Shoulder and Elbow Injuries in the Skeletally Immature Athlete

44th Annual Symposium on Sports Medicine (Feb. 20th, 2017)

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Disclosure

I have no potential conflicts with this presentation

Objectives (20 minutes)

Shoulder injuries in skeletally immature athletes:
  • Explain unique anatomy of the pediatric shoulder
  • Recognize unique injuries in the pediatric shoulder
  • Distinguish from injuries in skeletally mature athletes

Elbow injuries in skeletally immature athletes
  • Explain unique anatomy of the pediatric elbow
  • Recognize unique injuries in the pediatric elbow
  • Distinguish from injuries in skeletally mature athletes

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Quick summary

Sports injury treatment:
- Rest
- Physical therapy

Outline

Mimickers of common injuries in skeletally mature athletes:

Shoulder
- Rotator cuff tendinitis
- AC separation

Elbow
- Medial ulnar collateral ligament (MUCL) tear
- Lateral epicondylitis (tennis elbow)

Skeletal maturity

Age does not correlate reliably with skeletal maturity
Skeletal maturity

“Children are not little adults”
“Children athletes are not little adult athletes”

Injuries happen at the weak link
• The weak link depends on patients skeletal maturation and speed of growth

Growth plate:
• Apophysitis
• Avulsion fractures
• Physeal fractures

Ligaments, bone:
• Sprains
• Adult pattern fractures

Watch out for paradoxes
• There are contradictions to “the rules”

Growth plate:
• Tibial eminence avulsion fracture

Ligaments, bone:
• ACL tear

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Skeletal maturity

And yet this happens…

The end of growth is a slow taper

• Example: growth remaining at the knee

Assess before bony surgery

• Shorthand bone age method

Heyworth, J Pediatr Orthop. 2013;33:569-574

Table 5. Descriptions of Radiographic Criteria Used for Determination of Skeletal age in Females, aged 10 to 14 years, and Males, aged 12.5 to 16 years, according to the Stature Bone Age Assessment Method

Shoulder
Shoulder problems

Shoulder pain
• Approximately 30% of youth baseball pitchers developed shoulder pain over the course of 2 seasons
• Longitudinal study of 298 youth baseball pitchers

Case #1
12 yo male with a “sore rotator cuff”
• History:
  • All-star pitcher
  • Playing every week for the last 12 months
  • Lateral shoulder soreness
• Exam:
  • Full rotator cuff strength with pain
  • Labral tests normal
  • Tender over lateral shoulder
  • Obligate abduction
• Diagnosis: rotator cuff tendonitis?

Case #1
His radiograph:

Diagnosis:
Proximal humerus epiphysiodesis
(Little Leaguer’s shoulder)

Little League shoulder

Our patient
Normal 10.5 yo male

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Little League shoulder

Also called proximal humerus epiphysiolsis
- Repetitive stress injury to the proximal humeral physis
- Thought to be secondary to torsion and traction
  - Salter Harris type I equivalent microfracture in the hypertrophic zone

Also called proximal humerus epiphysiolsis
- Highest incidence in male baseball pitchers ages 9-15
  - Peak incidence around puberty at age 14
  - Physis metabolically active
  - Muscle strength
  - Throwing: late cocking/early acceleration phase
    - Fastest recorded human motion
    - High torque
    - Significant tension and shear stress

Mechanism of physeal stress injuries

Some recent studies define the mechanism of physeal stress injury as:
- Begins in the metaphysis with disruption of the normal metaphyseal blood supply
  - Absent blood flow disrupts endochondral bone formation
  - Long columns of hypertrophic cartilage cells from the physis extend into the metaphysis
  - Cartilage signal intensity of apparent physeal widening seen on MRI
- Three areas of physeal widening differ from SH-1 injuries:
  - No discrete fracture is identified through the cartilage
  - Widening can be focal
  - Neither epiphyseal nor apophyseal displacement is seen

- Jaramillo D. Radiology 1993; 187: 171-176
- Laor T. Pediatric Radiology 1997; 27: 654-662
- Laor T. AJR American Journal of Roentgenology 2006; 186: 1260-1264
- The newly formed metaphyseal bone is fragile and unable to resist compressive, shear or tensile forces making the chondro-osseous junction (COJ) susceptible to injury
  - The newly formed metaphysis (primary spongiosa) has only a few mineralized cartilage spikes to provide strength
  - The peripheral metaphyseal cortex is thin compared to the cortical thickness of the diaphysis

