Practical Radiology: Pediatric Fractures Head to Toe

Summer L. Kaplan, MD MS

Associate Professor of Clinical Radiology

Associate Chair for Quality, Department of Radiology

Children's Hospital of Philadelphia

Perelman School of Medicine, University of Pennsylvania

Children's Hospital of Philadelphia

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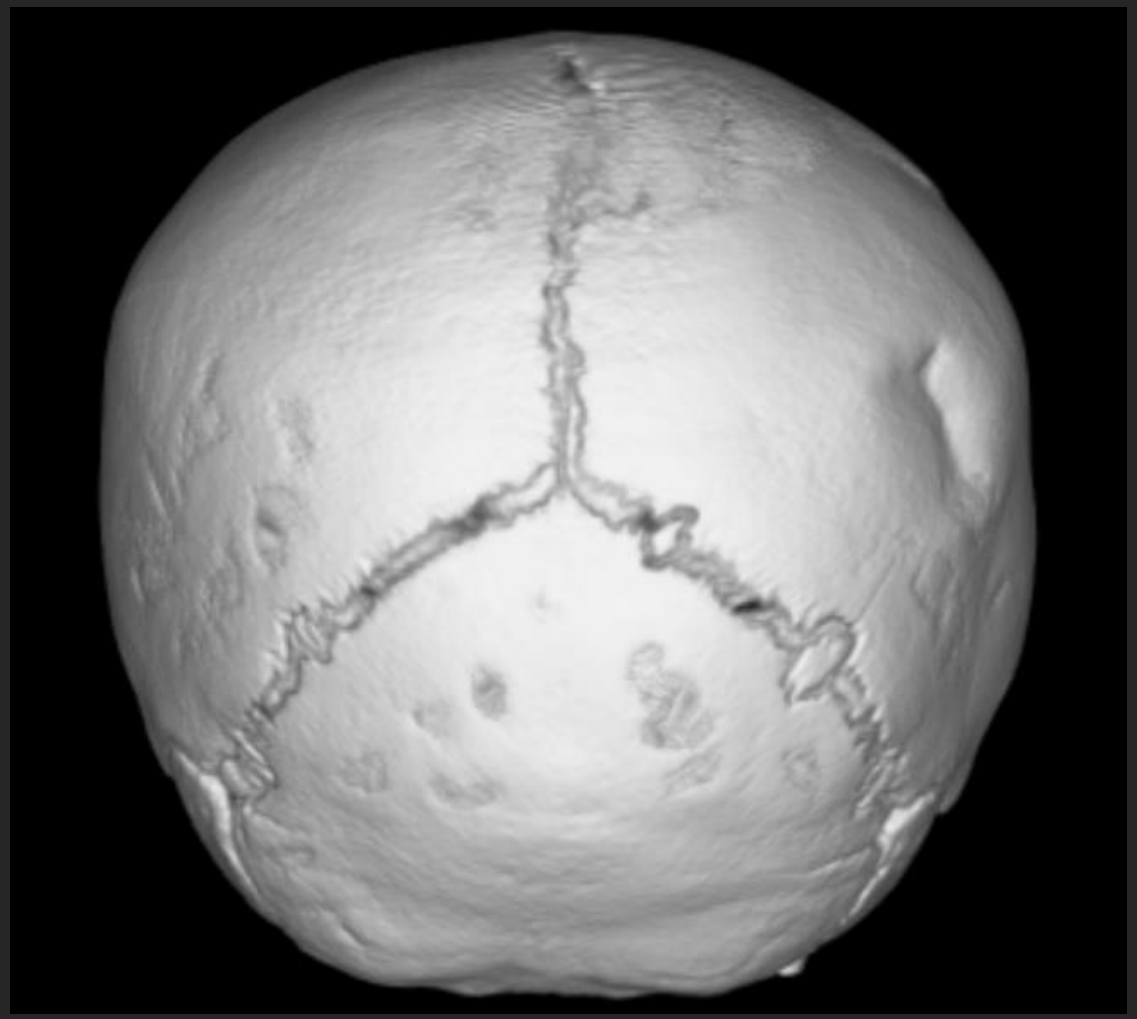
Objectives

After this presentation, the participant will be able to:

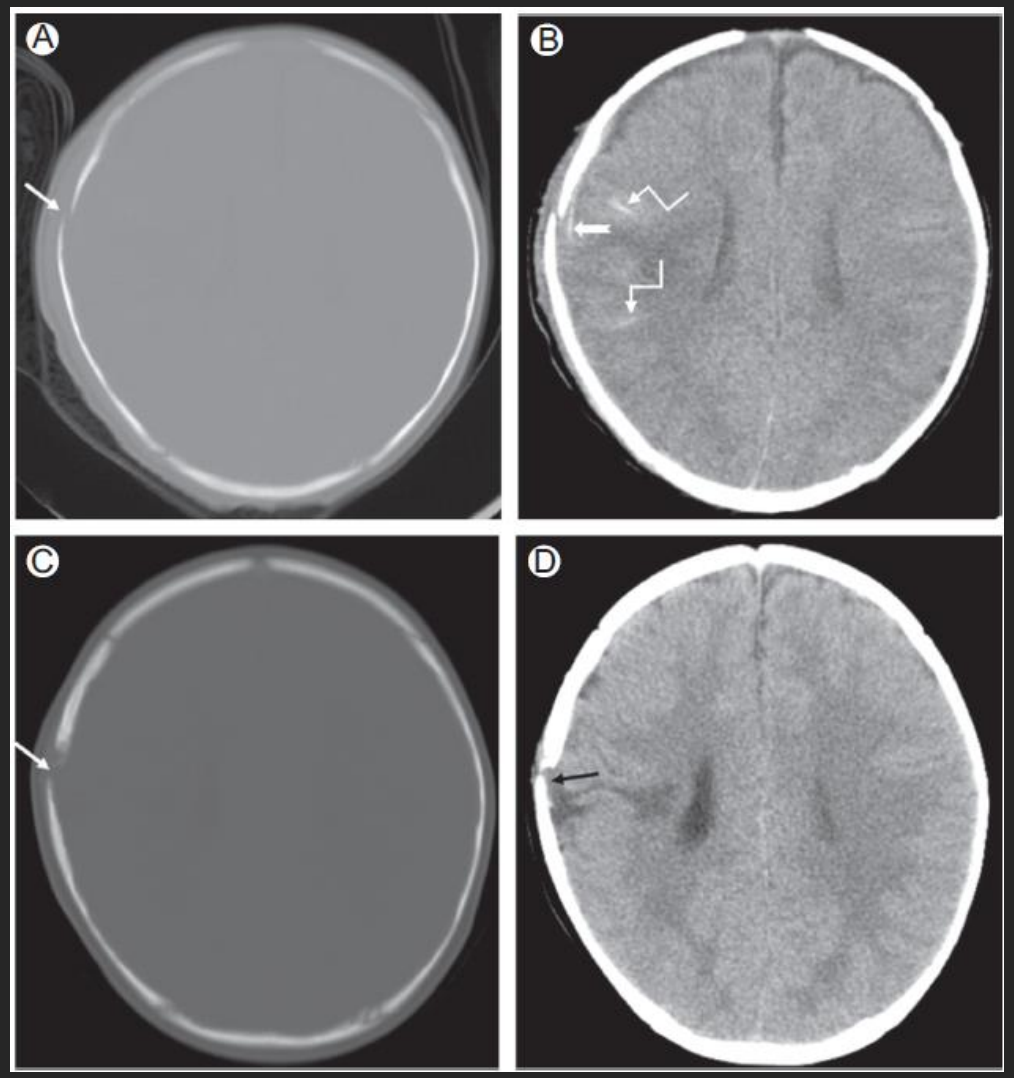
1. Recognize fractures occurring around a patent physis
2. Describe injuries related to plasticity of pediatric bone
3. List features in fractures of abuse

