

Pediatric Sports Injuries: Upper Extremity



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Red Tape

- Conflicts of Interest: 
- Off-Label Medications: Intra-articular Gadolinium 

Objectives

- Compare and contrast Panner's disease and osteochondritis dissecans of the elbow.
- Define the various overuse syndromes and injuries of the pediatric athlete.
- List the injuries included within the broad topics of Little Leaguer's elbow and gymnast wrist.
- Describe the utility of shoulder MRI in the pediatric athlete.

Introduction

- Bones and physes often the weakest link
- Injuries ↑ during growth spurt:
 - ↑ muscle/tendon tightness
 - ↓ relative strength and bone mineralization
 - ↓ coordination and balance
 - ↑ intensity of practice and game schedules
- Overuse vs. acute injuries
 - Overuse: repetitive submaximal stresses to normal tissues
 - Often related to poor technique, over training

Introduction

- Many overuse injuries don't come to our attention.
 - “Tendonitis” is ubiquitous diagnosis.
 - Ankle sprain is the most common sports injury.
 - Overuse is less common in free play (trauma) and more common in organized sports.

Caine D. CSM 2008; 27:19-50

Lord J. Curr Op Ped 2004; 16:47-50

Garrick JG. PCNA 1986; 33:1541-1550

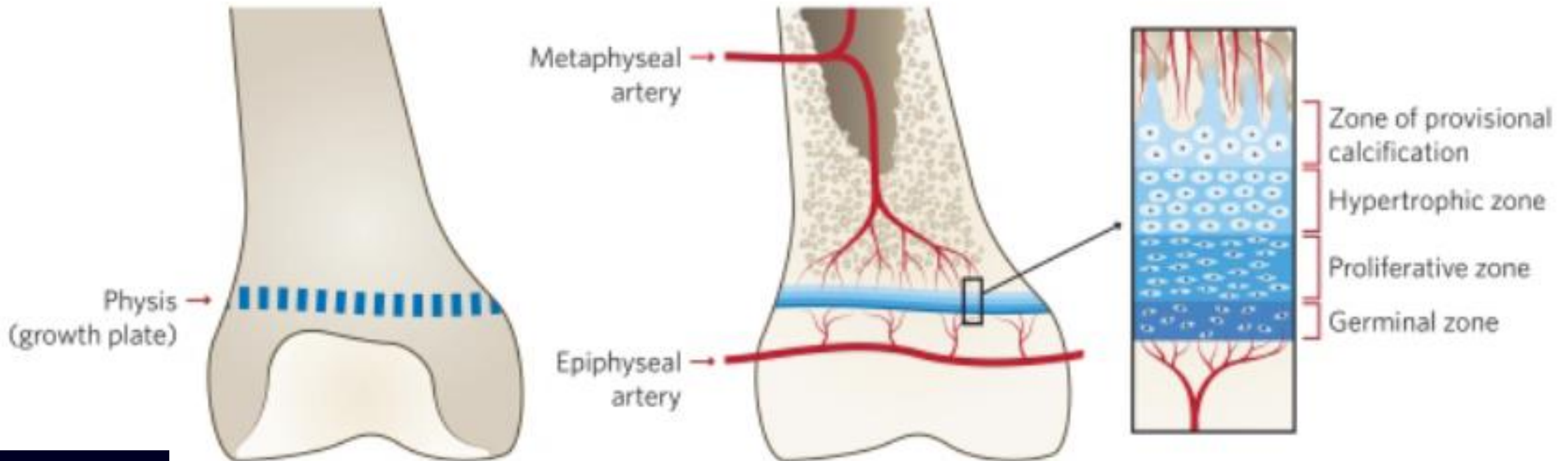
Frank J. JAAOS 2007; 15:356-366

Outerbridge AR. CSM 1995; 14:503-16

Micheli L. CSM 1992; 11: 713-726

Anatomy of the Pysis

- Chronic repetitive overuse
 - Disrupts scaffolding, interferes w vascular arcade, ↓ blood supply, metaphyseal bone cannot form normally, zone of hypertrophy persists longer, **pysis gets wider**



Overuse Syndromes

Chronic Injuries

Osteochondritis Dissecans

Knee

Talus: Osteochondral Lesion of Talus

Elbow: OCD vs. Panner's

Elbow: Osteochondritis Dissecans vs. Panner Disease

Do T. *Curr Opin Peds* 2003; 15:68-73

Bowen RE. *JPO* 2001; 21:298-301

Kijowski R. *AJR* 2005; 185:453-459

Kelly AM. *Adol Med* 1998; 9:569-587

Osteochondritis Dissecans

- Acquired condition affecting subchondral bone and overlying cartilage
- Damage and “isolation” of the fragment from the remainder
- Death of subchondral bone—no support of cartilage
- Likely secondary to repetitive trauma
- “Partial or total separation of a fragment of articular cartilage and subchondral bone from the articular surface.”
--Choi, 2007

Elbow

- Panner Disease

- < 10 yo
- Osteochondrosis—disordered cartilage growth
- Self-limited
- Improves with conservative treatment
- Involves whole capitulum ossification center
- → Irregular articular surface

- OCD

- Adolescents
- Chronic valgus stress injury
- Pitchers and quarterbacks
- Involves a portion of the capitulum (anterior)
- X-ray: lucency → sclerosis → fragmentation, LBs
- Unstable: rim of ↑ T2, cysts
- Surgery more common
 - (than knee)