Bone anatomy

Physis (growth plate)

Shoulder anatomy

Proximal humeral physis
- Begins closing around 14 yo
- Done closing by 17 yo
  - 16 yo for females
  - 18 yo for males

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Growth plate (physis) anatomy

Endochondral bone growth
- Epiphyseal cartilage turns into mineralized osseous matrix
- Chondrocytes align in columns and progress through defined zones:
  - Resting
  - Proliferative
  - Hypertrophic
- Chondrocytes becoming separated by increasing bands of mineralized cartilage matrix starting in the proliferative zone and increasing in density towards the chondro-osseous junction (COJ)
  - Osteoblasts in the metaphysis differentiate, produce, and mineralize the extracellular matrix of bone on the surface of these mineralized cartilaginous struts

Little League shoulder

Presentation:
- Insidious onset of pain – anterior and lateral shoulder
- Pain exacerbated during and after throwing

Can be misdiagnosed as rotator cuff tendonitis (seen in skeletally mature athletes)
- An aside on the rotator cuff:
  - Rotator cuff tears almost non-existent in teenagers
  - Partial thickness tears exist but rarely the whole story and rarely isolated

Risk factors: daily, weekly, annual overuse
- Pitch count more than 80 per game
- Pitching more than 8 months per year
- Arm pain and fatigue during pitching

- Pitching while fatigued
- Throwing too many innings over the year (>100 innings)
  - Avoid throwing 2-3 months per year
  - Avoid competitive pitching at least 4 months per year
- Too many pitches per game
- Pitching on consecutive days
- Excessive throwing when not pitching
- Playing for multiple teams at the same time
- Pitching with injuries to other areas
- Not following strength and conditioning routines
- Throwing curveballs and sliders at a young age
- Radar gun use (inspires harder throwing)
- Not following safe practices at showcases (interrupts off-season rests, inspires over throwing)

Evaluation:
- For pitchers – ask about adherence to pitching guidelines
- Tenderness of the proximal humerus
- Abduction and forward flexion motion/strength may be limited but often unaffected
- Glenohumeral internal rotation deficit (GIRD) often present
  - Unlike adults with GIRD, may NOT have increased external rotation

May lead to:
- Scapulothoracic dyskinesis: compensatory recruitment of scapular elevation and protraction, asymmetric scapulothoracic motion
- Internal impingement
- Superior labral and long head of biceps pathology

Nakamizo H, J Shoulder Elbow Surg, 2008;17:795-801
http://m.mlb.com/pitchsmart

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Little League shoulder

Imaging:
- Radiographs: AP bilateral shoulders in external rotation
- Epiphysiolysis: physeal widening, cystic changes, juxtaphyseal sclerosis, periosteal reaction
- MRI helpful but not usually needed
  - Physeal widening, abnormal signal in the juxtaphyseal-metaphyseal region

Little League shoulder

Treatment:
- Patient/family education about cause and prevention
- Rest until pain and tenderness gone
  - Typically 6-12 weeks but varies
  - Warn the family
- Physical therapy
  - Begins after acute pain resolved
  - Can practice batting but no throwing
  - Range of motion
    - “Sleeper stretch” to improve internal rotation
  - Strengthening
    - Periscapular strengthening to address scapulothoracic dyskinesia, hyperangulation, and internal impingement
    - GIRD pain often worsens with rotator cuff strengthening exercises

Little League shoulder

Sleeper stretch

Periscapular exercises

Little League shoulder

Treatment:
- Interval throwing program
- Pitching mechanics
- “Soreness rule”
Little League shoulder

Interval throwing program for youth baseball (10-12 yo)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Short toss 25 ft., 2 sets of 10 throws, 1 set of 20 throws, Long toss 90% target distance, 25 throws, Rest 10 min.</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Short toss 25 ft., 2 sets of 10 throws, 1 set of 20 throws, Long toss 90% target distance, 25 throws, Rest 10 min.</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Short toss 25 ft., 2 sets of 10 throws, 1 set of 20 throws, Long toss 95% target distance, 25 throws, Rest 10 min.</td>
</tr>
<tr>
<td>Phase 4</td>
<td>Short toss 25 ft., 2 sets of 10 throws, 1 set of 20 throws, Long toss 90% target distance, 25 throws, Rest 10 min.</td>
</tr>
<tr>
<td>Phase 5</td>
<td>Short toss 25 ft., 2 sets of 10 throws, 1 set of 20 throws, Long toss 90% target distance, 25 throws, Rest 10 min.</td>
</tr>
</tbody>
</table>