Ping-Pong Fracture



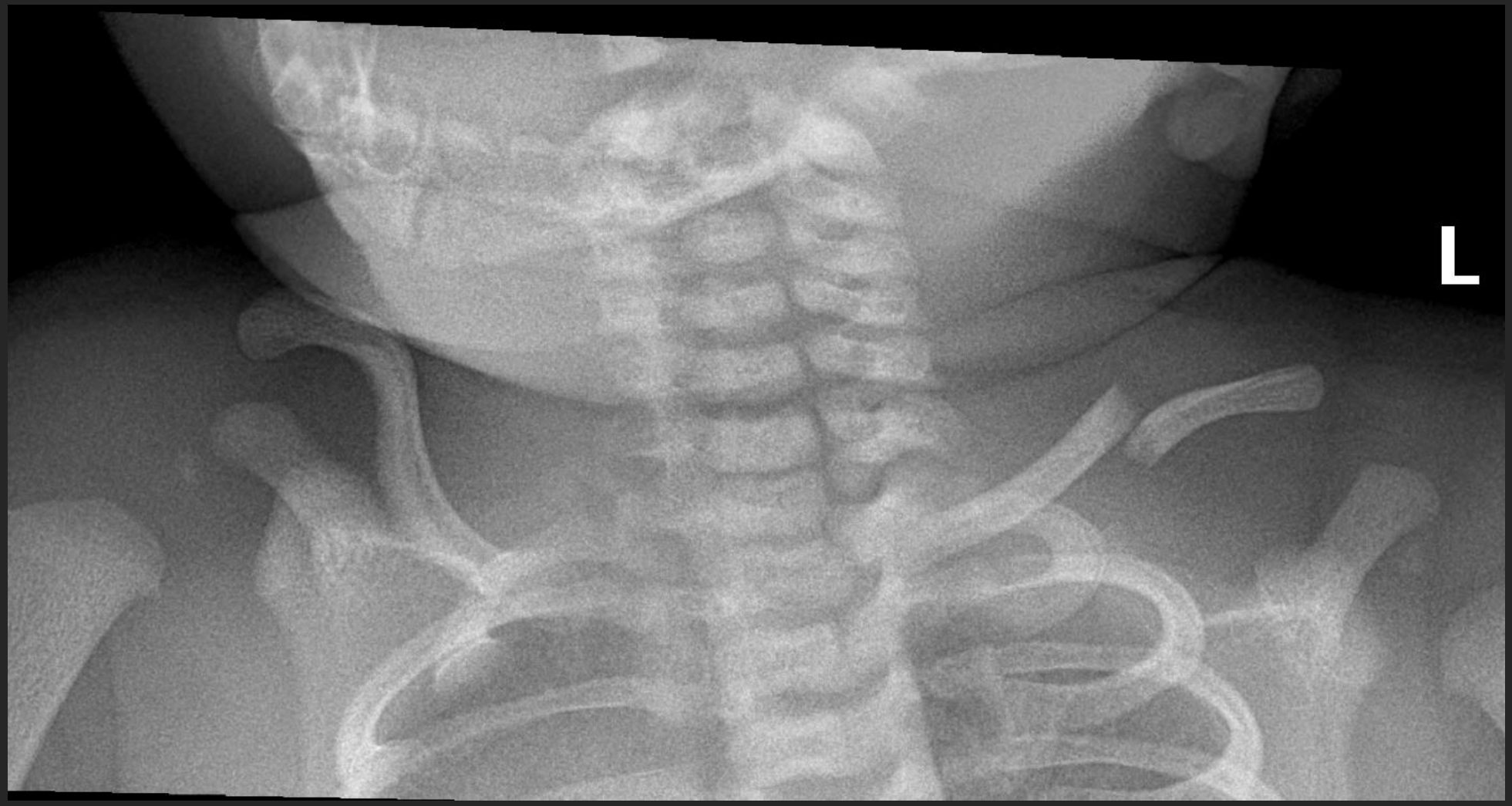
- Pediatric bone is more pliable, will bend rather than break
  - May be palpable
  - CT is indicated
- Etiologies
  - May be birth-related injury
  - May be present in child abuse but is not specific

Leptomeningeal Cyst



O'Brien WT et al. Semin US CT MR

- Ages ≤ 3-years old
- "Growing fracture" results from CSF pulsation at fracture
  - Most common at diastasis of sutures
  - May contain CSF or brain tissue
- Several months to evolve



