsteroidal anti-inflammatory drugs in initial treatment of shoulder pain
- Subacromial lidocaine/corticosteroid injection (diagnosis and treatment)
 - Physical therapy and steroid injections seem to have similar outcomes for unilateral shoulder pain

5. Consider

- Transcutaneous electrical nerve stimulation
- Iontophoresis
- Ultrasound
 - May be helpful for calcific tendonitis
- Surgery
 - Arthroscopic subacromial decompression if no response to conservative therapy

Follow-up

1. Return to play

- Gradual return essential
- Typically 6-12 weeks
- Pain free range of motion
- No signs of impingement
- Strength 90% of uninjured side
- Infrequent or no nonsteroidal anti-inflammatory drugs use

2. Continued physical therapy

- Flexibility and strengthening exercises
3. Referral to orthopedics
- Significant weakness of rotator cuff
 - Failure to improve with 2-3 months of conservative treatment/rehabilitation

Prognosis

1. Good with prompt diagnosis and treatment
2. 60-90% of athletes improve with conservative treatment

Prevention

1. Primary
 - Proper warm up techniques
 - Proper sport technique
 - Specific strengthening techniques
 - Core stability
 - Flexibility
 - Strengthen
 - Internal rotation
 - External rotation
 - Abduction
 - Learn warning signs of early impingement
 - Educate coaches and athletes
2. Secondary
 - Continued flexibility and strengthening program

Evidence-Based Inquiry

1. Does injection of steroids and lidocaine in the shoulder relieve bursitis?
2. What is the initial approach to the treatment of shoulder pain?
3. What is the best way to diagnose a suspected rotator cuff tear?

References

1. Neer CS II. Anterior acromioplasty for the chronic impingement syndrome in the shoulder. A preliminary report. *J Bone Joint Surg Am* 1972;54A:41-50
2. Walch G, Boileau P, Noel E, et al. Impingement of the deep surface of the supraspinatus tendon on the posteriosuperior glenoid rim: an arthroscopic study. *J Shoulder Elbow Surg* 1992;1:238-45
3. Heyworth, B, Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
4. Fongemie AE, Buss DD, Rolnick SJ. Management of Shoulder Impingement Syndrome and Rotator Cuff Tears. *American Family Physician* 1998;57(4):667
5. Cools AN, Witvrouw EE, Maheiu NN, Danneels. Isokinetic scapular muscle performance in overhead athletes with and without impingement symptoms. *Journal of Athletic Training* 2005;40(2):104-110
6. Lyman S, Fleisig GS, Andrews JR, Osinski ED. Effect of Pitch Type, Pitch Count and Pitching Mechanics on Risk of Elbow and Shoulder Pain in Youth Baseball Pitchers. *American Journal of Sports Medicine* 2002;30(4):463-468
7. Fongemie AE, Buss DD, Rolnick SJ. Management of Shoulder Impingement Syndrome and Rotator Cuff Tears. *American Family Physician* 1998;57(4):667

8. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
9. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
10. Calis M, Akgun K, Britane M, Karacan I, Calis H, Tuzun, F. Diagnostic Values of Clinical Diagnostic Tests in Subacromial impingement Syndrome. *Annals of Rheumatic Diseases* 2000;59;44-47
11. Meister K, Bcukley B, Batts J. The posterior impingement sign: diagnosis of rotator cuff and posterior labral tears secondary to internal impingement in overhand athletes. *Am J Orthop.* 2004;33:412-415
12. Fongemie AE, Buss DD, Rolnick SJ. Management of Shoulder Impingement Syndrome and Rotator Cuff Tears. *American Family Physician* 1998;57(4):667
13. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
14. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
15. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.
16. Cools AM, Cambier D, Witvrouw, E. Screening the athlete's shoulder for impingement symptoms: a clinical reasoning algorithm for early detection of shoulder pathology, *Br J Sports Med* 2008;42:628-635
17. Fongemie AE, Buss DD, Rolnick SJ. Management of Shoulder Impingement Syndrome and Rotator Cuff Tears. *American Family Physician* 1998;57(4):667
18. Heyworth, B Williams, R. Internal Impingement of the Shoulder. *The American Journal of Sports Medicine* 2009;37(5):1024-1037.

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