Throwing Overhead Sports

See also Medial epicondylar apophysitis (Little League Elbow)
See also Shoulder Impingement Syndrome in Athletes
See also Rotator Cuff Tear in Athletes
See also Shoulder Rehabilitation
See also H&P of Shoulder in Athletes

Background

1. General Information
    - Sports at risk of shoulder injury from overhead usage
        - Baseball
        - Racquet Sports (Tennis and other racquet sports)
        - Volleyball
        - Swimming
        - Gymnastics
        - Track & Field (Javelin Throw)
        - Synonyms of Little League Shoulder[1]
            - Proximal humeral apophysitis, epiphysiolysis, osteochondrosis, stress fracture and rotational stress fracture

Pathophysiology

1. Pathology of disease[2]
    - Pathologic changes can be observed in majority of overhead athletes including those that are asymptomatic
    - No exact cellular or pathologic mechanism is known, but examination of biomechanics, anatomic patterns, and outcomes to txs have shaped current understanding
    - Adaptive changes found in overhead athletes:
        - GIRD (Glenohumueral Internal Rotation Deficit)
            - An increase in external rotation and a decr in internal rotation when compared to non-throwing shoulder
            - Average shift is 10º and maintain a compensatory change so their total arc of motion is unchanged but often times the deficit in internal rotation is greater than the gain in external rotation
            - Facilitated by osseous and capsular adaptations
    - Little League Shoulder[1]
        - The exact mechanism of injury to the proximal humeral epiphysis is uncertain
        - It has been proposed that constant traction and rotational torque forces applied to the proximal humeral epiphysis cause microfractures to the physis
        - Pathology is widening and potential fracturing of the proximal humeral physis in a growing child
    - Rotator Cuff Disorders
        - Also See: Rotator Cuff Tear in Athletes
        - Overuse Injury, Repetitive nature of overhead sports
        - Impingement

                - Also See: Shoulder Impingement Syndrome in Athletes
                - Coracoacromial arch irritates tendons and bursa as they move beneath the bony arch
        - SLAP (Superior Labrum Anterior and Posterior) Lesions
            - The biceps tendon insertion superior to the labrum is detached from the antr and post. portions of the glenohumeral labrum from a tear in the labral rim
2. Incidence/prevalence
    - MRI of asymptomatic elite overhead athletes revealed:
        - 79% glenoid labrum abnormalities[2]
        - 40% partial or full thickness rotator cuff tears[2]
        - Pediatrics (8-15 yo)
        - 55% of asymptomatic and 62% of symptomatic pts revealed physeal widening of proximal humerus[2]
3. Risk factors
    - GIRD
        - Greatest change in range of motion of shoulder occurs in 13-14 y[2]
        - 60% of professional baseball players with clinically significant GIRD developed shoulder injuries during that season[3]
    - Specific for Little League Shoulder
        - The average age of onset of little league shoulder is 14[4]
        - M/c seen in male baseball pitchers age 11 to 16[1]
        - Pitchers who throw curveballs and sliders are at incr risk of little league shoulder[4]
    - Poor mechanics
    - Overuse
4. Morbidity/mortality
    - Little League Shoulder
        - No known complication
        - Self-limiting condition

Diagnostics

1. History
    - Assess for trauma (acute vs chronic)
    - Neurovascular symptoms
    - Level of activity, length of season, number of contests/practices, and of special concern: pitch counts in pitchers and what types of pitches thrown
    - Medications/therapies used
    - Little League Shoulder
        - Present w/ complaints of lateral shoulder pain while doing activity
        - Typically not an acute event
        - Often an insidious course w/ pain for months
        - Commonly prompted to seek care for:
            - Increase pain
            - Decrease in velocity, accuracy, or other performance declines
    - SLAP lesions
        - Pts often complain of

- Clicking
- Deep shoulder pain
- Dead Arm
- Instability

2. Physical examination
    - Full examination of the shoulder is warranted:
        - See also Hx & PE of Shoulder in Athletes
    - Inspection for
        - Swelling
        - Asymmetry in bony architecture
        - Muscle build
        - Palpation
    - Palpation
        - Up to 70% with little league shoulder have pain over the proximal and lateral portions of the humerus[4]
        - AC and SC joints and biceps tendon should be evaluated for tenderness as well
    - ROM
        - Particular attention should be paid to ROM because overhead athletes are at significant risk for GIRD
        - GIRD
            - Defined as a decr in ROM greater than 25º but it has been suggested that 15º can affect activity of daily living[5]
    - Strength
        - Rotator Cuff
            - Supraspinatus test: Empty can
            - Lift Off: Subscapularis
            - External Rotation
    - Neurovascular
    - Special Signs
        - Neer - "Impingement"
            - Passive forward flexion w/ scapular depression
            - Positive test produces pain
        - Hawkins - "Impingement"
            - Shoulder in Forward flexion to 90º
            - Elbow flexed to 90º
            - Passively internal rotate shoulder
            - Positive test produces pain
        - Speed - "Biceps Tendonitis"
            - Straighten pts arm and resist elbow flexion
            - Positive test produces pain
        - Yergason - "Biceps Tendonitis"
            - Hold pts hand and resist supination
            - Positive test produces pain
        - SLAP
            - No one single test is recommended to make the dx
            - Tests are very specific so a pos test incr clinical suspicion