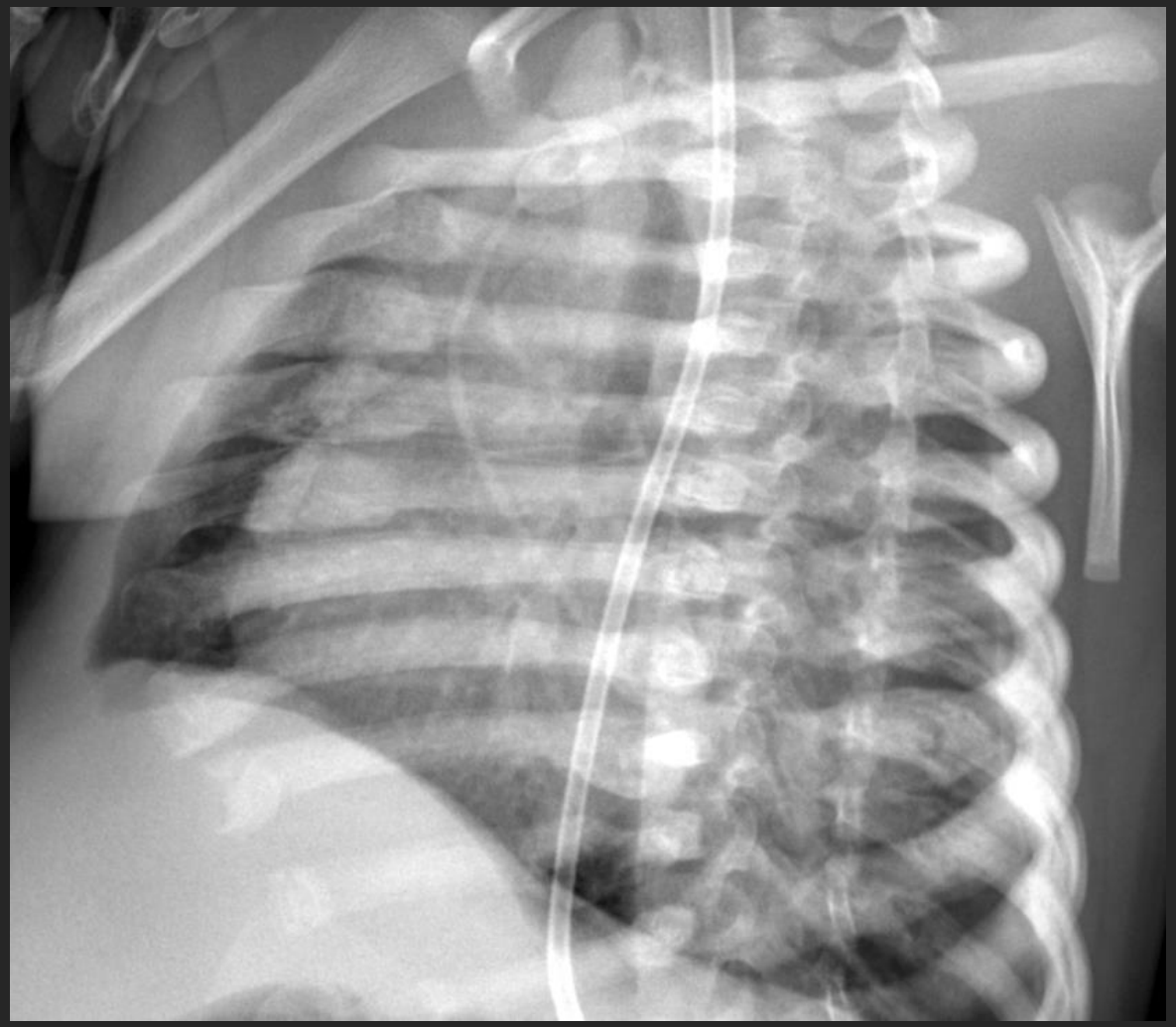
0-do, L shoulder palpable abnormality

Clavicular pseudoarthrosis

0-do, L shoulder palpable abnormality

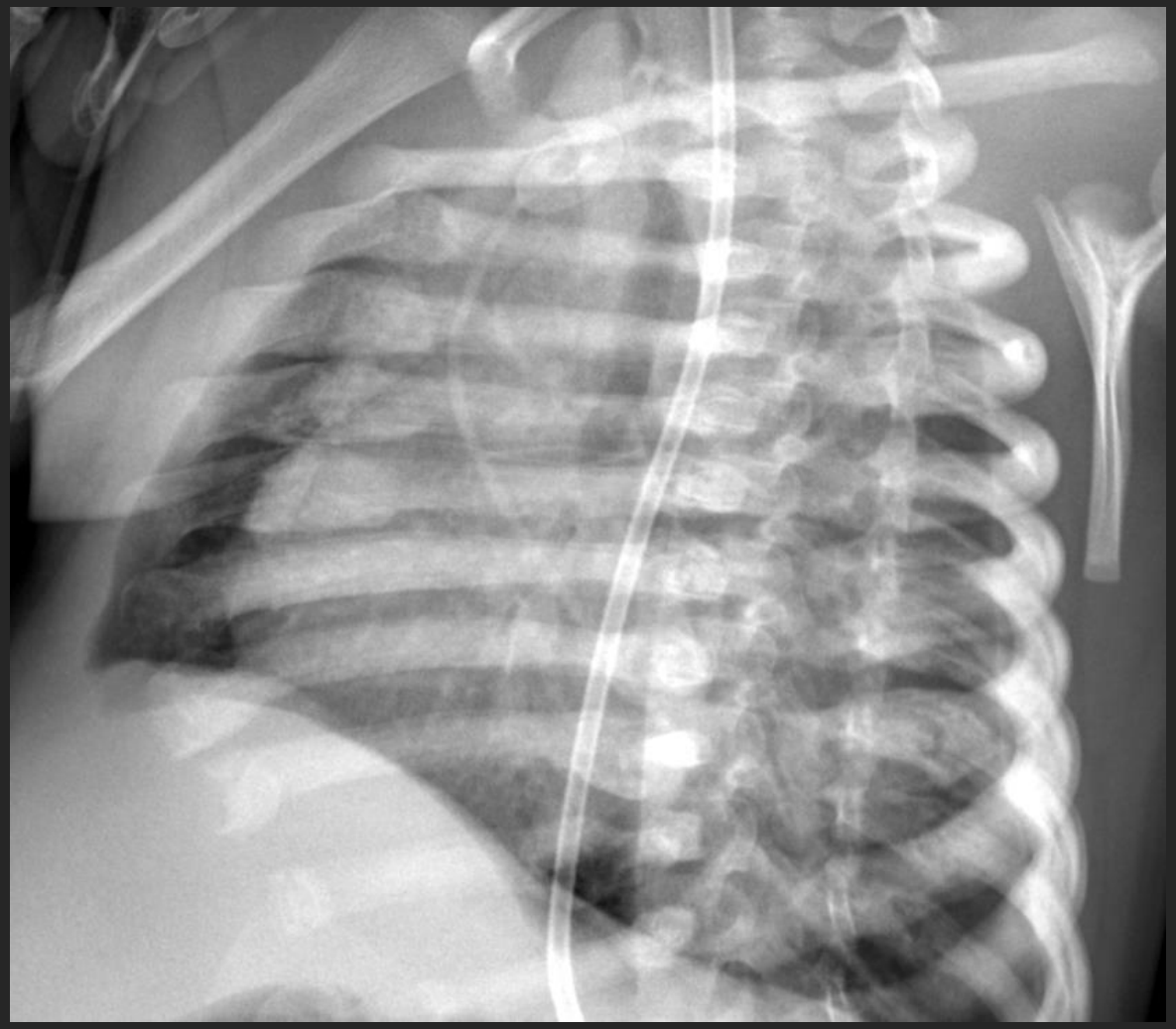
Fracture vs. pseudoarthrosis

- Fracture:
  - Birth-related trauma
  - Decreased arm movement
  - Typically margins oblique
- Pseudoarthrosis
  - Non-fusion medial and lateral ossification centers
  - Blunted vertical margins