Panner Disease: Radiographs



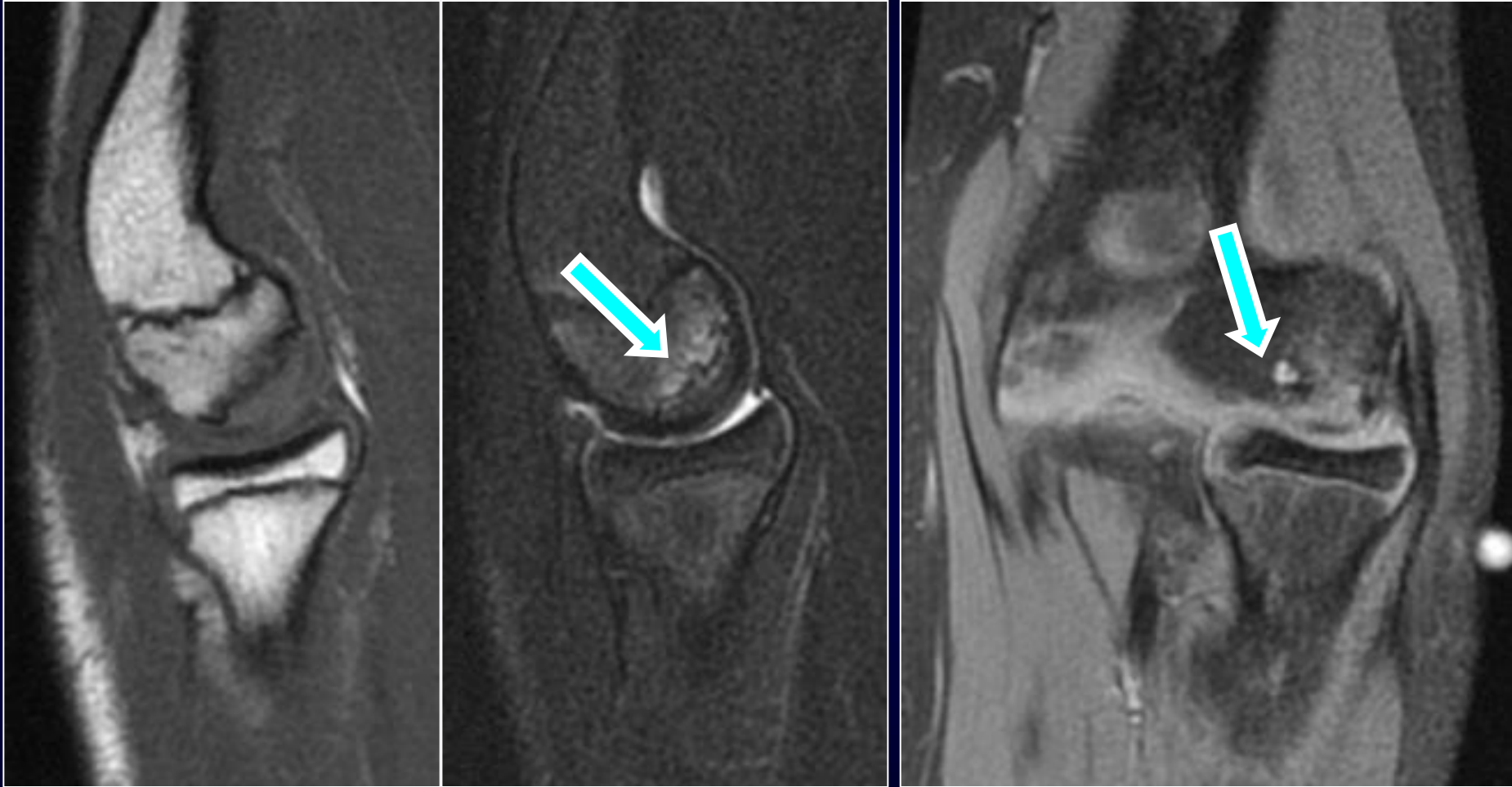
5 ♂

OCD: 16 ♂ Pitcher



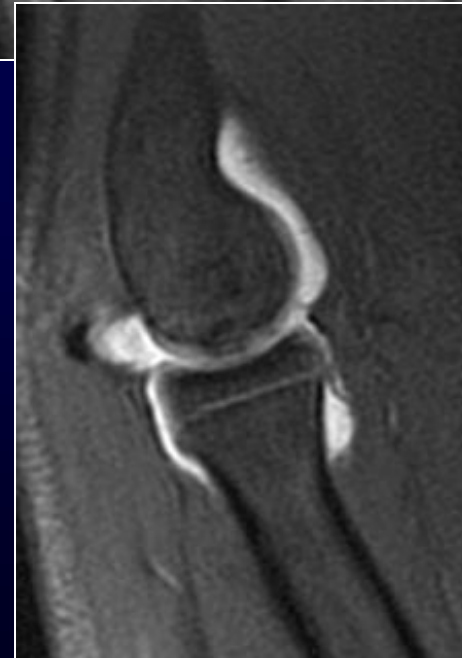
TP: Look for this
on every pediatric
elbow.

OCD: 12 ♂ Pitcher



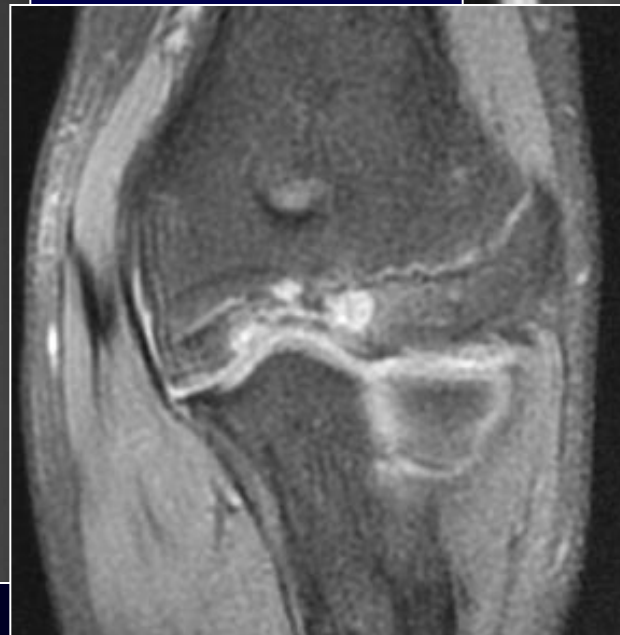
OCD: 13 ♂ Pitcher

2 years
earlier!

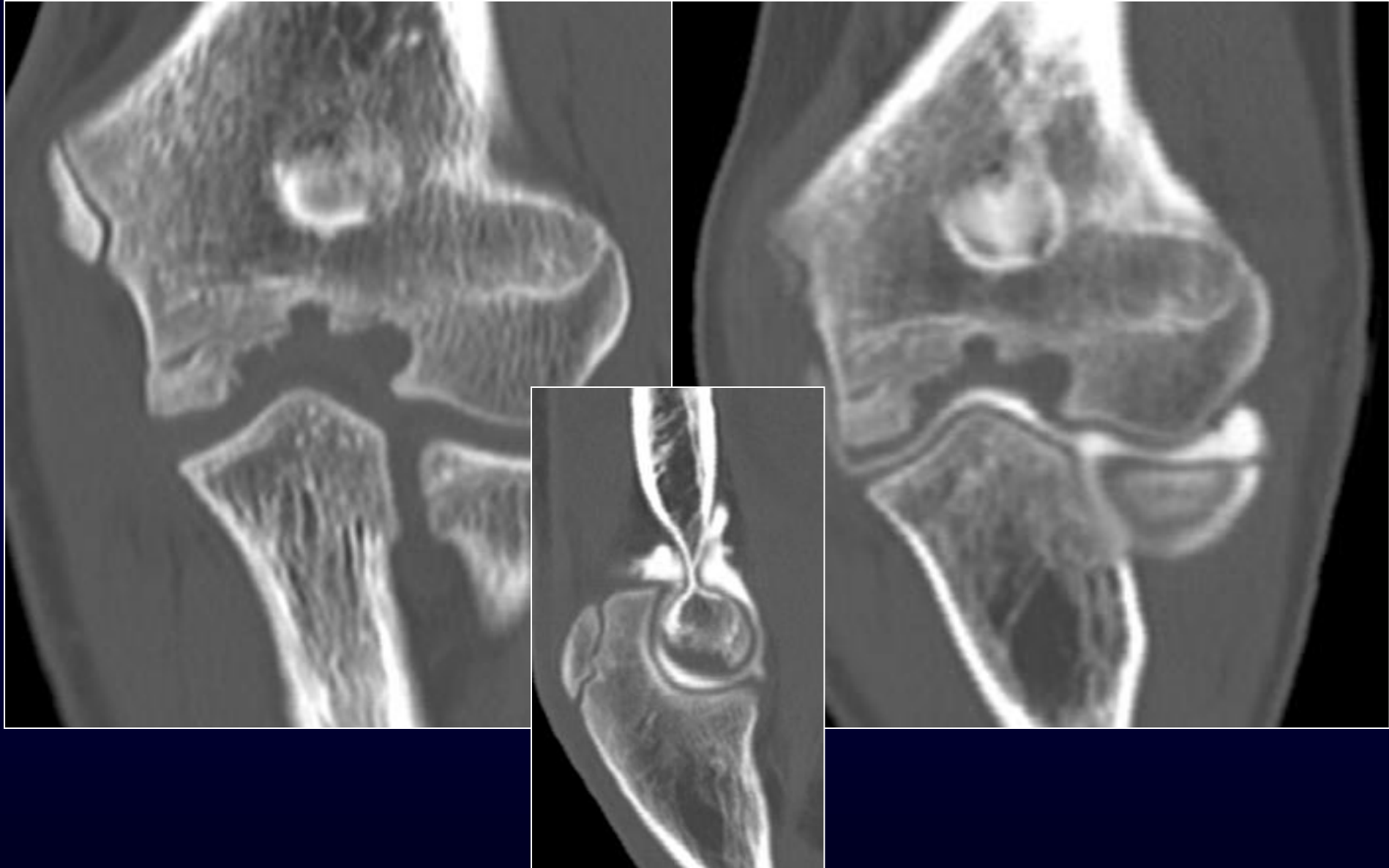


TP: OCD of elbow
difficult to heal.