**Pitching guidelines**

USA baseball recommendations [web.usabaseball.com]

- **Pitch count monitoring**
  - Daily pitch counts are maintained by coaches, and pitchers are removed if they reach specific limits.
  - Coaches and managers should monitor pitch counts for young pitchers, especially during warm-ups and practices.

- **Immediate removal from pitching if complaints or signs of arm pain during a game**
  - Pain may include soreness, fatigue, or discomfort.
  - Remove pitchers immediately if they exhibit any of these signs.

- **Pitch count monitoring by age and pitch type**
  - The pitch count guidelines vary by age and pitch type.
  - For example, a 9-12-year-old pitcher may have different pitch limits compared to a 13-15-year-old pitcher.

- **Pitch count restriction by age and pitch type**
  - The pitch count restrictions also vary by age and pitch type.
  - For instance, a pitcher in the pre-pubertal stage may have different pitch limits compared to a pitcher in the pubertal stage.

- **Pitch count monitoring by location**
  - The pitch count guidelines are based on location, with different limits for different areas.
  - For example, pitchers in the upper Midwest may have different pitch limits compared to pitchers in the southern United States.

- **Pitch count monitoring by competition level**
  - The pitch count guidelines vary by competition level, with different limits for different levels of play.
  - For example, pitchers in a high-level competition may have different pitch limits compared to pitchers in a low-level competition.

**Pitch count**

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**Complications (rare)**

- **Premature physeal closure**
- **Length discrepancy**
- **Angular deformity**
- **Physeal fracture**

**Prevention: formal pitching guidelines**

- Derived from epidemiological data of shoulder injuries in youth throwers.
- Concensus of medical and baseball experts.

**Little League shoulder**

- 91% return to sports and remain asymptomatic with structured PT.
- Long-term consequences rare due to remodeling potential of the proximal humerus.
- 80% of the growth of the humerus happens at the proximal physis.

**Natural history**

- Physeal fracture:
  - Premature physeal closure
  - Complications (rare)
    - Long-term consequences rare due to remodeling.

- 91% return to sports and remain asymptomatic with structured PT.
- Long-term consequences rare due to remodeling potential of the proximal humerus.
- 80% of the growth of the humerus happens at the proximal physis.

**Complications (rare)**

- Premature physeal closure
- Length discrepancy
- Angular deformity
- Physeal fracture

**Contact**

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Pitching guidelines

USA Baseball and MLB's Pitch Smart website:
• "Ultimately, it is the responsibility of the parent and the athlete to ensure that the player follows the guidelines for his age group over the course of the year - given that he will oftentimes play in multiple Leagues with different affiliations covering different times of the year."

Yeah, right

Despite established pitching guidelines…

• Nationwide study of youth pitchers:
  • 45% pitched in a League without pitch counts or limits
  • 43.5% pitched on consecutive days
  • 30.4% pitched on multiple teams with overlapping seasons
  • 19% pitched in multiple games on the same day
  • 13.2% pitched competitive baseball for more than 8 months per year


Case #2

12 yo male “separated his shoulder”
• Tackled playing football, landed on his shoulder
• Exam:
  • Prominent and tender distal clavicle

Diagnosis: AC separation?

His radiograph
Diagnosis: distal clavicle fracture
Red: acromion  
Orange: coracoid  
Light green: distal clavicle  
Green: proximal clavicle  
Blue circle: fracture

Distal clavicle fracture

- Distal clavicle ruptures through the periosteum
- Significant remodeling potential

Distal clavicle fracture

Treatment:
- **Initial treatment:** sling
- Ortho follow-up with in 1 week
- **Definitive treatment:** sling vs. ORIF
  - Age (under/over 13 yo)
  - Displacement
  - Fracture pattern:
    - Types I-III: usually sling
    - Types IV-VI: sling vs. ORIF

Dameron and Rockwood Classification

Elbow

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Elbow problems

Elbow pain
• Approximately 26% of youth baseball pitchers developed elbow pain in-season
• Longitudinal study of 298 youth baseball pitchers

• Common in:
  • Pitchers and throwers
  • Gymnasts
  • Tennis, other racquet sports
  • Wrestlers
  • Football players
  • Etc.

