Pediatric Upper Extremity Injuries

Andrew Westbrook, DO

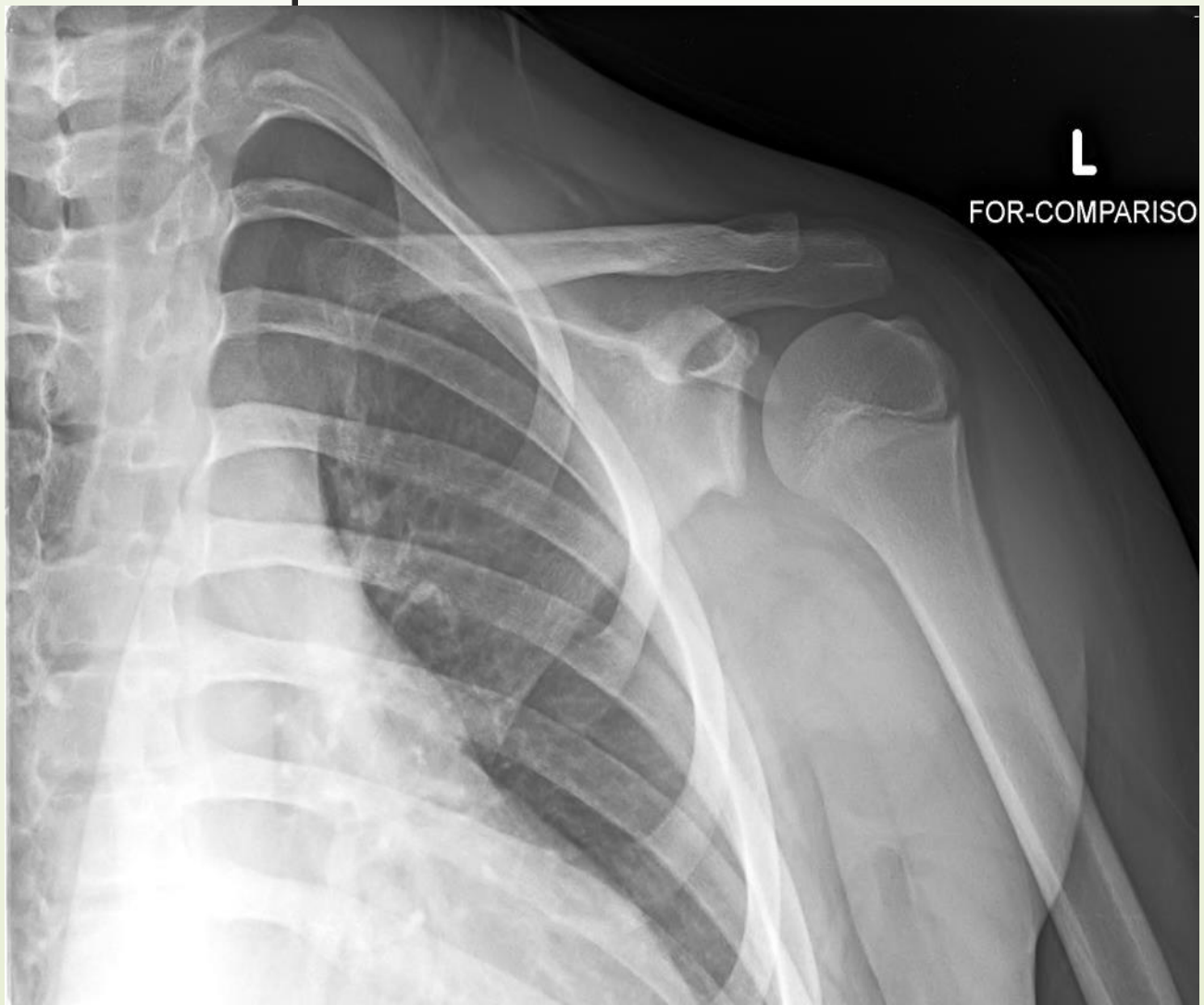
Case #1

- 12 yo male who presents to sports medicine clinic due to right shoulder pain
- Pain started 3 days ago during a baseball game when he was playing catcher and he went to throw a runner out at second and felt pop and instant pain in his shoulder
- He is having difficulty moving shoulder and feels weak
- Taking Acetaminophen as needed for pain
- Has been unable to throw or play since injury occurred
- Physical Exam
  - Lateral shoulder TTP over growth plate, limited external rotation, 3/5 strength