OCD: 15 ♂ “Catching”



OCD: 15 ♂ “Catching”



Overuse Syndromes

- Little Leaguer's elbow
- Little Leaguer's shoulder
- Gymnast wrist
- Foot:
 - Sever
 - Iselin
- Knee
 - Osgood-Schlatter
 - Tibial tubercle avulsion
 - Sinding-Larsen-Johansson
 - Jumper's knee
 - PFSS

Little Leaguer's Elbow

Medial Epicondyle Apophysitis/Avulsion

Little Leaguer's Elbow

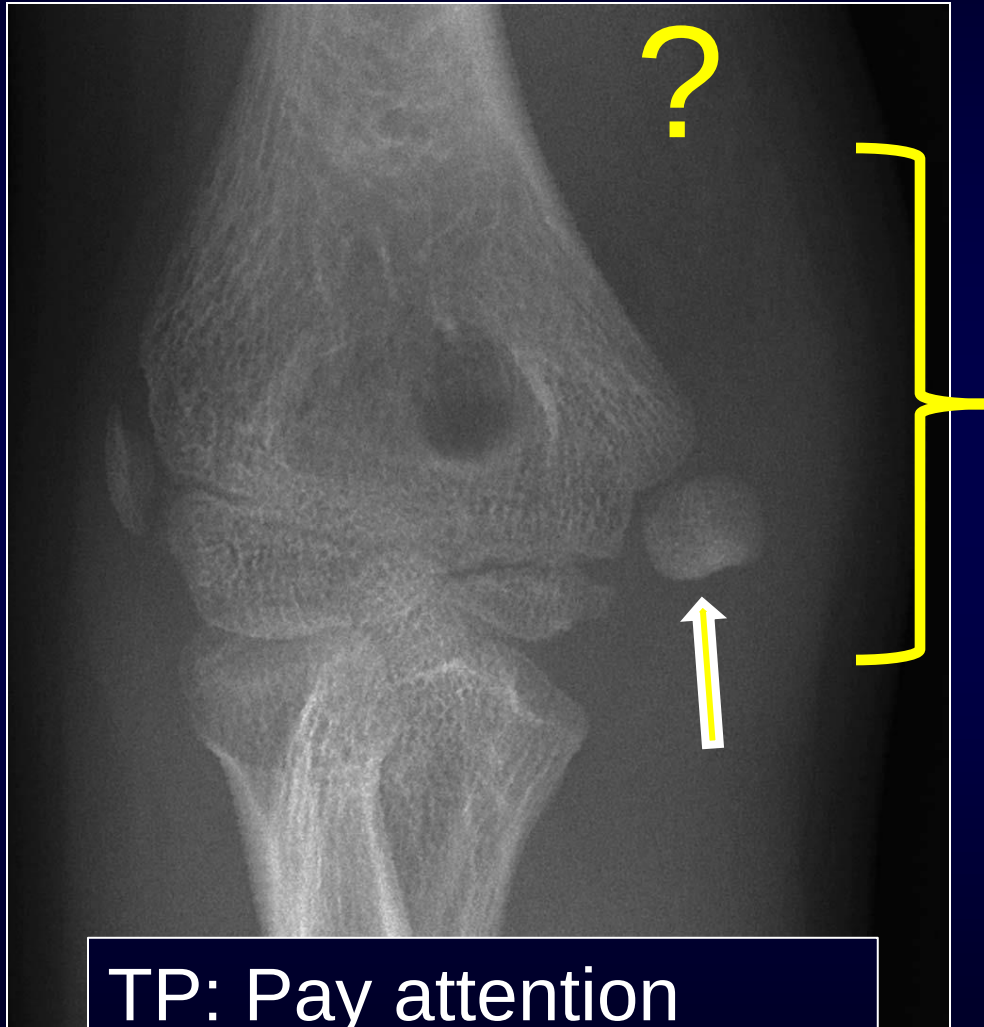
- Little Leaguer's elbow:
 - Traction apophysitis medial epicondyle
 - Mechanism: valgus stresses
 - Physis widens with edema; or fragmentation and resorption
 - Chronic “Salter-Harris I stress fracture”
 - → Vascular insult is part of the culprit
 - May avulse acutely
- Lateral compartment OCD may accompany
- +/- Olecranon avulsion/stress injuries
- +/- Tendinopathy

