Sports Imaging
Pediatric Elbow Injuries

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NO DISCLOSURES
Objectives

• Discuss spectrum sport related elbow injuries in children/adolescents

• Review MRI appearance of ligaments and tendons

• Discuss sequela of chronic repetitive injuries and potential complications of acute injuries
Acute

Chronic

Developmental
Acute Injuries: Fractures
Radiographic Evaluation: Secondary Ossification Centers

• CRITOE
  • Capitellum
  • Radial head
  • Internal Epicondyle
  • Trochlea
  • Olecranon
  • External Epicondyle
Radiographic Evaluation:
Secondary Ossification Centers
Radiographic Evaluation: Lateral Radiograph

• Adequate lateral view (first step)
  • Teardrop/hour-glass sign
  • Superimposition of capitellum and trochlea

• Anterior Humeral Line
  • Middle third of the capitellum

• Radiocapitellar line
  • Line across center of radius should intersect capitellum
Lateral Radiograph: Joint effusion

• Fad pads lie over the joint capsule
  • Anterior Fat Pad
    • Over the coronoid fossa
  • Posterior Fat Pad
    • Over the olecranon fossa
Elbow fractures

- Peak age 5-10 years
- 75% of fractures in children - upper limb
  - FOOSH
  - Distal radius >>> elbow
Supracondylar Fracture

• Extension Injury (FOOSH) most common
  • Posterior displacement of distal fragment

• Flexion Injury (1%)
  • Anterior displacement of the distal fragment
  • Direct posterior blow with the elbow flexed
  • Very unstable
Supracondylar Fracture Garland Classification - Extension Mechanism

Type I
Minimally displaced

Type II
Intact posterior cortex with posterior angulation

Type III
Complete disruption of the cortex with displacement
Supracondylar Fracture Complications

- Vascular injury most common with Type III fractures
  - Posterolateral displacement > brachial vessels/median nerve
  - Urgent closed reduction and stabilization

- Nerve Injury

- Malunion and cubitus varus/valgus
3 year old boy with left elbow trauma
F/U 2 weeks
Cubitus varus angulation

18 year old with supracondylar fracture at age 5
Additional Chronic Sequela of Elbow Fracture

2013

Urgent Sx
2013 – 3 months f/u
Fishtail Deformity

- Central concavity of the distal humeral epiphyses

- Premature closure of a portion of the physes with growth of the remaining physes

- Rare complication of different fx with unclear etiology:
  - Incomplete fracture reduction
  - Avascular necrosis

- Precise contour of the fish tail is determined by amount of throclear, central or capitellar physes damage
Normal Specimen – 3 y/o

Fishtail Deformity Classification

Type A

Type B

Rockwood and Wilkins' Fractures in Children 7th edition. Lippincott Williams & Wilkins. 2009
5 y/o boy with decreased elbow ROM; prior trauma 2 years ago
Overhead Throwing Injuries
Medial Epicondyle Fracture
11 year boy old fall rollerblading
Medial Epicondyle Fracture

• Between 9 and 15 years of age

• During medial epicondyle apophysis ossification just before fusion with the distal humerus

• Medial epicondyle
  • Traction apophysis for the flexor muscle compartment
  • Attachment for the ulnar collateral ligament and the joint capsule

• > 5 mm displacement – surgical management
Chronic Repetitive Injury
Little League Elbow

Baseball pitcher with persistent medial elbow pain
Ulnar Collateral Ligament Complex

Anterior Bundle

Posterior Bundle

Transverse Bundle

Normal UCL
Medial Epicondyle Apophysitis/UCL tear

14 y/o boy in dual sports (baseball pitcher/football QB)
UCL tear – T sign

16 y/o baseball pitcher with medial elbow pain
Sublime Tubercle
Avulsion/Entesophathy

15 year old boy

Baseball pitcher with chronic medial elbow pain
Ulnar Collateral Ligament Reconstruction

“Tommy John” Surgery
Radial Collateral Ligament Complex

- Radial Collateral Ligament
- Lateral Ulnar Collateral Ligament
- Annular Ligament
Radial Collateral Ligament Tear

13 y/o boy with hx of right elbow dislocation during fall in triathlon

Mild elbow discomfort
Posterior elbow dislocation pattern
RCL + UCL + Coronoid Process Avulsion
Follow-Up

- Patient doing well
- Pain 3/10
- Some decreased in ROM
- Only did 4 swimming events
  - Usually does all events
  - Plans to compete in the National Swimming Trials
Posterolateral Rotatory Instability

12 y/o girl with left elbow injury following collision with another player during baseball game
3 month old f/u
Posterior Dislocation–Osborne Cotterill Lesion

• Posterolateral rotatory instability
  • Insufficiency of the lateral collateral ligament complex
  • Lateral ulnar collateral ligament

• Osborne Cotterill Lesion

- Osteochondral fragment in posterolateral capitellum
- Associated to posterolateral rotatory instability
- Hyperextension injury with shearing force at posterior capitellum (lateral ulnar collateral ligament tear)
- Radial head engaging into bone defect

In-Ho et. Al. AJR. Osborne-Cotterill Lesion: An osseous defect of the capitellum associated with instability of the elbow. 191, September 2008
Overhead Throwing Injuries
Capitellar OCD
13 y/o boy with chronic lateral elbow pain
Capitellar OCD
13 y/o boy with chronic lateral elbow pain
Chronic Repetitive Injury
Capitellar OCD

14 y/o girl gymnast (level 10) with left elbow pain (4/10) and locking; not improving with conservative management

Marshmallow protuberance underwent drilling
Acute Osteochondral Injuries

11 year old boy with insidious elbow pain
No acute injury
Patient is a gymnast with pain after attending wrestling camp for first time

Plans to begin soccer camp
Developmental Variant
Capitellar Pseudodefect

- 14 year old boy

Other Capitellar Injuries

6 year old boy with elbow fracture after fall from basketball rim
Panners Disease?
Panner Disease

• Capitellar osteochondrosis

• Young children 5-10 years of age
  • Younger age than typical OCD overhead throwers

• Spontaneous healing with rest
Developmental Variant
Trochlear pre-ossification center

Jaimes et. Al. The trochlear pre-ossification center: a normal developmental stage and potential pitfall on MRI images. Peds Rad 2012
In Summary....

• Relevant anatomy of the elbow development

• Spectrum of sport related elbow injuries in children
  • Overhead throwing mechanism
    • Bony and ligamentous injuries

• Mimickers of acute injury
Thanks SPR!!!