UPPER EXTREMITY SPORTS INJURIES IN CHILDREN

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LEARNING OBJECTIVES

SPORTS INJURIES IN CHILDREN CONTINUE TO RISE. SPORTS INJURIES ARE THE MOST COMMON REASON FOR ADOLESCENT VISITS TO THE ED AND THE 4TH MOST COMMON REASON FOR PCP VISITS FOR PEDIATRIC PATIENTS.

1. Understand how basic anatomy, mechanics, and normal bone development contribute to sports injuries of the upper extremity that you do not want to miss in pediatric patients.

2. Know the indications for imaging for sports injuries of the upper extremity in growing children and what to order to make the diagnosis.

3. Recognize sports injuries of the upper extremity—some acute and some over-use that require removal from play for student athletes and usually referral to a pediatric orthopedics specialist because they are at risk for growth disturbance or may require surgical treatment.

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CASES

UPPER EXTREMITY SPORTS INJURIES

1. 13 yo male baseball pitcher with shoulder pain. No acute injury.
2. 14 yo baseball pitcher with elbow pain. No acute injury.
3. 15 yo LHD pitcher injured his elbow playing in a showcase.
4. 12 yo girl with wrist pain injured while snowboarding.
5. 15 yo male injured middle finger catching a football.
6. 10 yo girl injured pinky finger playing “the floor is lava.”
CASE #1

13 YO MALE BASEBALL PITCHER WITH SHOULDER PAIN. NO ACUTE INJURY.

Further questioning reveals a several weeks’ history of increasing shoulder pain with throwing. This past week he was removed from a tournament game by his coach because he was not throwing as well (lost speed and accuracy). Now his shoulder hurts all the time and he is having pain lifting his back pack or even pulling a milk jug out of the refrigerator. He played summer ball and is on a travel team and it is now Fall Ball season.

No other relevant history, PMH
CASE #1  
ANATOMY

**Shoulder exam**

**Inspection** – trauma, atrophy, contracture, sag

**Palpation** for Tenderness- 
- bones, joints, muscles

**ROM**- active, passive. Abduction, rotation

**Strength**- deltoid, rotator cuff

**Instability**- sulcus sign, apprehension
CASE#1

13 YO MALE BASEBALL PITCHER WITH SHOULD PAIN. NO ACUTE INJURY.

Pain with all motions, including rotation
Unable to do a fake overhead throw

1. What next?
2. What is the diagnosis?
3. What is your advice?
4. Refer?
CASE#1

13YO MALE BASEBALL PITCHER WITH SHOULDER PAIN. NO ACUTE INJURY.

1. What next?
2. What is the diagnosis?
3. What is your advice?
4. Refer?

Little League Shoulder
-Pitcher’s Shoulder
-Physiolysis of the Proximal Humerus
Think: non-displaced Salter-Harris I fracture
Or stress fracture

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- Adolescent/pre-adolescent pitchers (any high volume throwing position), gymnasts, tennis/racquet sports, javelin
- Risks: high volume overhead throwing, poor throwing mechanics, recent weight gain, breaking pitches too young
CASE#1
13 YO MALE BASEBALL PITCHER WITH SHOULDER PAIN. NO ACUTE INJURY.

Treatment:
- Remove from play, no overhead throwing 2-3 mos
- Refer? Probably. Peds Ortho or Peds Sports Medicine
- Outcome: Excellent healing with rest
- Most fully recover
- Small risk of growth arrest, angular deformity

Differential Dx: muscle strain, rotator cuff sprain, impingement, multi-directional instability, pathologic fracture through tumor

Little League Shoulder

Heals like a fracture
CASE #2
14 YO BASEBALL PITCHER WITH ELBOW PAIN

Insidious onset of elbow pain during baseball season. Pain is felt with overhead throwing and is becoming more intense and more frequent. Now has pain with every throw. No pain at rest. In his opinion, he has had no loss of speed or accuracy. He has a game this weekend but his coach said he cannot play unless cleared by the doctor.

Exam: no swelling, full symmetric ROM of the elbow. Tender at the medial elbow / distal humerus and extending to the soft tissue just distal to the medial epicondyle. Pain is reproduced with resisted pronation of the forearm and resisted flexion of the elbow. No elbow instability/laxity.

What would you do next? Can he play baseball this weekend? Can he rest a bit, and return to play when the pain is gone? Does he need imaging? What views?
Little League Elbow
Apophysitis of the medial epicondyle

1. What is apophysitis?
2. What is an Apophysis?
3. Where are they?
4. What attaches to them?
5. What does apophysitis happen?
6. Why is this important to know when treating kids and sports injuries?
The elbow has 6 apophyses

-Growth centers that do not Add to the length of the bone.  
-Connected to main bone by a growth plate (physis)  
-All have muscle-tendon units and/or ligaments attached to them  
-The “soft tissues” are stronger than the physis!