14 ♂ Epicondyle Avulsion

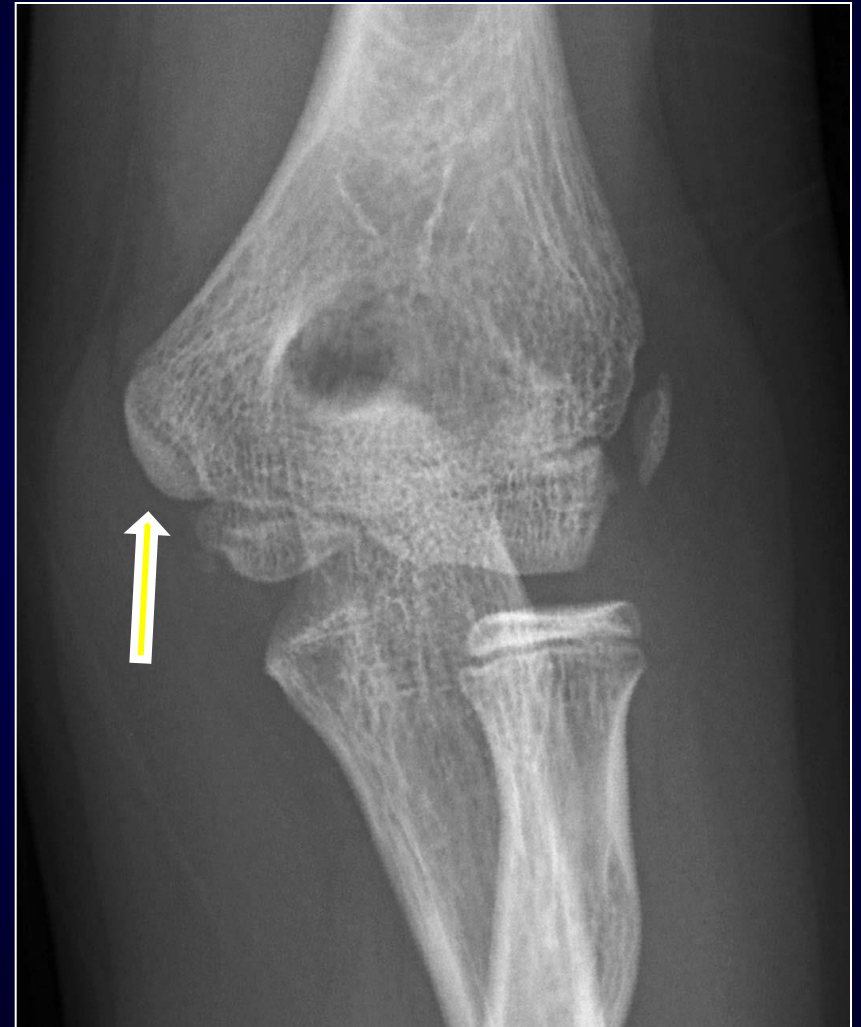


Case courtesy of Ken L. Schreibman, PhD, MD

Epicondyle Avulsion

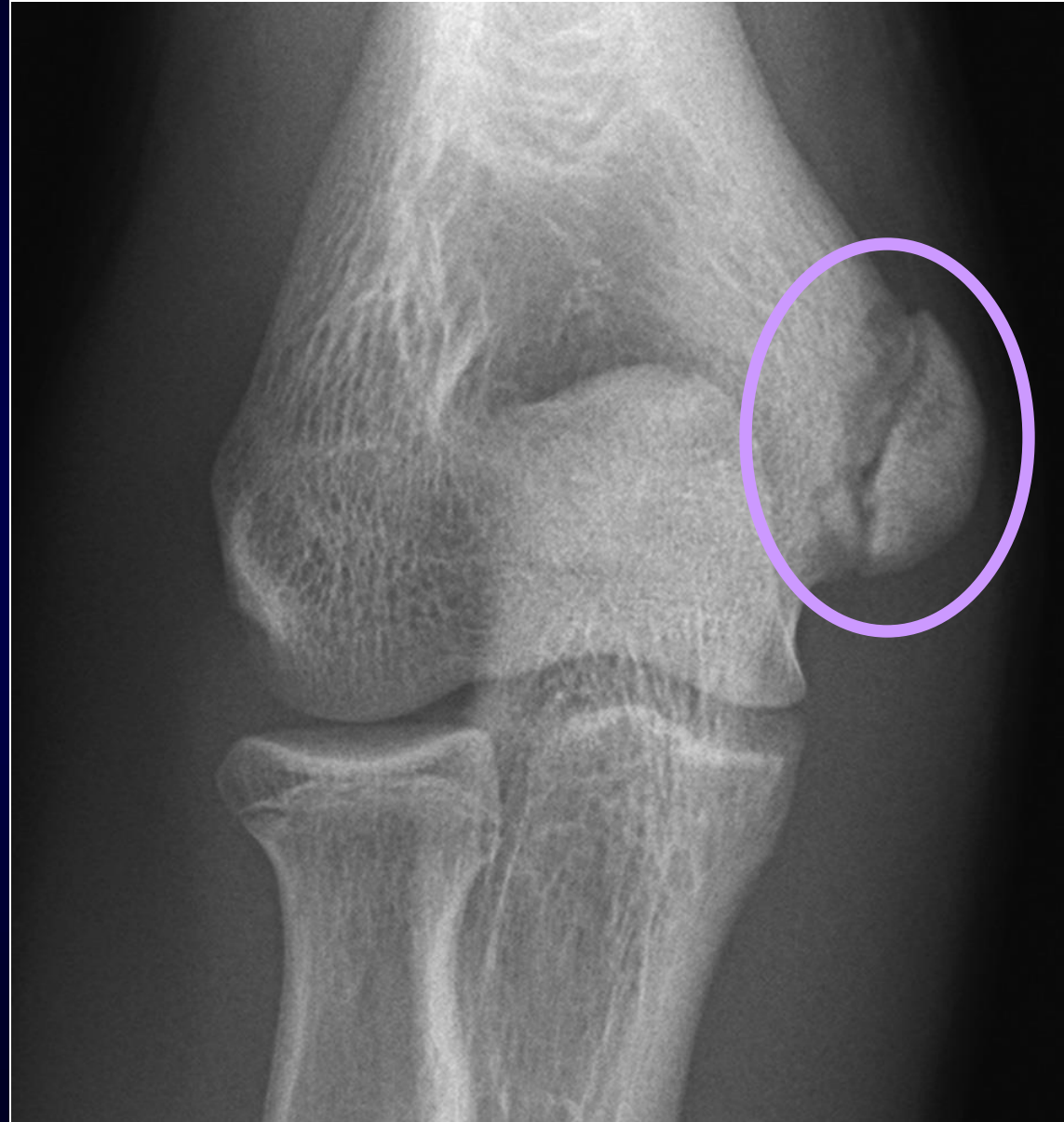


TP: Pay attention
to soft tissue swelling.