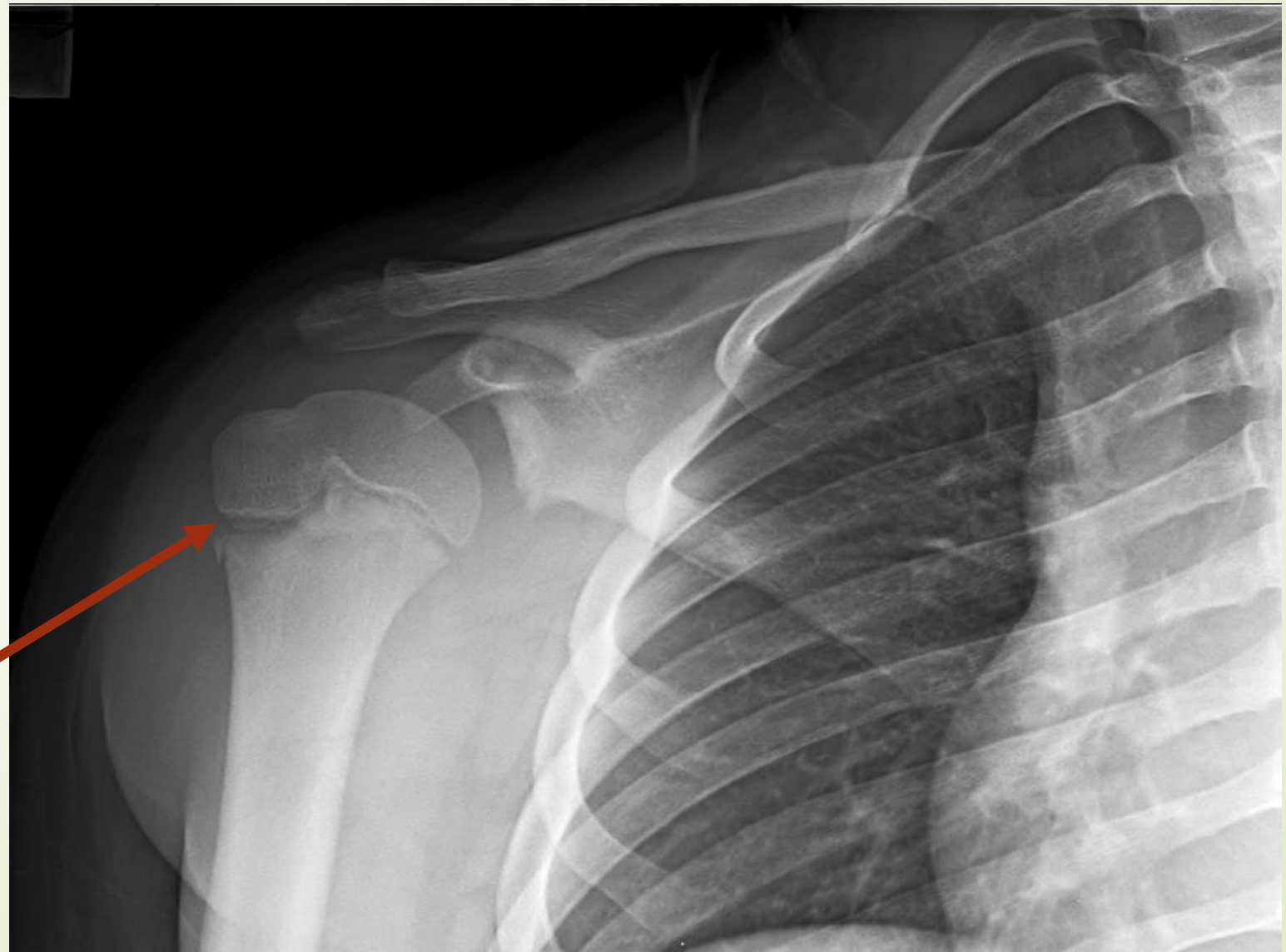
Right Shoulder X-ray AP View

Right Shoulder True AP (Grashey) View

Left Shoulder True AP (Grashey) View For Comparison



“Little League Shoulder” Proximal Humeral Epiphysiolysis



Case #1 Continued

- Sling for 1 week for comfort then physical therapy for stretching/strengthening
- Follow up at 6 weeks pt is asymptomatic
- No tenderness to palpation over physis
- 4/5 strength
- Completed throwing progression and finished season as catcher for the last 2 games

6 Week Follow Up

Periosteal Growth

“Little League Shoulder”

“Little League Shoulder”
Proximal Humeral Epiphysiolysis