3-month old, altered mental status

Non-Accidental Trauma



3-month old, altered mental status

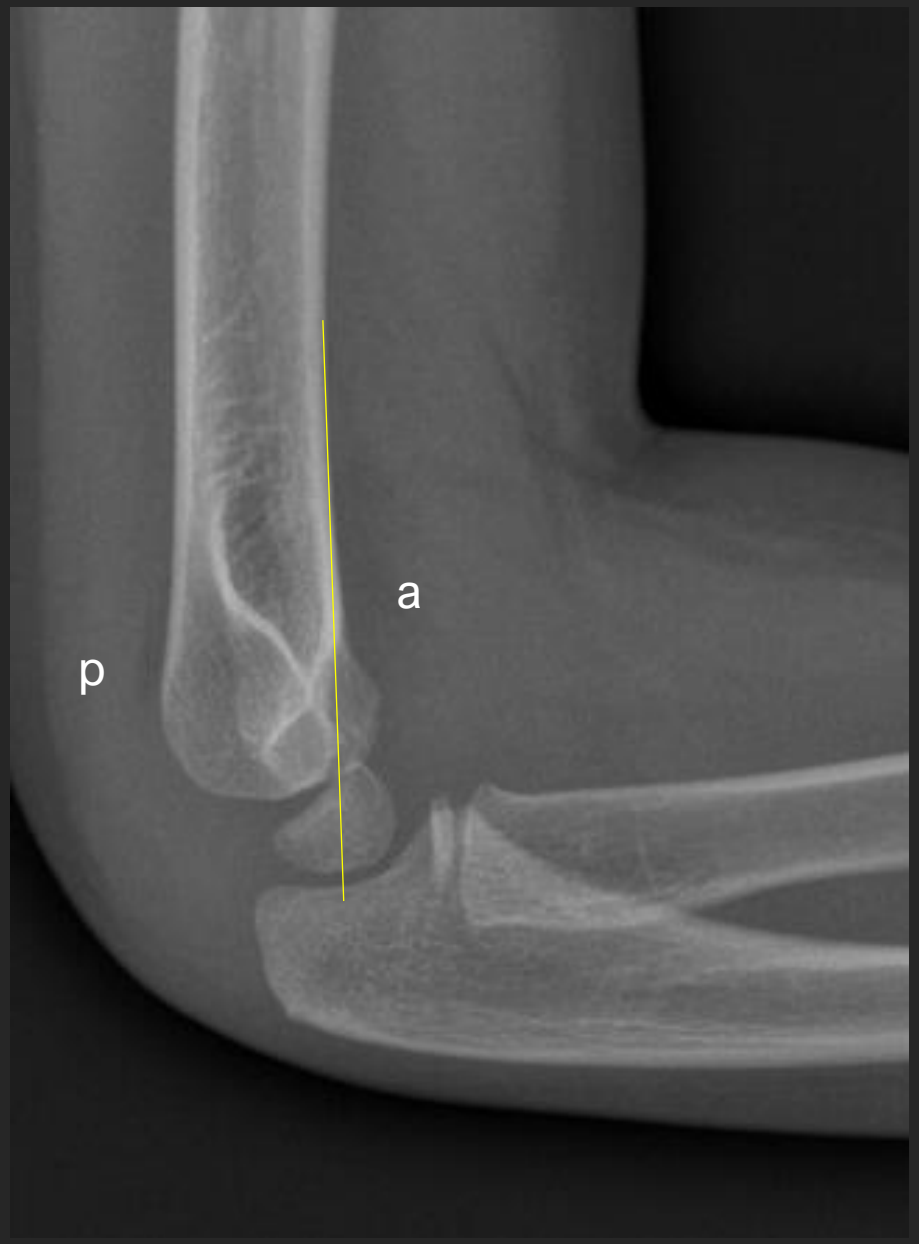
- Child ≤ 2-years old
  - Social stresses, chronic illness
  - Squeezing of chest
- Fractures of varied ages
  - Aligned posterior rib fractures 95% predictive
  - Anterior “bucket handle”
  - Not precise aging
- Occult fractures show healing changes at 2-week follow-up

4-month old, decreased left arm movement

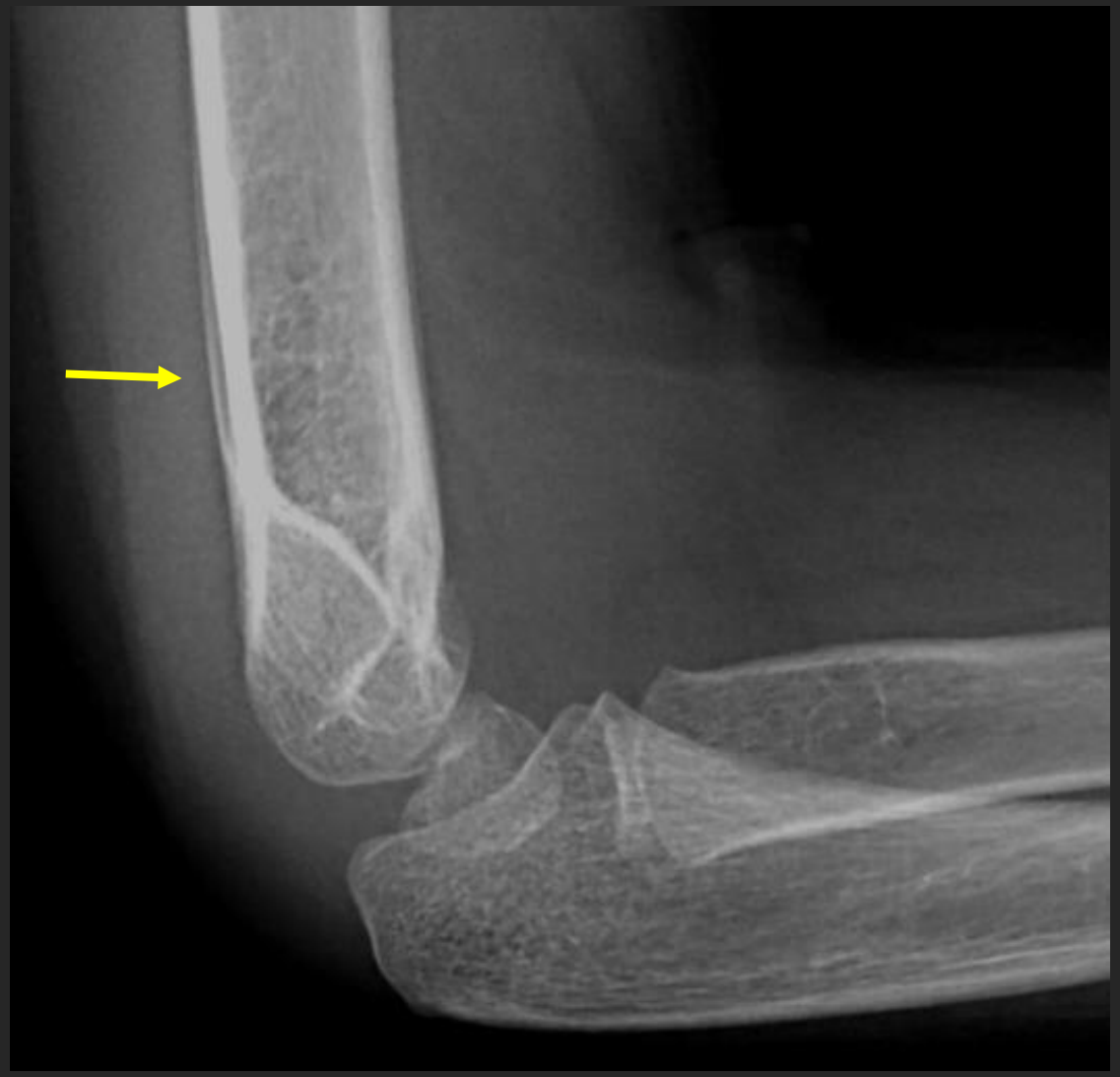
Oblique Humerus Fracture

4-month old, decreased left arm movement

- "Spiral fracture"
- May exist with child abuse but not specific
  - < 18-months old
  - Delayed presentation
- Spiral fractures of humerus may occur as infants 4 – 7 months beginning to roll over