*Most vulnerable to repetitive, sub-maximal loading*

Osgood Schlatter = apophysitis of the tibial tubercle
CASE #2
14 YO BASEBALL PITCHER WITH ELBOW PAIN

Little League Elbow
Apophysitis of the medial epicondyle

Risk factors (ages 8-17)
Exceeding pitch count limits for age
Throwing breaking pitches too soon
Year-round play
Multiple teams
Mechanical forces
Growth spurt
Recent weight gain

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CASE #2
14 YO BASEBALL PITCHER WITH ELBOW PAIN

Little League Elbow
Apophysitis of the medial epicondyle

Osteochondritis Dissecans of the Capitellum
(sometimes called Little League Elbow)
Caused by same mechanical forces
Overhead throwers, gymnasts
Insidious onset, lateral elbow pain
Loss of extension, then catching, locking, grinding
Refer: Non-operative or Operative

DDx: UCL tear
Loss of speed
And accuracy
Elbow laxity
DX: MRI with arthrogram
CASE #2
14 YO BASEBALL PITCHER WITH ELBOW PAIN

Little League Elbow
Apophysitis of the medial epicondyle

**TREATMENT:** 3-6 months
Refer? Probably, Yes.

**REST:** 4-6 weeks no throwing
(Fracture healing)

**REHAB:** skilled PT – refer
arm, shoulder, back, core

**RETURN to Throwing**
Supervised throwing program

**PREVENTION:** Advice for sports physicals
Year-round conditioning, Active rest (non-throwing sports), Pitching Guidelines,
Control → Command → Speed, Avoid Max Effort throws when not pitching,
Avoid further injury - teach growing athletes to not play through the pain
Use proper mechanics - get a pitching coach

The only proven risk factor for an overuse injury is: History of Previous Overuse Injury
CASE #3

15 YO LHD PITCHER INJURED HIS ELBOW PLAYING IN A SHOWCASE.

When pitching a fastball, he felt a pop and then intense pain at the inside of his left elbow. He was unable to throw after that. Despite ice, he developed swelling and continues to have persistent pain at rest at the inside of the elbow.

Exam:
Tender medial elbow at distal humerus, there is increased pain with forearm pronation against resistance, and there is mild valgus instability of the elbow

What next?
CASE #3
15 YO LHD PITCHER INJURED HIS ELBOW PLAYING IN A SHOWCASE.

Medial Epicondyle Avulsion Fracture

Now What?
Refer

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CASE #3
15 YO LHD PITCHER INJURED HIS ELBOW PLAYING IN A SHOWCASE.

MEDIAL EPICONDYLE FRACTURE

**Spectrum:**
- Chronic stress fracture/Apophysitis (top image)
- Overuse injury - overhead throwing, tennis
- Often called Little League Elbow
- Non-displaced medial epicondyle avulsion fracture
- Displaced medial epicondyle avulsion fracture
  - Can flip into elbow joint. Usually traumatic - fall, elbow dislocation

**Treatment**
- Chronic stress, Non-displaced, Minimally displaced
  - Non-operative: rest in long arm cast, rehabilitation PT, throwing program, gradual re-entry
- Displaced 5-10 mm - Controversial
  - Operative and Non-operative both good to excellent results. Plus rehabilitation
- >10 mm displaced, intra-articular loose body, open fracture, gross valgus instability, ulnar nerve entrapment
  - ORIF (open reduction, internal fixation)

ORTHOPAEDICS

← valgus stress view demonstrating instability of fragment
MEDIAL EPICONDYLE FRACTURE

CAUTION: WITH A DIRECT BLOW OR A FALL, UP TO 50% OF MEDIAL EPICONDYLE FRACTURES HAVE CONCOMITANT ELBOW DISLOCATION.

The dislocation may reduce spontaneously and not be seen on imaging.

BE extra cautious and refer to Ortho more urgently if there is a lot of generalized elbow swelling.
CASE #3
15 YO LHD PITCHER INJURED HIS ELBOW PLAYING IN A SHOWCASE.

MEDIAL EPICONDYLE FRACTURE

ORIF vs Non-operative treatment
For controversial cases. CT may be helpful

Non-operative
Most have good to excellent results and return to play
Even with fibrous “non-union”
Some may develop chronic pain.

ORIF
For elite athletes may allow earlier return to play
Significantly Increased rate of osseous union

Estimated time until return to competitive play:
6-9 months
Includes healing time and rehabilitation
12 YO GIRL WITH WRIST PAIN INJURED WHILE SNOWBOARDING

Presents 6 days after injury. MOI: Backwards FOOSH while snowboarding. She is concerned her wrist still hurts. It is her dominant arm and she is having trouble completing her school work due to pain. She has tried ice and elastic wrap bandage but it just isn’t getting better.

Exam: there is no swelling, redness, bruising, or heat. She states she originally had bruising of the palm of the hand and points to her thenar eminence. Palpation: PMT is the anatomic snuffbox and radial side volar wrist. Pain is increased with axial load of the thumb.

Exam tips
- Be GENTLE
- Use your pinky, not your thumb
- Tenderness at the Tubercle of the scaphoid Volar wrist is more specific than Snuffbox tenderness

Dx?