- Pathophysiology
  - Increased **rotational torque** at **late cocking** and **deceleration** phases through growth plate (Bassett)
- Presentation
  - Typically presents from 11-16 years old (Peak incidence at 13 y/o)
  - Progressively worsening, generalized or lateral shoulder pain with throwing
  - TTP proximal, lateral humerus over growth plate
- Diagnosis
  - Radiograph (AP in External Rotation)
    - compare to contralateral shoulder
  - MSK US (hypo-echoic swelling of affected shoulder)
  - MRI – Definitive Diagnosis

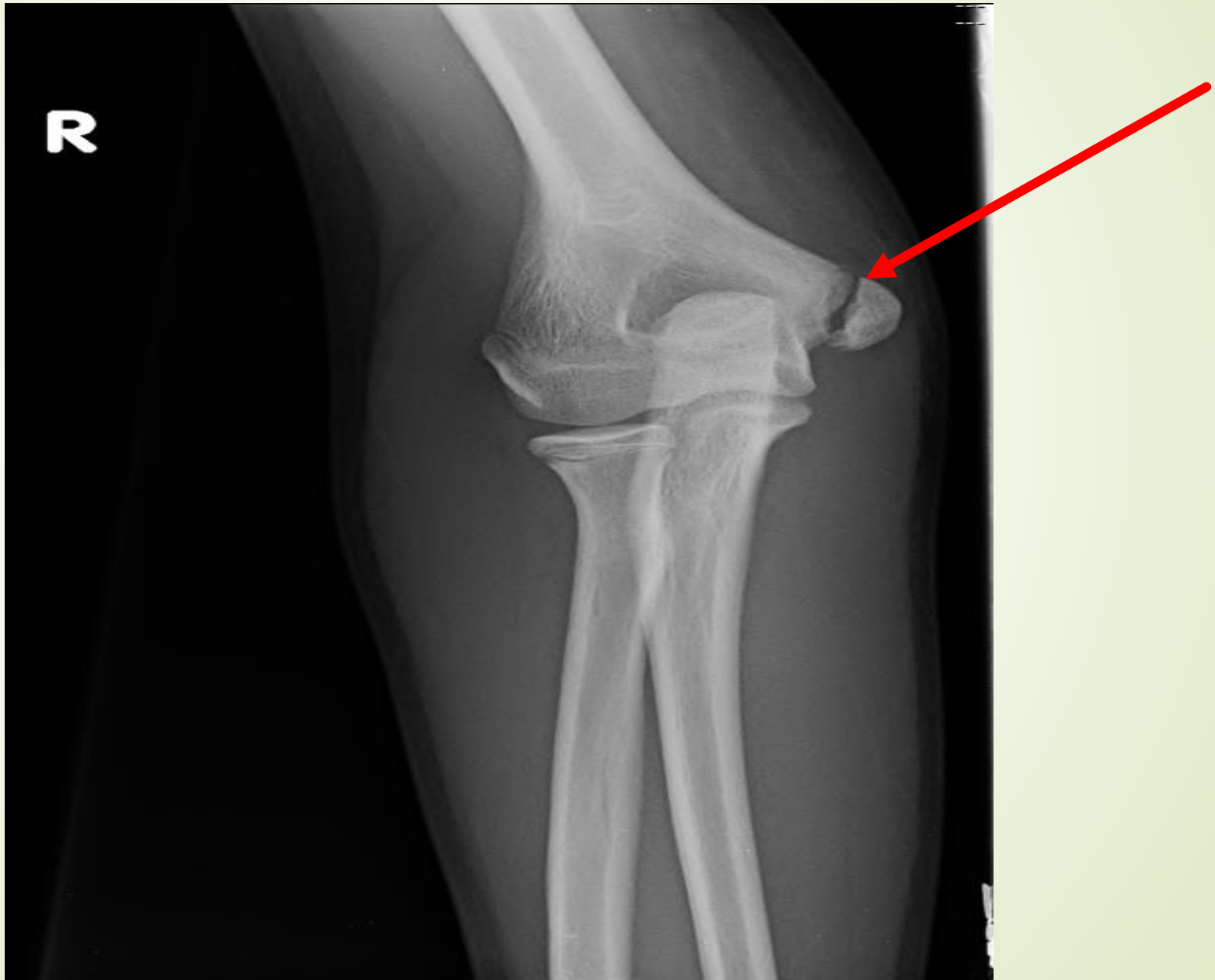
“Little League Shoulder”
Proximal Humeral Epiphysiolysis