4-year old w/ fall on playground

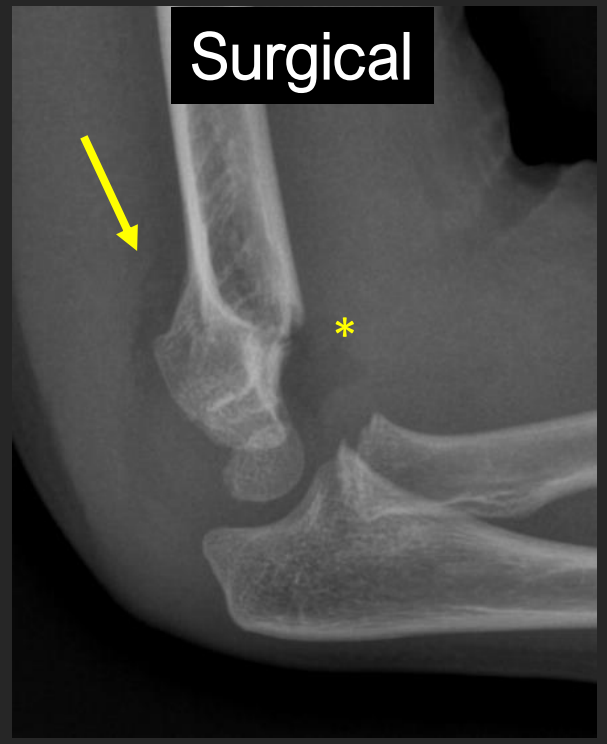


4 weeks later

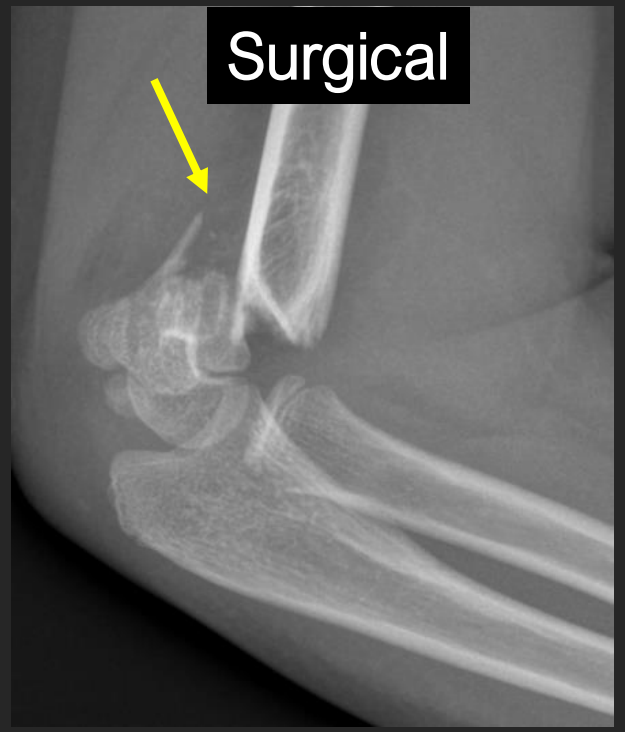
Supracondylar Fracture

Occult

Type 1



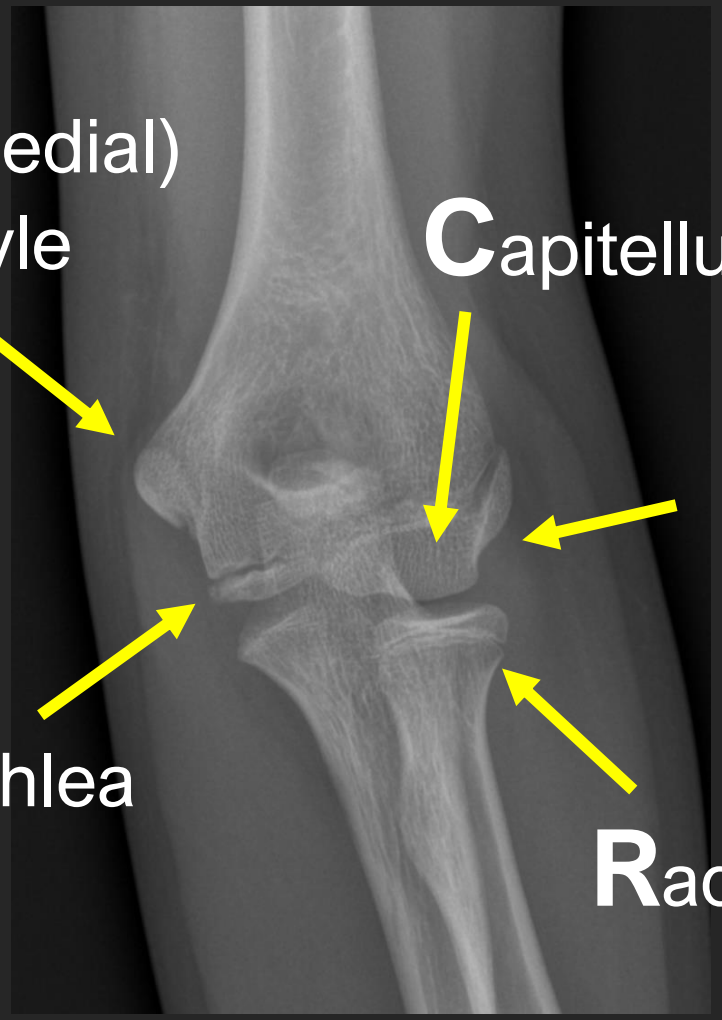
Type 2

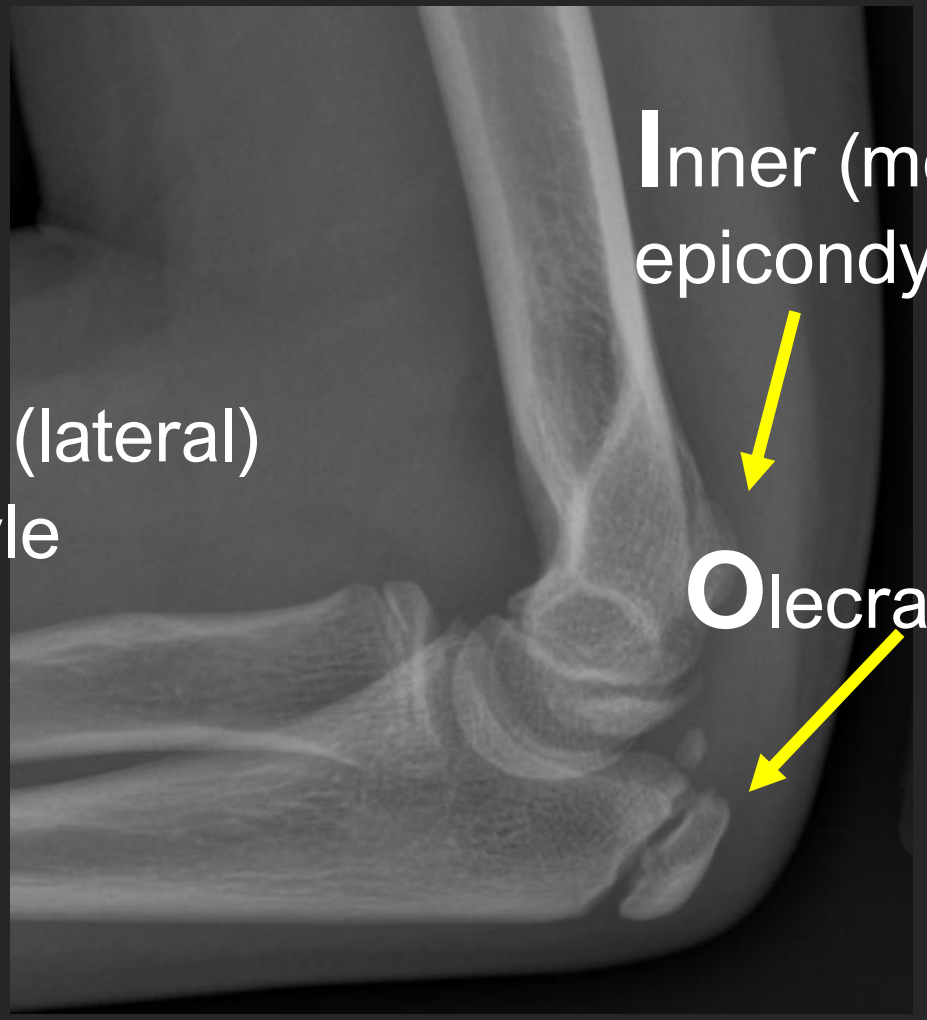


Type 3

Gartland Fracture Classification

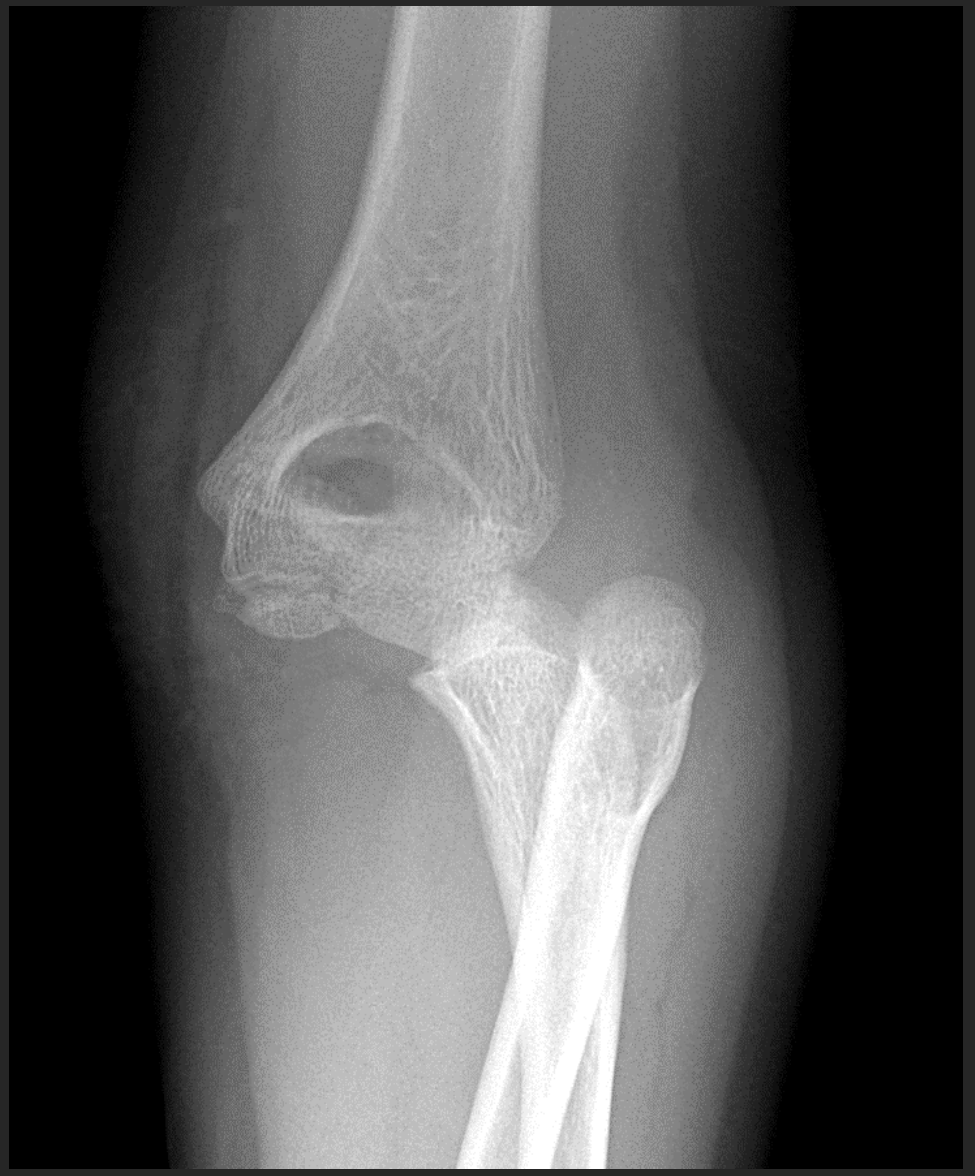
Pediatric Elbow: CRITOE





Medial Apophysis Non-Fusion

10-yo, fell during gymnastics



10-yo, s/p backflip

Posterior Elbow Dislocation

10-yo, s/p backflip

- Associated findings
  - Radial head/neck fracture
  - Olecranon fracture
  - Medial epicondyle apophysis
- May injure brachial artery, median and ulnar nerve
- Intra-articular olecranon fracture needs surgery

Monteggia Fracture

6-year old w/ fall

- Proximal 1/3 ulnar fracture + radial head dislocation
  - Radial head dislocation may be missed
- Galeazzi (distal radial fracture and DRUJ malalignment) is rare.