Case #1

12 yo male baseball player
• Best pitcher on the team
• Plays on multiple teams year round
• Medial elbow pain after pitching

11 yo female gymnast
• Level 10
• Medial elbow pain after floor routines

Diagnosis:
medial ulnar collateral ligament tear?

Case #1
Radiographs from the 12 yo pitcher

Little League elbow
(medial epicondyle apophysitis)

Little League elbow
His MRI

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Bone anatomy

Physis: growth plate
Apophysis: protuberance from a bone
• Gives shape to bone rather than length
• Origin of large muscles
• Insertion of large tendons

Elbow anatomy

Multiple ossification centers – appear sequentially
• Capitellum: 1 year
• Radial head: 3 years
• Medial epicondyle: 5 years
• Trochlea: 7 years
• Olecranon: 9 years
• Lateral epicondyle: 11 years

Elbow anatomy

Medial ulnar collateral ligament (MUCL)
• Proximal attachment: inferior surface of the medial epicondyle
Elbow anatomy

Medial ulnar collateral ligament (MUCL)
- Proximal attachment: inferior surface of the medial epicondyle
- Distal attachment: sublime tubercle of the ulna and medial ulnar crest

Elbow anatomy

Medial ulnar collateral ligament (MUCL)
- Proximal attachment: inferior surface of the medial epicondyle
- Distal attachment: sublime tubercle of the ulna and medial ulnar crest
- Anterior band of the MUCL: primary ligamentous stabilizer against valgus stress

Elbow anatomy

Ossification centers (age appears)
- Capitellum (1 yo)
- Radial head (3 yo)
- Medial epicondyle (5 yo)
  - Appears as late as age 7 in males
  - Fuses around age 15 in males
- Trochlea (7 yo)
- Olecranon (9 yo)
- Lateral epicondyle (12-14 yo)

Pitching mechanics


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**Pitching mechanics**

Late cocking/early acceleration:
- Elbow flexing/extending under valgus stress →
  - Tensile force distracts the ulnar side → medial epicondyle apophysitis / MUCL injury
  - Compressive forces on the radial side → radiocapitellar overload
  - Abutment/shear of the medial olecranon tip into the olecranon fossa → valgus extension overload

**Pitching mechanics**

All together: valgus overload syndrome

**Little League elbow**

Also called Little Leaguer’s elbow

Termed used for multiple similar injuries:
- Medial epicondylar apophysitis (most common use)
- Accelerated apophyseal growth with delayed closure
- Medial epicondyle avulsion fracture (initial description)
  - Complete avulsions - true Salter-Harris I physeal fracture
  - Partial avulsions
- All caused by repetitive valgus extension stress on the medial epicondyle apophysis (via the MUCL)
Medial epicondyle apophysitis

Stress/over-use injury of the apophysis
- Sometimes precedes a medial epicondylar avulsion fracture
- High-energy injury to an already weakened apophysis
- Cause:
  - Valgus stress on the elbow with overhead and weight bearing activity
  - Repetitive eccentric loading of the flexor-pronator mass
  - Apophysis is the "weak link"

Presentation:
- Patients 5-15 yo (unfused medial epicondyle), but usually under 10 yo
- Insidious or acute onset medial elbow pain
  - Specific to the medial epicondyle and flexor-pronator origin
  - Pain during and/or after sports
    - Pitching, handstands, racquet sports
  - Decreased throwing speed
  - Decreased throwing distance

Evaluation
- History:
  - Ask pitchers about risk factors, pitch counts
- Elbow:
  - Tenderness at the medial epicondyle and flexor-pronator origin
  - Full elbow motion or occasionally a subtle flexion contracture
  - Valgus stress test:
    - Valgus stress is applied to the elbow in 25º of flexion
    - Elicits pain but rarely laxity/instability
  - Milking maneuver (moving valgus stress test):
    - Apply valgus stress while moving the elbow from flexion to extension.
    - Rarely, ulnar nerve symptoms (irritation in the cubital tunnel)
- Shoulder:
  - Assess glenohumeral and scapulothoracic ROM
  - GIRD
  - Scapulothoracic dyskinesis