- Treatment
  - Cessation of throwing
  - Physical Therapy (posterior capsule stretching, rotator cuff strengthening)
  - OMM once healed- Spencer's, BLT, Muscle Energy
  - Pitch progression after ~3 months of being asymptomatic
  - 2000 mg Calcium + 800 IU Vitamin D daily
  - Avoidance of NSAID’s as NSAID’s can impair bone healing
- Prevention
  - Pitch Counts per USA Baseball Guidelines
  - Biomechanics and Stretching
  - Discouragement of breaking pitches until skeletal maturity

Case #2

- **14 year old male** football player presents with pain of his **R medial elbow**
- He was throwing a football last night at practice and during the follow through portion of the throw he had **immediate pain** with elbow extension
- He **felt a pop** and was unable to finish practice
- He did have some **swelling** and his father wrapped it last night and he also iced it multiple times and took Ibuprofen
- He has never had an injury to the elbow before
- Right handed QB and Right handed baseball pitcher

Right Elbow AP X-ray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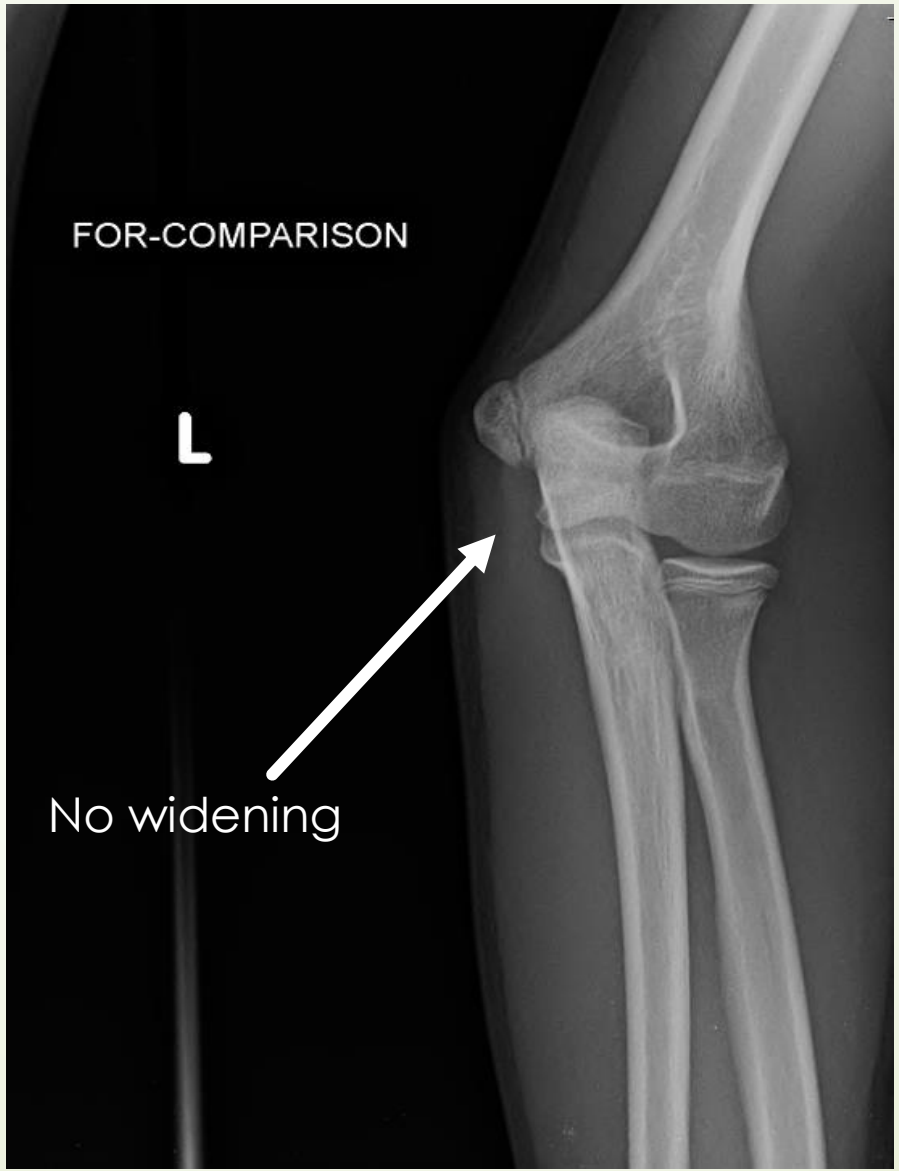
Left Elbow AP X-ray for comparison



“Little League Elbow”
Medial Epicondylar Avulsion

Case #2 Continued

- Monitored at 2 week intervals with follow-up xrays
- Fully released at 8 weeks
- Played as a defensive back throughout the rehab process with minimal pain and improving ROM

Follow-Up AP X-ray after treatment

Periosteal reaction & avulsion filling in with bone

“Little League Elbow”

“Little League Elbow”
Medial Epicondylar Apophysitis/Avulsion