Plastic Deformity Injury

Bowing

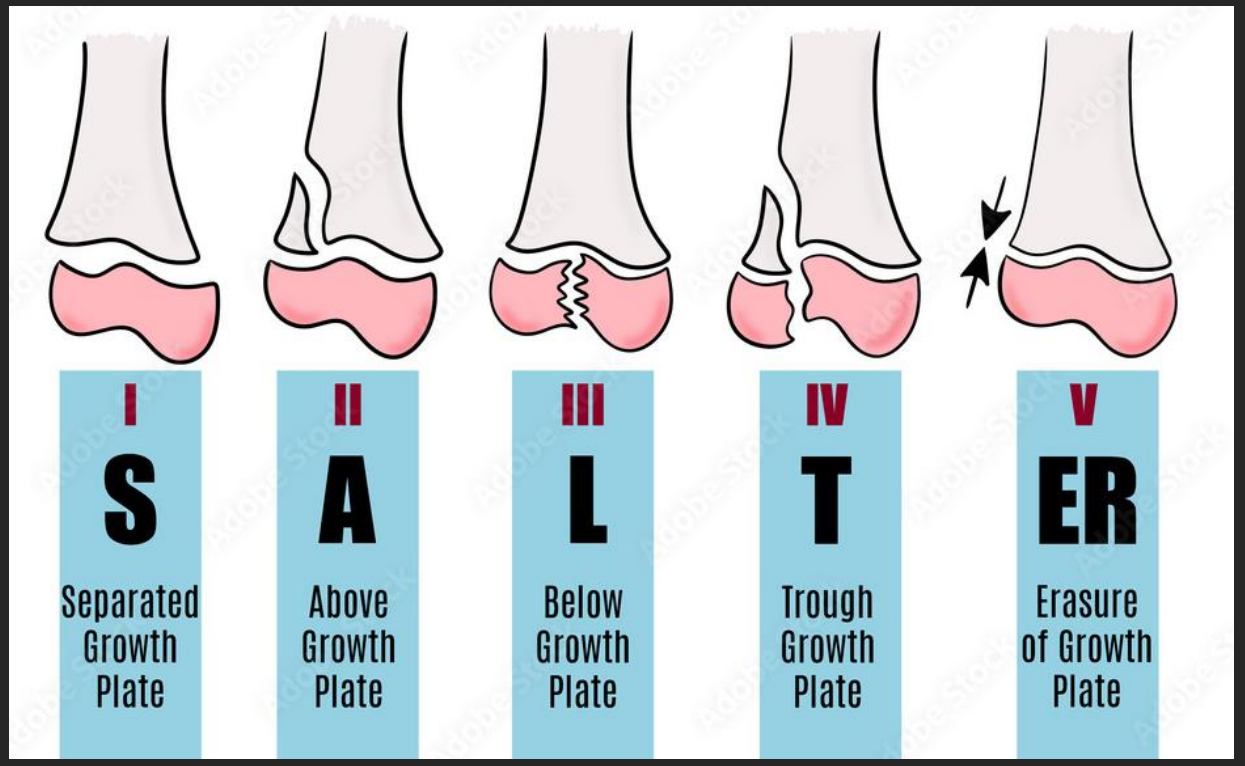
Buckle

16-year old w/ fall on outstretched hand

Fall on Outstretched Hand

16-year old w/ fall on outstretched hand

- Salter-Harris Injury
  - Fracture involving an open physis



Metaphyseal Corner Fracture

3-month old w/ injury

- "Bucket handle"
  - Salter-Harris II
- Specific for child abuse in non-ambulatory children
- Result of shaking
  - Shearing mechanism
  - Associated intracranial and retinal hemorrhages

20-month old w/ concern for NAT

Normal contralateral

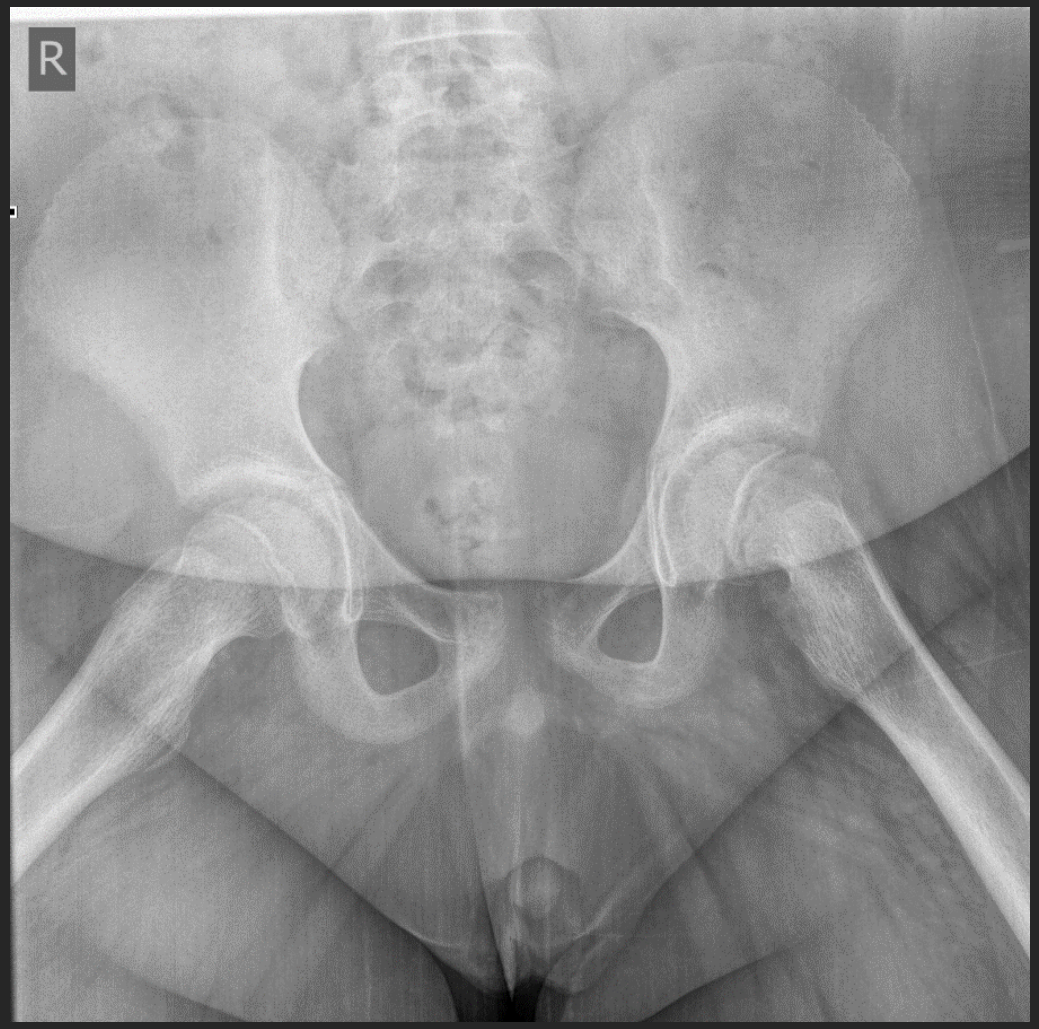
Buckle Fractures Phalanges

20-month old w/ concern for NAT

- Not fracture of abuse
- Easily overlooked
- Mechanism
  - Hyperextension
  - Impaction

11-year old w left hip pain

Slipped Capital Femoral Epiphysis



11-year old w left hip pain

- Obesity major risk factor
- Best seen in frog lateral view
- Often bilateral
- Requires surgical repair