Normal contralateral elbow

14 ♂ Pitcher



15♂ Pitcher

Normal, asyx side

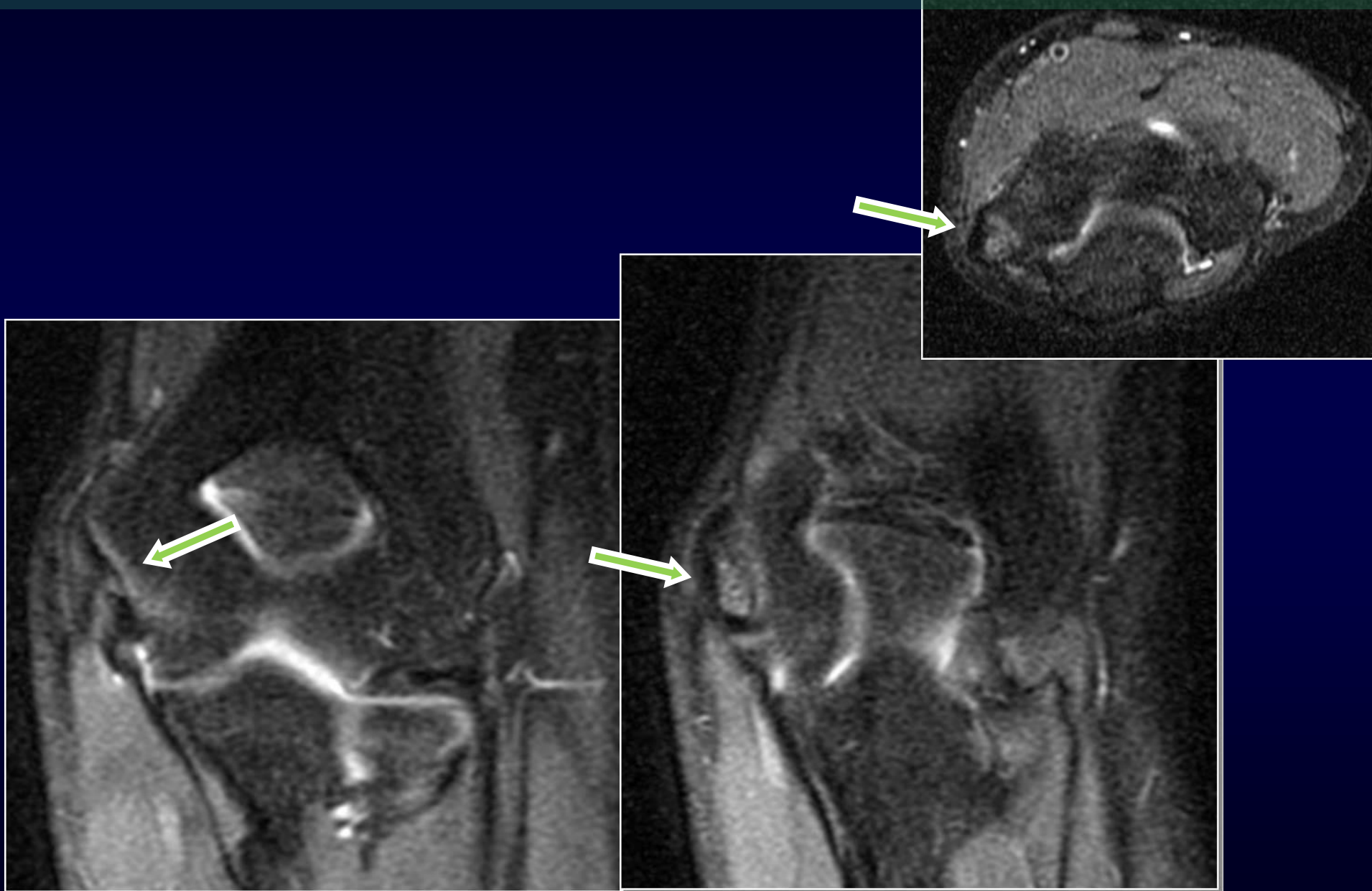


Painful side



- Physis wide
- Apophysis hypertrophied

Apophysitis in Young Pitchers



13 ♂ Pitcher



Olecranon apophysitis
Valgus extension overload

Little Leaguer's Shoulder

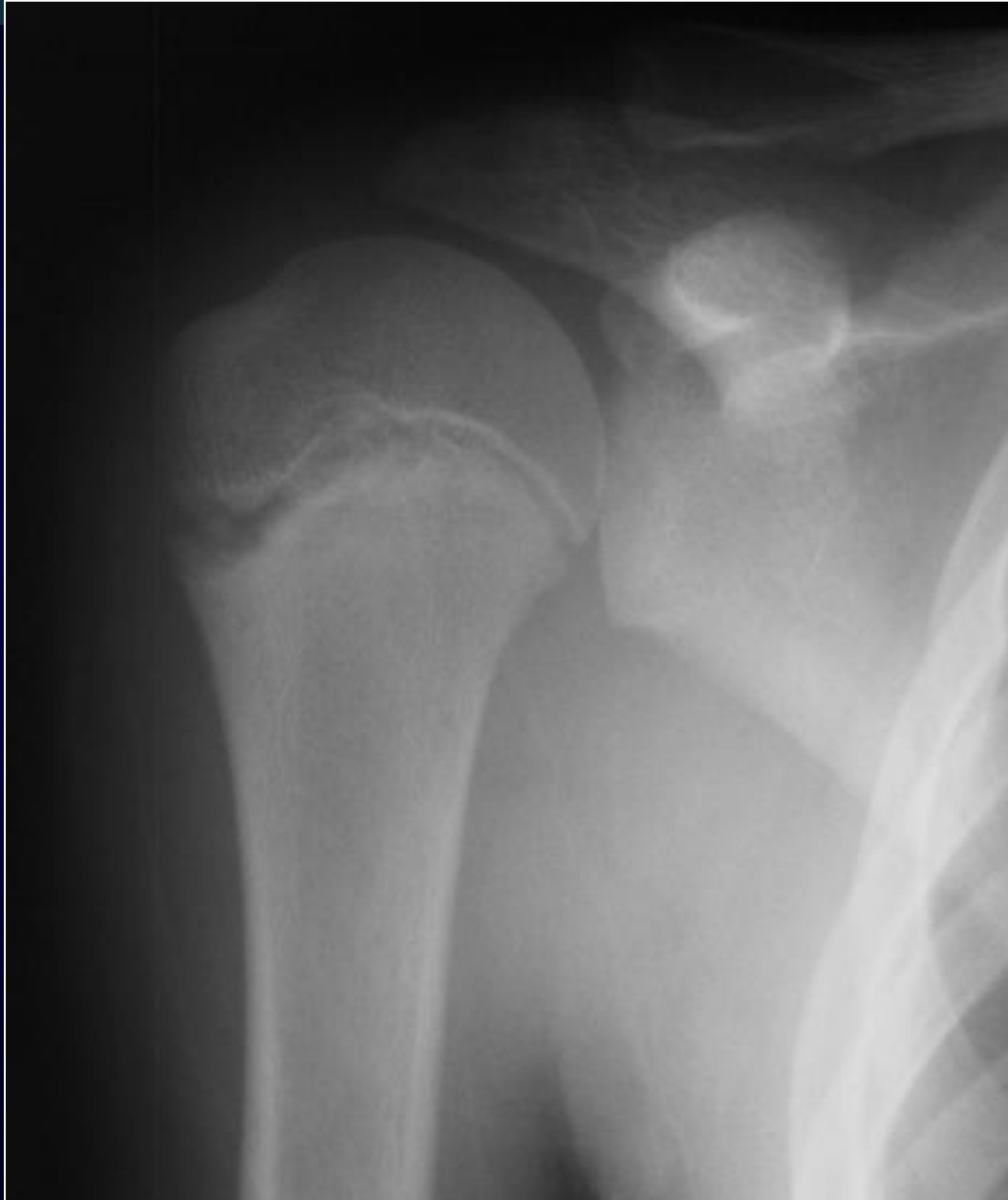
Stress Injury/Fracture of the
Proximal Humeral Physis

Little Leaguer's Shoulder

- Traction stress fracture of proximal humeral physis (Salter-Harris I)
- Pitchers!
- Twisting motion (curve balls)
- > 200 pitches/week
- Radiographs:
 - Wide physis (subtle → get contralateral image)
 - Demineralization
 - Fragmentation

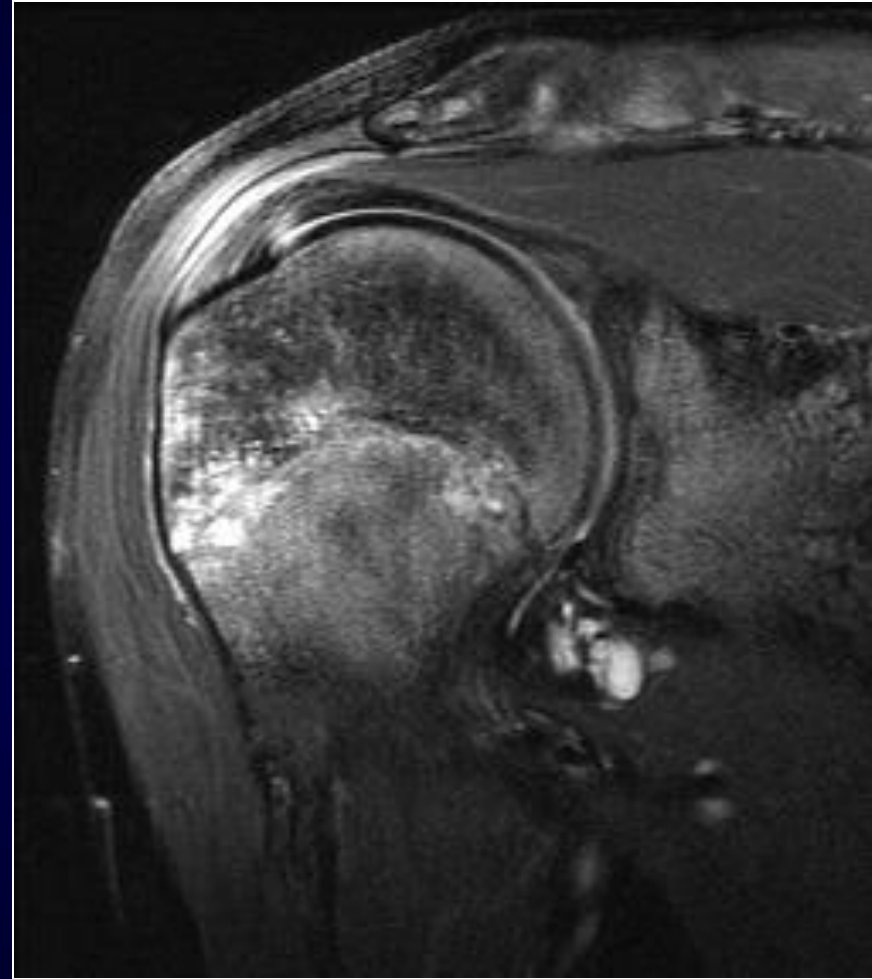
Adams JE. *Cal Med* 1966; 105:22-25
Kelly AM. *Adol Med* 1998; 9:569-587