- Pathophysiology
  - Repetitive valgus loading and microtrauma (Abbasi)
  - Physis is the weak leak in adolescents vs the UCL in adults
- Presentation
  - 9-12 y/o overhead throwing athletes
  - Medial elbow pain, decreased velocity/accuracy
  - TTP medial epicondyle, swelling, laxity w/Valgus test
- Diagnosis
  - XR AP and lateral with physeal widening or avulsion
  - US widening and edema
    - Static and dynamic UCL evaluation
  - MRI edema and also UCL evaluation

"Little League Elbow"
Medial Epicondylar Apophysitis/Avulsion

- Treatment
  - **Apophysitis** – Nonoperative
    - Rest, PT, Throwing progression
    - Maintain ROM
    - OMM – Tx radial head dysfunctions, Muscle Energy
  - **Avulsion** – It depends…
    - Non-operative
      - <5-6 mm of displacement
    - Operative
      - Potential UCL reconstruction
        - Generally the weak "link" is the apophysis in younger patients
        - When elbow growth plates fuse, then UCL is the vulnerable area of the elbow

“Little League Elbow”
Medial Epicondylar Apophysitis/Avulsion

- Prevention
  - Follow pitch counts based on age and USA Baseball Guidelines
  - Limit to <9 months competitive pitching/year
    - Time off is needed to give the pitcher's body time to rest and recover
    - 3 months or more per year a pitcher should not play any baseball, participate in throwing drills or stress their arm in overhead activities
      - Javelin throwing, football quarterback
  - Discontinue pitching if arm fatigue is associated with pain
  - Higher risk if fastball >85 mph