Imaging
- Radiographs:
  - Views:
    - AP, lateral, oblique
    - Sometimes comparison radiographs
    - Gravity stress radiograph: if suspect ulnar collateral ligament insufficiency
    - AP of elbow (beam parallel to the floor) when patient supine, shoulder abducted 90º, elbow extended, forearm supinated
    - Look for medial joint widening >3 mm
    - Widened apophysis
  - MRI helpful but not usually needed
    - Increased T2 signal around the medial epicondyle and apophysis
    - Absence of T2 signal in the ulnar collateral injury

Treatment
- Patient/family education about cause and prevention
- Pitching guidelines
- Rest until pain and tenderness resolved – typically 6-12 weeks, sometimes longer
  - No throwing, batting okay if no pain
  - No handstands, floor routine, or vault
- NSAIDs
- Physical therapy after pain/tenderness resolved:
  - Elbow flexor-pronator stretching and strengthening
  - Shoulder/scapular motion and strengthening
  - Treatment of concomitant shoulder issues:
    - GIRD, posterior capsular contracture
    - Scapulothoracic dyskinesis
  - Interval throwing program
    - Pitching mechanics
    - "Soreness rules"
Case #1.5

9 yo female gymnast
• Presents to urgent care in severe pain
• Was at gymnastics, back handspring, injured her elbow
• Because of her pain and mechanism, the ED physician that called thought the elbow was dislocated
  • But “the x-rays are normal”
  • Given morphine and splinted, pain improved a little
  • “Should I send her home and follow-up in your office?”

Diagnosis:
medial ulnar collateral ligament tear?
medial epicondyle apophysitis?

Diagnosis:
medial epicondyle avulsion fracture

Diagnosis:
medial epicondyle avulsion fracture

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Medial epicondyle avulsion fracture

Presentation
- Ages 7-15 yo
- 3 mechanisms
  - Avulsion
    - Pop and pain
    - Elbow buckles while tumbling
    - Throwing a fastball
  - Dislocation
  - Direct trauma

10-20% of pediatric elbow fractures
50-60% associated with elbow dislocations
  - Watch for fragment incarcerated in the elbow joint
  - Watch for ulnar nerve symptoms

Fracture displacement
- Displaces anterior to the origin on the medial epicondyle
- In line with the pull of the flexor-pronator muscle mass
- Hard to measure on radiographs
  - Internal oblique (45°) view best
  - Multiply measurement by 1.4 for best estimate

• Exact amount of displacement that requires surgery not known

Treatment:
- Non-operative:
  - Brief immobilization for pain then mobilize to avoid stiffness
  - Stiffness is the most common complication
  - Fragment heals anterior → MCL tight in extension → loss of extension
  - Indications:
    - Minimal displacement
    - Non-athletic types
- Open reduction internal fixation
  - Secure fixation allows safe and early ROM to avoid stiffness
  - Indications:
    - Incarcerated fragment
    - Open fracture
    - Throwing athlete, gymnast, upper extremity athlete
    - Significant displacement (? mm or cm)
    - Valgus instability
    - Elbow dislocation?
    - Ulnar nerve symptoms?
Case #2
13 yo male baseball player
- Pitcher and catcher
- Lateral elbow sore after every game
- No injury

12 yo female gymnast
- Elbow hurts after practice and recently started locking
- No injury

Diagnosis:
lateral epicondylitis (tennis elbow)?

Case #2
Diagnosis:
Osteochondritis dissecans (OCD) of the capitellum

Osteochondritis Dissecans (OCD) of the capitellum
Localized disorder of subchondral bone causing separation and fragmentation of the articular surface
- Chronic compressive forces at the radiocapitellar articulation
- Avascular necrosis of subchondral bone
- Same possible mechanism of injury as physeal stress injuries:
  - Disruption of blood flow to the secondary epiphysis "metaphyseal equivalent"

Osteochondrosis:
- Disorder of an epiphysis (growth ossification center)
  - Epiphysis = proximal and distal end of bone
  - Connects to the radius by forming the joint surface
  - Aseptic (non-infectious) avascular necrosis (AVN) from an unknown etiology (repetitive injury or vascular problem)
  - Majority of the epiphysis affected - can deform the joint surface
  - Like a road after an earthquake