        - It is recommended that the examiner perform multiple maneuvers[5]
    - O'Brien Test - (Part A) - Shoulder forward flexed 90º, Shoulder adducted 10º, Elbow full extension, Shoulder maximally internally rotated so that pt's thumb points to floor
        - Push down on the arm and have pt resist
    - O'Brien Test - (Part B) - Same position, but have the pt's palm face ceiling
        - Repeat test
    - Positive test is pain or click on thumb down but not with the palm up
    - Anterior slide test
        - Have pt place injured arm w/ hand on hip
        - Examiner places axial load on the pts arm while palpating the antr shoulder with the other hand
        - Internal pain or palpation of a click is a post test
    - Biceps load II test
        - Lying on back
        - 120º of shoulder abduction
        - 90º of elbow flexion
        - Have pt flex at the elbow against resistance
        - Positive test is pain or click

3. Diagnostic Testing
    - Little League Shoulder
        - Clinical diagnosis from Hx &PE is acceptable[1]
        - Diagnostic imaging
            - May be necessary to confirm the diagnosis
            - X-Ray both shoulders for comparison
            - AP internal rotation
            - AP external rotation
            - Lateral Y view or axillary view
        - Findings:
            - Widening of proximal physis
            - Physeal fragmentation
            - Physeal sclerosis and demineralization
        - Other studies
            - If there is suspicion for additional pathology or neg x-rays w/ high clinical suspicion:
            - Bone Scan
            - MRI
    - MRI
        - SLAP
            - Non-contrast MRI 98% sensitive[3]
        - Rotator Cuff
            - Contrast MRI is 84% sensitive on tears that are <25%[3]
            - 95% sensitive for sever rotator cuff disease[3]

Differential Diagnosis

1. Biceps tendonitis
    - See: Biceps Tendonitis (Ortho)
2. Glenohumeral instability
3. Impingement syndrome
    - See: Shoulder impingement syndrome in athletes
4. Labral pathology/SLAP tear
5. Proximal humerus stress injury (little leaguer's shoulder)
6. Rotator cuff tendonitis or bursitis
    - See: Rotator Cuff Tendonitis

Extensive Differential Diagnoses

1. Acromioclavicular sprain or injury
    - See: Acromioclavicular Joint Injuries
2. Fracture
3. Bone tumor
4. Brachial plexus injury
5. Distal clavicle osteolysis
6. Thoracic outlet syndrome
    - See: Thoracic Outlet Synd

Therapeutics

1. Little League Shoulder
    - Acute Treatment
        - Ice
        - Analgesics
        - Rest from throwing
    - Long-Term Care
        - Rest from throwing for 3 months[4]
        - Continued ice and analgesics if needed[1]
        - OTC NSAID's may decr inflammation and provide analgesia[4]
    - Strengthening Exercises
        - Physical therapy targeting ROM and flexibility can optimize shoulder functionality[1]
    - Interval throwing program at onset of throwing[4]
        - Evaluation of mechanics at this time
        - Begin w/ light toss and progress with distance and velocity
    - Rotator Cuff
        - NSAIDS, rest for minor lesions
        - Physical therapy
        - Refer to orthopedic surgery for advanced lesions
    - SLAP
        - Refer to Orthopedics

Follow-Up

1. Little League Shoulder
    - Pt should follow up if

        - Pain returns during throwing program following the 3 months rest period
    - No recommendation for surgery in any case
    - Physical therapy for prevention of re-injury optional
2. SLAP
    - Lesions should be referred to orthopedic surgery

Prognosis

1. Little League Shoulder
    - Self-limiting condition w/ proper rest period
    - No known complications
2. Partial Rotator Cuff Tear
    - One Year[3]
        - 20% Heal or decrease in size
        - 53% Incr in size
        - 28% Progress to full thickness tears

Prevention

1. Pre-participation Physical[1]
    - Assess for GIRD
    - Inquire about changes in mechanics
    - Inquire about hx of shoulder pain/injuries
2. Guidelines for Pitch Count from USA Baseball Medical & Safety Advisory Committee[6]
    - 9-10 yo
        - 50 per game
        - 75 per week
        - 1000 per season
        - 2000 per year
    - 11-12 yo
        - 75 per game
        - 100 per week
        - 1000 per season
        - 3000 per year
    - 13-14 y/o
        - 75 per game
        - 125 per week
        - 1000 per season
        - 3000 per year
    - Warm-up pitches, practice pitches, throwing from other positions, and throwing drills are not included in these recommendations
    - Players w/ arm pain should be removed from competition immediately
    - Players should only compete in overhead sports of any kind for 9 months of the year with a break period from all overhead sports for 3 consecutive mons
3. Stretching
    - Tennis players w/ daily post. capsule stretching had a 38% reduction in shoulder problems[3]

Patient Education

1. Umpires/officials, coaches, parents, and participants need to be educated on the guidelines outlined above for prevention
2. Pitch counts must be enforced

References

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