USA Baseball Pitch Count Recommendations

- **9-10 year old pitchers:**
  - 50 pitches per game
  - 75 pitches per week
  - 1000 pitches per season
  - 2000 pitches per year
- **11-12 year old pitchers:**
  - 75 pitches per game
  - 100 pitches per week
  - 1000 pitches per season
  - 3000 pitches per year
- **13-14 year old pitchers:**
  - 75 pitches per game
  - 125 pitches per week
  - 1000 pitches per season
  - 3000 pitches per year

USA Baseball Pitch Count Recommendations

- Pitch count limits pertain to pitches thrown in **games** only
- Pitchers should not throw breaking pitches (curveballs, sliders) in competition until their bones have matured
  - ~ 13 years of age
- Youth pitcher should focus on good mechanics
  - Fastball, changeup, and good control
- Pitchers should develop proper mechanics and include year-round physical conditioning

Case #3

- Former College Men's Basketball athlete presents complaining of **right wrist pain** & limited AROM
- Injured his wrist **2 months ago** after he was undercut when he went up for a dunk and landed onto his right hand in a **FOOSH type injury**
- He had pain and swelling in his wrist at that time and was evaluated in an ER out of state where **initial x-rays were negative** for fracture
- Since the injury, he has **persistent right wrist pain and limited AROM**

Wrist X-ray with AP ulnar deviated view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Scaphoid Fractures

Scaphoid Fractures

- Pathophysiology
  - Mechanism: Axial load on a hyperextended & radially deviated wrist
    - Often a fall on outstretched hand (FOOSH) injury
- Presentation
  - Most common fractured carpal bone (Abbasi)
  - TTP anatomic snuffbox dorsally and scaphoid tubercle volarly
  - Pain with resisted pronation or radial deviation

Scaphoid Fractures

- Diagnosis
  - Radiographs
    - Standard wrist x-rays (AP, Lateral, and Oblique views) **plus** a dedicated scaphoid view (AP with ulnar deviation)
    - Be aware that early imaging with x-ray is often unrevealing for a scaphoid fracture.
  - If radiographs negative with high clinical suspicion repeat in 14 days
    - Consider placing patient in short arm thumb spica cast in interim and limiting activities
  - MRI – Most sensitive if fracture <24 hours; can assess for AVN
  - Bone Scan – Sens/Spec if >72 hours out
  - CT Scan – High Sens/Spec for bone injury

Scaphoid Fractures

- Treatment
  - **Non-Surgical** (long or short arm thumb spica cast)
    - IMMOBILIZE EARLY!
    - If <1mm then union rate is 90%
  - *Blood supply to the scaphoid is distal to proximal*
    - **Distal third** fractures →4-6 weeks
    - **Middle third** fractures →10-12 weeks
    - **Proximal third** fractures →12 -20 weeks
    - A long arm cast may decrease healing time but it does not improve nonunion rates

Scaphoid Fractures

- Treatment
  - **Surgical**
    - ORIF vs Percutaneous Screw Fixation
    - Proximal 1/5 "pole" fractures **or** >1mm displacement **or** any fracture not simple transverse
    - Non-displaced middle third fractures for faster healing time
    - 90-95% union rate
    - Remember CT scan valuable to evaluate union vs non-union healing

Scaphoid Fractures

- Treatment
  - Acetaminophen for pain control
    - Avoid NSAIDs as they can impair bone healing (Simon)
  - Ensure adequate energy availability via diet and ensure adequate calcium and vitamin D intake (Lappe)
  - Avoid tobacco exposure to help heal the fracture
- OMM
  - Radial head dysfunctions common with casting
  - Muscle Energy after healing complete

Summary

- Little League Shoulder
  - XR True AP bilateral for comparison
  - Rest, Physical Therapy
  - Pitch Progression and Limit pitch counts
- Little League Elbow
  - XR AP bilateral for comparison
  - If greater than 5-6mm widening needs surgical correction
  - Pitch Progression and Limit pitch counts
- Scaphoid Fractures
  - Get Scaphoid View (AP w/ulnar deviation)
  - Commonly negative on initial XR; high clinical suspicion cast & reimage in 14 days
  - Surgical if >1mm wide, not simple transverse fracture, or proximal 1/5 fracture

References

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