14 ♂ Pitcher



Case courtesy of Ken L. Schreibman, PhD, MD

13 ♂ Pitcher



Chronic pain

Gymnast Wrist

Distal Radial Physis Injury

TFCC Tears

Ulnar Impaction

Ligament Tears

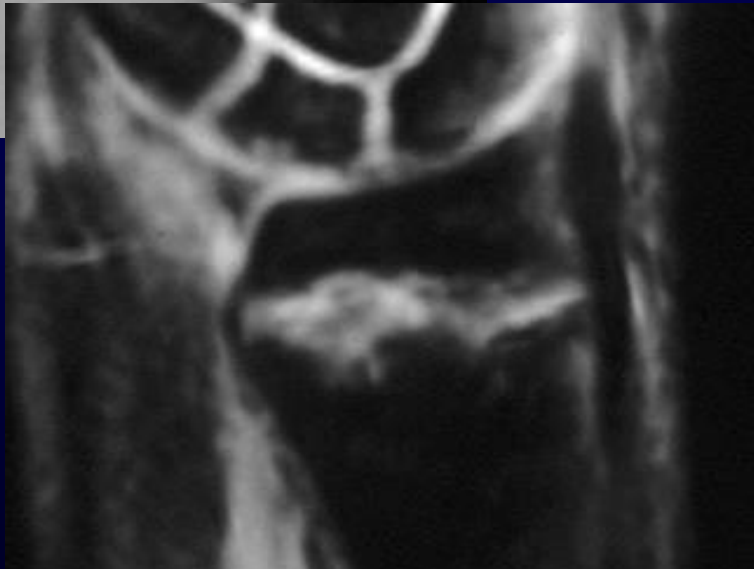
Scaphoid Stress Fractures

Gymnast Wrist

- 70% young female gymnasts get wrist pain
- Gymnast wrist: “Salter-Harris I chronic stress fracture”
- Microfractures in zone of hypertrophy of physis
- → wide growth plate, cystic changes, irregular metaphyseal side with beaking

15 ♂ Wrestler/Weightlifter





Cases courtesy of Marc S. Keller, MD, Child. Hosp. Phila

Acute Injuries

Shoulder

Rotator Cuff

Labroligamentous Complex

Background

- Shoulder injuries in pediatric athletes are especially common in overhead sports
 - Swimming
 - Baseball
 - Tennis



Background

- Pediatric sports shoulder injuries discussed in the clinical literature include
 - Labral lesions
 - Instability (dislocations, subluxations, MDI)
 - Little Leaguer's shoulder
 - Traction apophysitis
 - Rotator cuff tendonitis (+/-)
 - GIRD
 - Impingement

Kelly, Pappas. *Adolescent Med* 1998; 9:569-587.

Lawton et al. *J Pediatr Orthop* 2002; 22:52-61.

Lord, Winell. *Curr Opin Pediatrics* 2004; 16:47-50

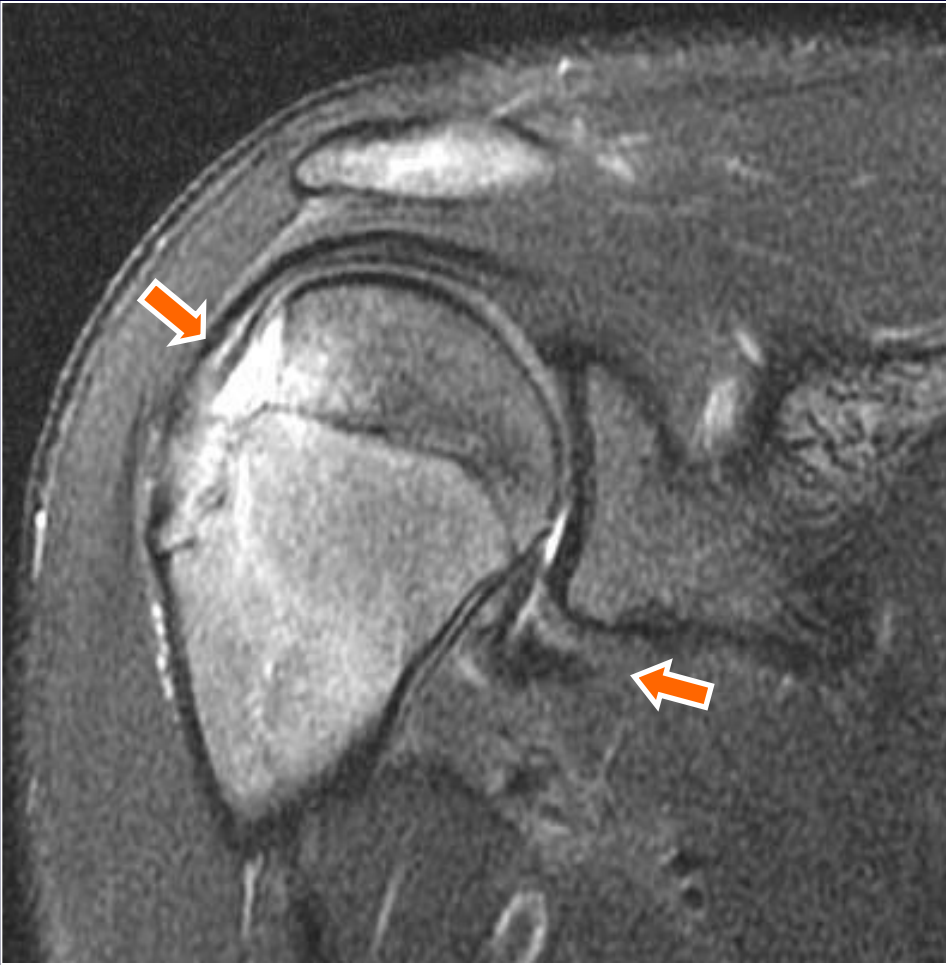
Sciascia, Kibler. *Clin J Sport Med* 2006; 16:471-477.

Background

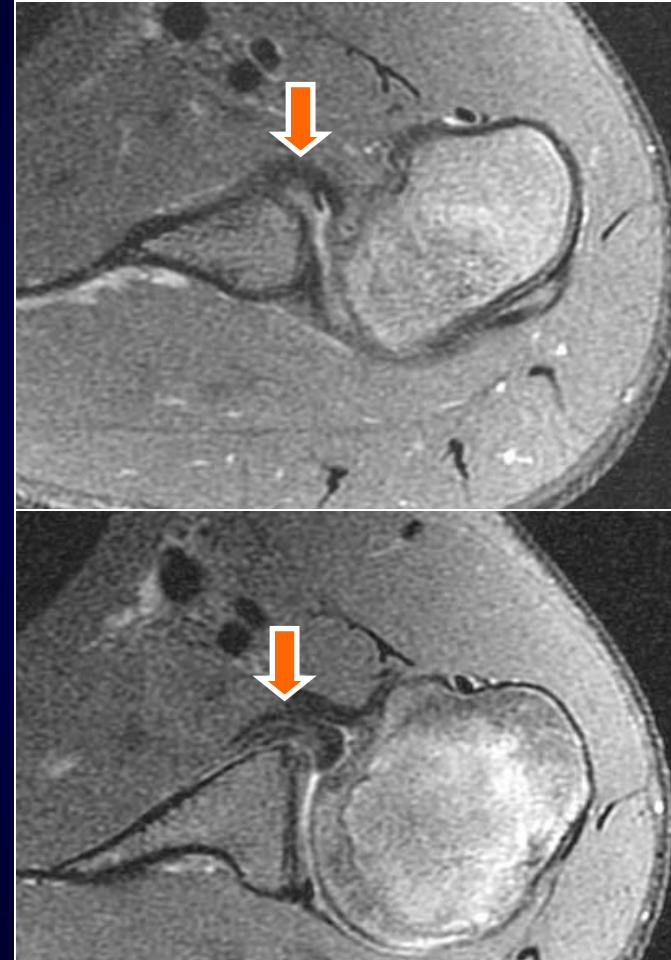
- There is a paucity of published data or descriptions of the use of shoulder MRI in the pediatric athlete