What Next?
CASE #4
12 YO GIRL WITH WRIST PAIN INJURED WHILE SNOWBOARDING
Pediatric Scaphoid Fracture

Pitfalls: imaging for scaphoid fx
Standard of care: 4 views
FX- May not be visible on x ray for 2 weeks
Consider bone age of child
Consider CT/MRI

Complications
Non-union (waist)
Risk incr. w/age
*Even w/proper Cast Rx
Displacement
AVN
Collapse
Surgery
Arthritis

Splint
& Refer

Scaphoid Fracture

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CASE #4

12 YO GIRL WITH WRIST PAIN INJURED WHILE SNOWBOARDING

Pediatric Scaphoid Fracture

Early detection with MRI: very sensitive/specific
Negative predictive value 100% 2 days post-injury
Cost-effective? Probably
Alternative= splint cost, specialist visit, cast cost
Repeat imaging 2 weeks later
CASE #4
12 YO GIRL WITH WRIST PAIN INJURED WHILE SNOWBOARDING

Pediatric Scaphoid Fracture

**TREATMENT** - **Skeletally Immature**
MOST are non-operative
Immobilize as soon as scaphoid fracture suspected
Consider MRI - if negative, nor further treatment needed

Fracture confirmed:
Long arm thumb spica for very active patients/waist fx
Short arm thumb spica cast
Cast until radiographic healing is complete
MRI may be needed if fracture is chondral
(in the non-ossified portion of immature scaphoid)

Prolonged casting >6 weeks may be needed
Non-union = not healed in 6 months → Surgical treatment

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**Indications for Surgical Treatment of Scaphoid Fracture in Pediatric Patients at or Near Skeletal Maturity**

- Fracture displacement ≥1.0 mm
- Fracture comminution
- Any proximal pole fracture
- Delay in diagnosis and initial treatment
- Fracture angulation in the sagittal plane with a lateral intrascaphoid angle >45° or a height-to-length ratio >0.65
- Poor patient compliance as evaluated from the patient interview

CASE #5

15 YO MALE INJURED MIDDLE FINGER CATCHING A FOOTBALL.

He is not sure what happened other than he tried to catch a football pass yesterday and it went badly. The end of his middle finger is swollen and intensely painful, he cannot straighten it without pushing up on the tip of it with the other hand, and there is a bruise under the fingernail. He is concerned that the finger looks bent.

MALLET FRACTURE
CASE #5
15 YO MALE INJURED MIDDLE FINGER CATCHING A FOOTBALL.

MALLET FRACTURE

Treatment - Most Non-operative
Extension splint 6-8 weeks
Activity restriction
Compliance is critical
Surgical: type IVC, subluxation of distal phalanx in extension splint, non-compliance w/splinting

IV A = open physis
Salter Harris III fracture

IV C = >50% volar plate/articular
Surface involved - Surgical

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CASE #5
15 YO MALE INJURED MIDDLE FINGER CATCHING A FOOTBALL.
MALLET FRACTURE

Extension block pinning

Complications
Non-union (Rare), Malunion
Infection if open fracture
Persistent extensor lag (even w/treatment)
Swan Neck Deformity
Arthritis → joint fusion

Seymour fracture - similar but different
Flexion at DIP due to displaced SH I
Physeal fracture with nailbed injury
(bleeding at cuticle)
Needs urgent repair
Osteomyelitis, growth arrest, nail deformity
if Rx delayed
CASE #6

10 YO GIRL INJURED PINKY FINGER PLAYING “THE FLOOR IS LAVA.”

When leaping from one piece of furniture to another, she fell, slipped on a cushion on the floor and snagged her pinky finger on the coffee table on the way to ground. They are sure it is broken. It looks bad.

All finger injuries - assess for:
Point of maximal tenderness [PMT]
Angulation
Malrotation / rotational deformity

What next?
CASE #6

10 yo girl injured pinky finger playing “the floor is lava.”

Extra Octave Fracture

>10 Angulation or Malrotation requires Reduction

Displaced Salter Harris II fracture of the little finger
CASE #6
10 yo girl injured pinky finger playing “the floor is lava.”
Extra Octave Fracture

TREATMENT
- Ulnar nerve block
- Fracture reduction
- Cotton pad in wed space/buddy tape
- Ulnar Gutter Splint or Cast
- Serial imaging
- Stable/Tenderness resolved
- Buddy straps- range of motion

Surgical Indications:
- Open fracture
- Tendon, nerve, vascular injury
- Intra-articular, unstable, malalignment
SUMMARY
WHAT CAN YOU DO TODAY

**Sports Physicals** are a great opportunity to:
Ask about history of overuse injuries
Counsel about risk factors for overuse injuries

Remember that growing kids with open growth plates are likely to fracture—not everything is a sprain.

**Have a lower threshold for imaging.**
- Long bones: AP/lateral
- Feet, fingers, hands: AP/lateral/oblique
- Wrist: PA/lateral/navicular (scaphoid)
- Elbows: AP/lateral/obliques
- Knees: AP/lateral/obliques, add sunrise for patella pain

**Review your anatomy** right before you go see a patient with an acute injury or chronic MSK pain with activity.
RESOURCES
SPORTS INJURIES / YOUTH SPORTS

www.littleleague.org or ASMI Position Statement for Youth Baseball Pitchers.