Osteochondritis dissecans (OCD):
- Localized disorder of an epiphysis
  - Involves a small portion of bone underneath the articular surface (radiocapitellar articulation)
  - Aseptic (non-infectious) avascular necrosis (AVN) from an unknown etiology
  - Same possible mechanism of injury as physeal stress injuries
  - Aseptic (non-infectious) avascular necrosis (AVN) from an unknown etiology
  - Same as an osteochondrosis
  - Can lead to fragmentation/fragmentation of a small portion (mm to cm) of the articular surface - like a pothole
  - Overall shape of the articular surface unchanged

Apophysitis:
- Stress injury to an apophysis
  - Apophysis = point where a tendon inserts into bone
  - Stresses the bone rather than the tendon itself
  - Origin of large muscles, insertion of large tendons
  - Sometimes leads to avulsion fractures
  - Overuse injury
  - Injures growth plate or metaphyseal vessels
  - Some authors categorize these as osteochondroses (more common in older texts)

Terminology confusion

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Terminology confusion

Osteochondrosis:
- Elbow: Panner’s disease (humerus capitellum)
- Hip: Legg-Calve-Perthes disease (femoral head)
- Foot: Köhler disease (navicular)

Osteochondritis dissecans:
- No eponyms

Apophysitis:
- Elbow: medial epicondyle of the humerus
- Knee: Patella
- Foot: Köhler disease (navicular), Freiberg disease (metatarsal head, usually 2nd)

Where do Slipped capital femoral epiphysis (SCFE) of the hip and Blount disease (tibia vara) of the knee fit in?
- A growth plate stress injury/mechanical problem with underlying genetic / environmental / metabolic / endocrine factors (like apophysitis)?
- As opposed to AVN of subchondral/epiphyseal bone like osteochondritis/osteochondrosis
- Primary problem more of the physis (growth plate) rather than epiphysis
- Joint surface doesn’t change much in SCFE
- Joint surface can become abnormal with long-standing Blount disease

Osteochondritis Dissecans (OCD) of the capitellum

Presentation:
- Overuse injury in gymnasts and throwers
- Dull pain, worse with activity
- Popping or locking

Exam
- Elbow tender laterally
- Asymmetric extension

Treatment
- Observation if asymptomatic
- Non-operative: stable lesions
- Restrict activities and weight bearing
- Immobilization
- Surgery:
  - Arthroscopy
  - Debridement & marrow stimulation / microfracture
  - Osteochondral grafting
- Surgical options:
  - Arthroscopy
  - Debridement and marrow stimulation / microfracture
  - Osteochondral autograft
  - Osteochondral allograft
- Mosaicplasty
- Osteochondral autograft transfer system (OATS)
- Osteochondral allograft

Return to sports: 25-86%
- Depends on the study and the sport

Panner’s Disease

AVN of the capitellum ossific nucleus
- “Perthes disease of the elbow”
- Etiology unclear
- Likely due to lateral compression across the radiocapitellar joint
- 4-8 yo

Difference from OCD
- "Maybe there isn’t"
- <10 yo
- NOT an over-use injury
- Benign natural history

Treatment:
- Rest then rehabilitation

Natural history:
- Self-limited
- Initial period of fragmentation then normal growth resumes
- Late sequelae rare
Case #3
10 yo female gymnast
- Lateral elbow pain
- Sore during practice
- No mechanical symptoms

Diagnosis:
lateral epicondylitis (tennis elbow)?

Case #3
Diagnosis:
Posterolateral Synovial Impingement

Posterolateral Synovial Impingement
Synovial Impingement of the Posterolateral Elbow (SIPLE)
- Plica of the elbow
- Often recall an injury

Exam:
- Negative for epicondylitis provocative findings
- Tender at posterolateral aspect of the radiocapitellar joint

Treatment:
- Rest, rest, rest
- Physical therapy and mechanics
- Arthroscopic resection (occasionally)

Summary
Shoulder
- Rotator cuff tendonitis
- AC separation
Little Leaguer’s shoulder
(proximal humeral epiphysiolysis)
Distal clavicle fracture

Elbow
- UCL tear
1. Little Leaguer’s elbow
(medial epicondyle apophysitis)
2. Medial epicondyle fracture
1. OCD of capitellum
2. Synovial impingement (SIPLE)
Thank you

References


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