Labral Lesions



15 ♂ dislocated rafting, swimmer



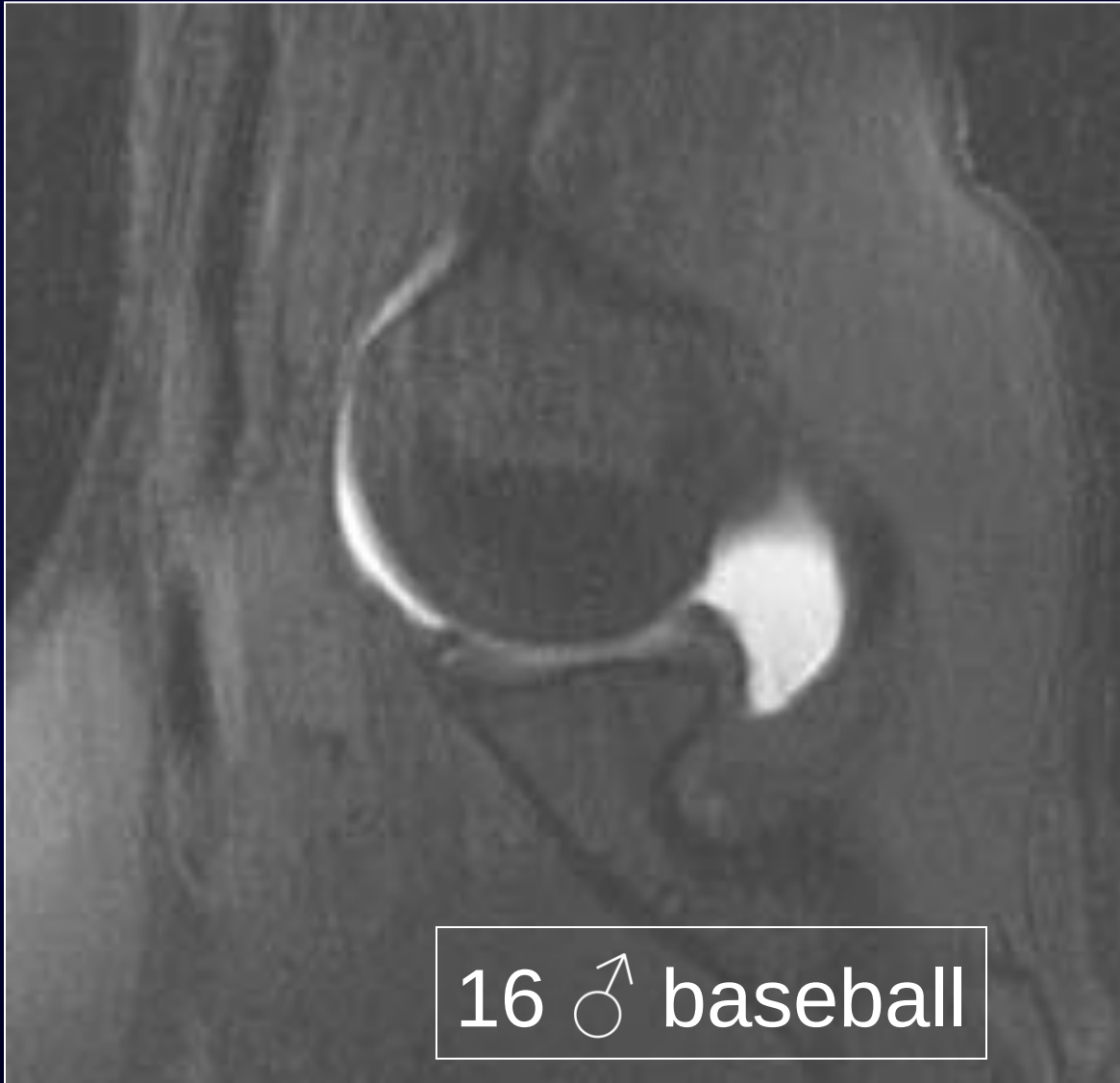
MRI: Bankart labral tear
Scope: Bankart confirmed



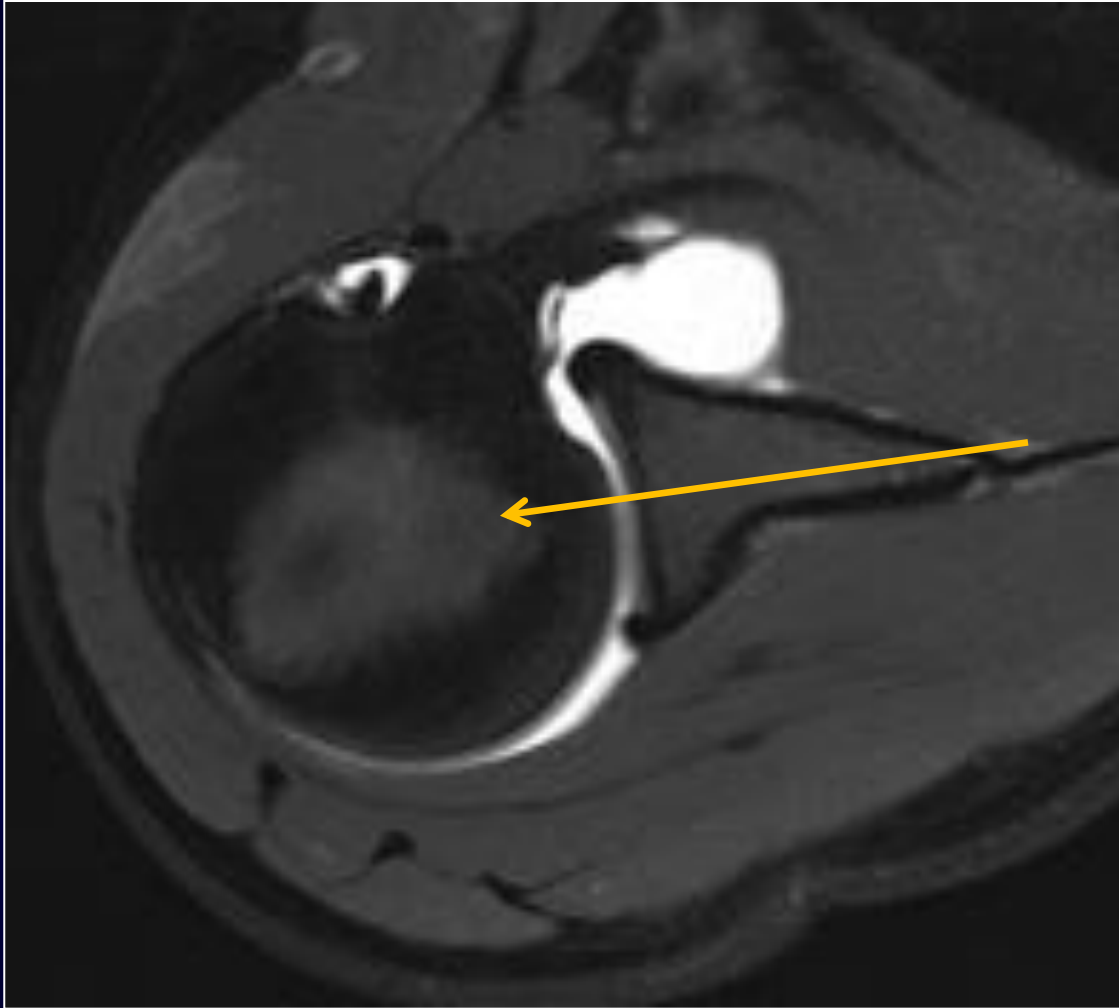
17 ♂ QB, pitcher

Scope: SLAP 3

Labral Lesions



12 ♀ Tennis



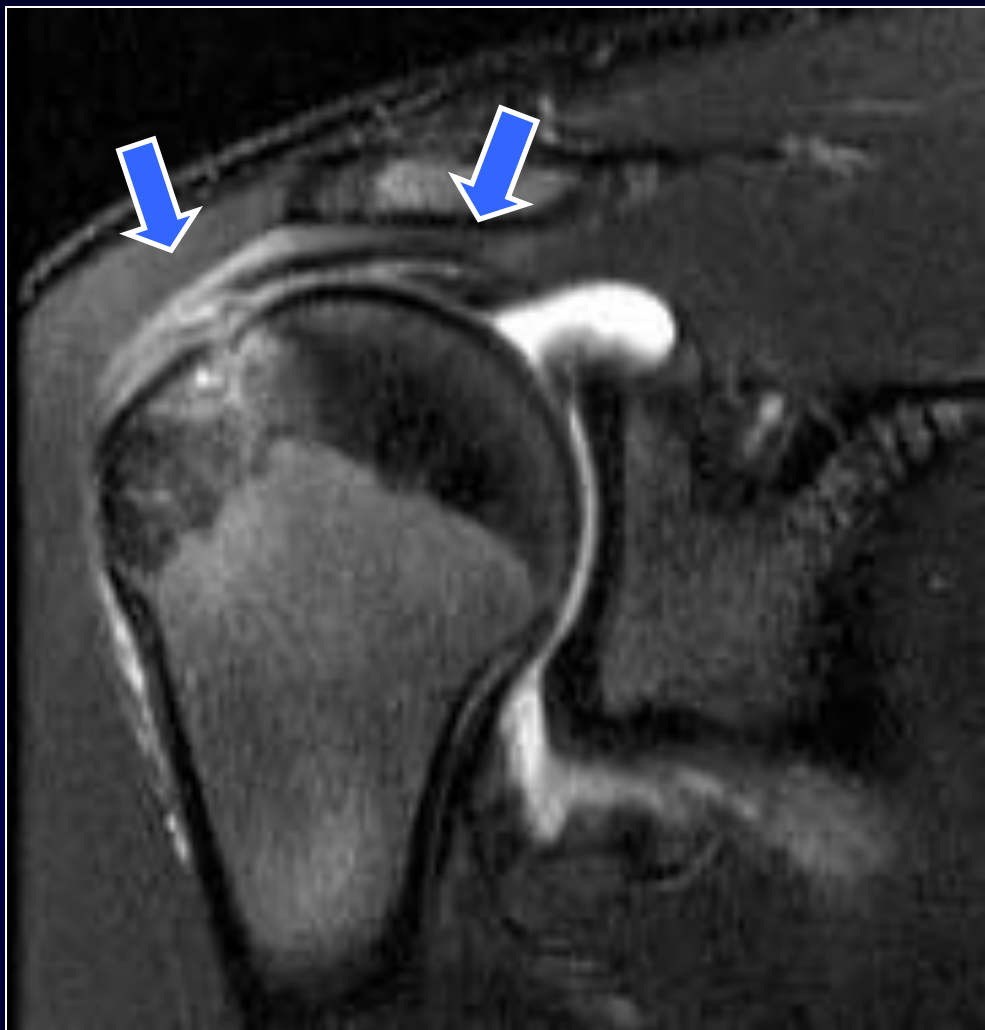
Secondary Signs of laxity:

- “Patulous capsule”
- Decentered humeral head (subluxation)
- Glenoid dysplasia
- Hypertrophic posterior labrum

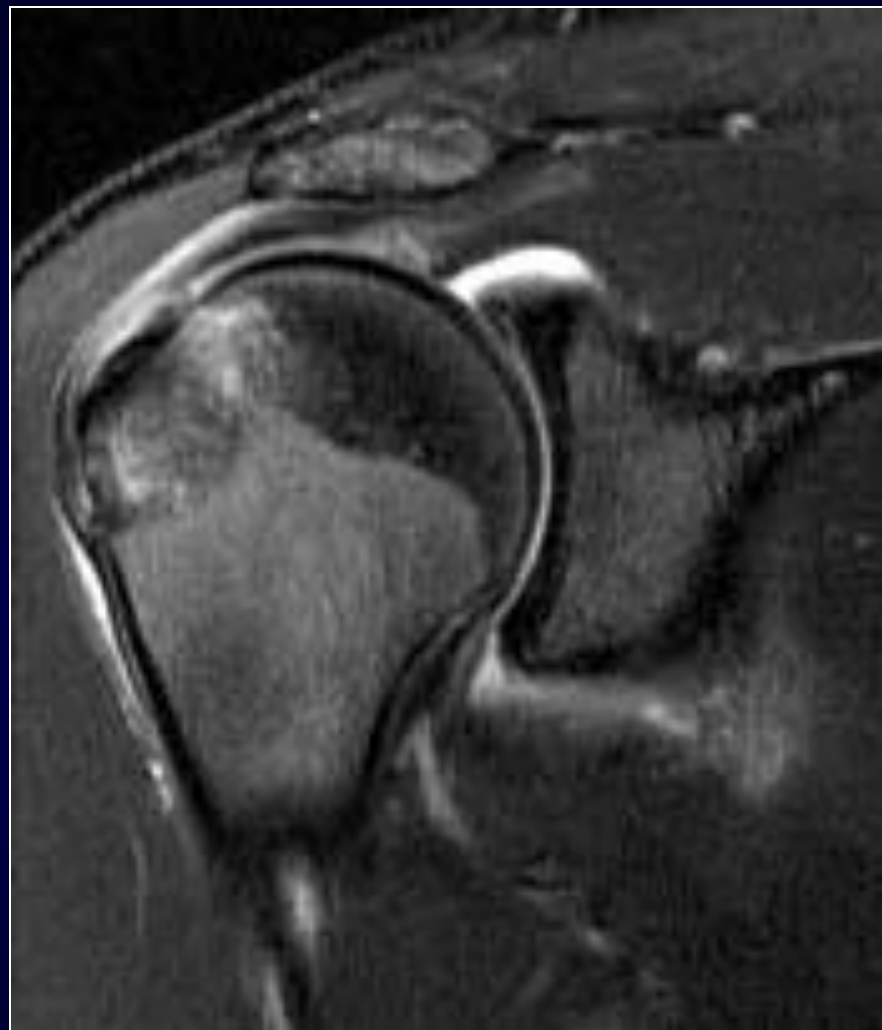
Multi-directional instability (MDI)

Shoulder

What about the rotator cuff?



16 ♂ hockey



MRI: FT RCT
Scope: Confirmed



15 ♀ volleyball

MRar: PT RCT
Scope: Confirmed

Shoulder MRI: Conclusions

- MRI of pediatric shoulder is most commonly requested in overhead athletes.
- Indications are most commonly instability and evaluation for labral tears (→ MR arthrogram).
- Full-thickness rotator cuff tears are uncommon under the age of 18.



THANKS!

Elbow



17 ♂

Football valgus-
hyperextension

Complete UCL tear



15 ♀

Partial UCL tear

Wrist



Occult scaphoid fracture



17 ♂ Football
Hyperextension

Peripheral TFC Tear

Brief Recap

Little Leaguer's Elbow

- Chronic stress injury to medial epicondyle physis in throwers
- Wide/fragmented physis
- Lateral compartment OCD may accompany
- Also may encompass olecranon injuries, tendons & ligaments



Gymnasts

- Gymnast wrist
 - Chronic stress injury to distal radial physis
 - Also:
 - Ulnar impaction syndrome
 - TFCC tears
 - Scaphoid stress fractures
- Males: upper extremity (shoulder)
- Females: lower extremity (ankle)
- Females: pars defects 4-5X normal rate