12-yo, playing basketball and heard a pop

Tibial Tubercle Avulsion

12-yo, playing basketball and heard a pop

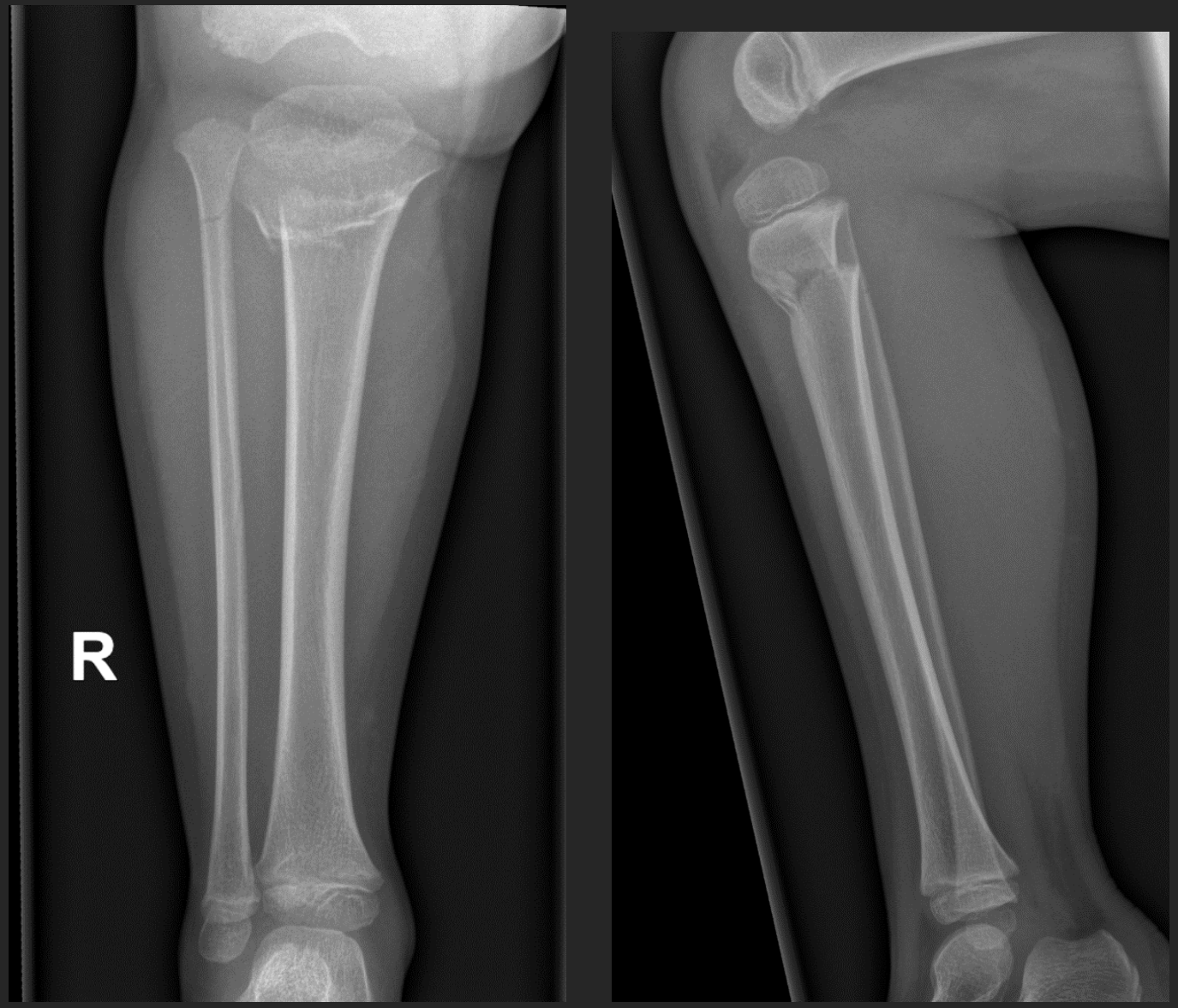
- "Osgood-Schlatter"
- Chronic repetitive trauma
  - Present as acute on chronic
- Occurs during tubercle ossification
  - 10 – 12 girls
  - 12 – 14 boys
- Patellar tendon thickening, infrapatellar fat pad edema, bony avulsion

Tibial Tubercle Development

6 month old

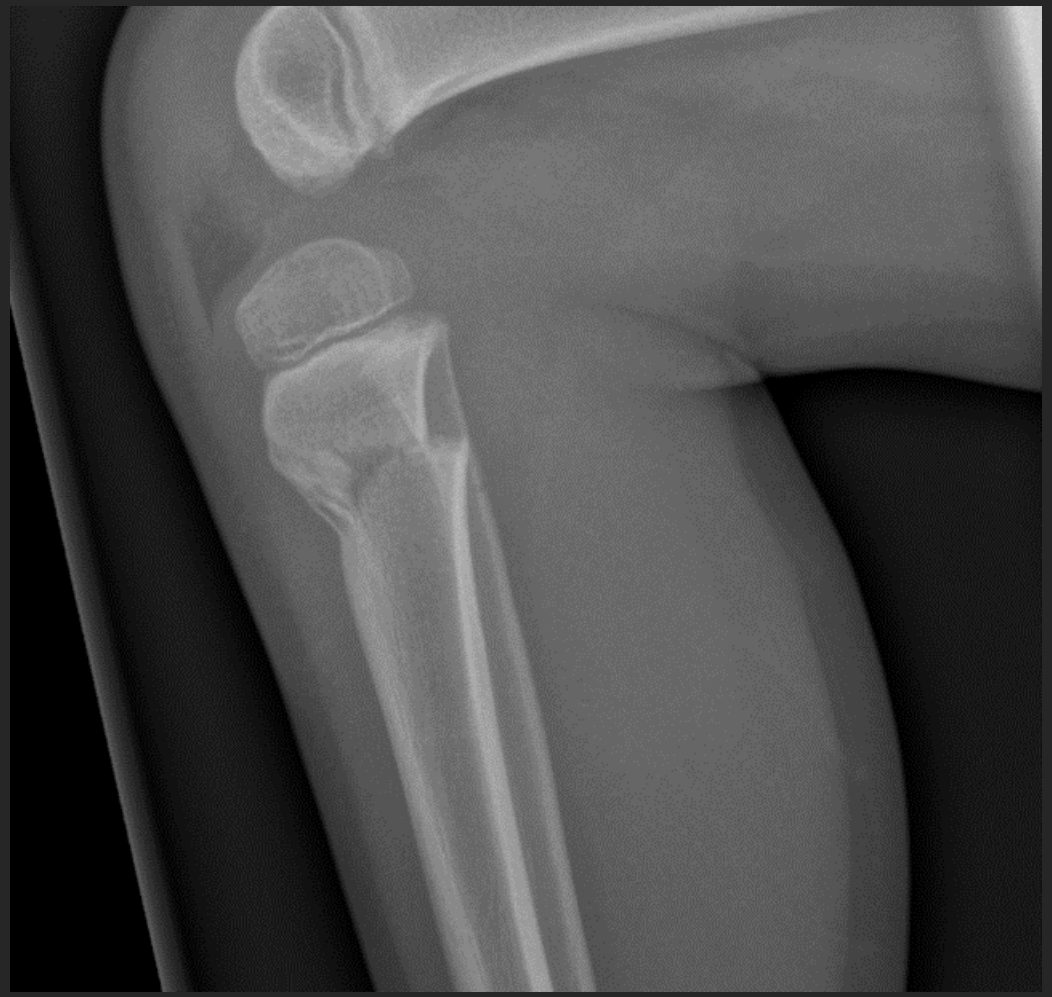
5 year old

13 year old



4-year old being bounced on trampoline by other children

Tibial Trampoline Fracture



4-year old being bounced on trampoline by other children

- Axial loading injury
  - Hyperextension
- Child jumping with larger people
  - “Double bouncing”
  - Mat recoil may have force of falling 9 ft
- May be bilateral
  - May include fibula
  - Buckle or complete impaction
- Alternatively, may be form of toddler’s fracture

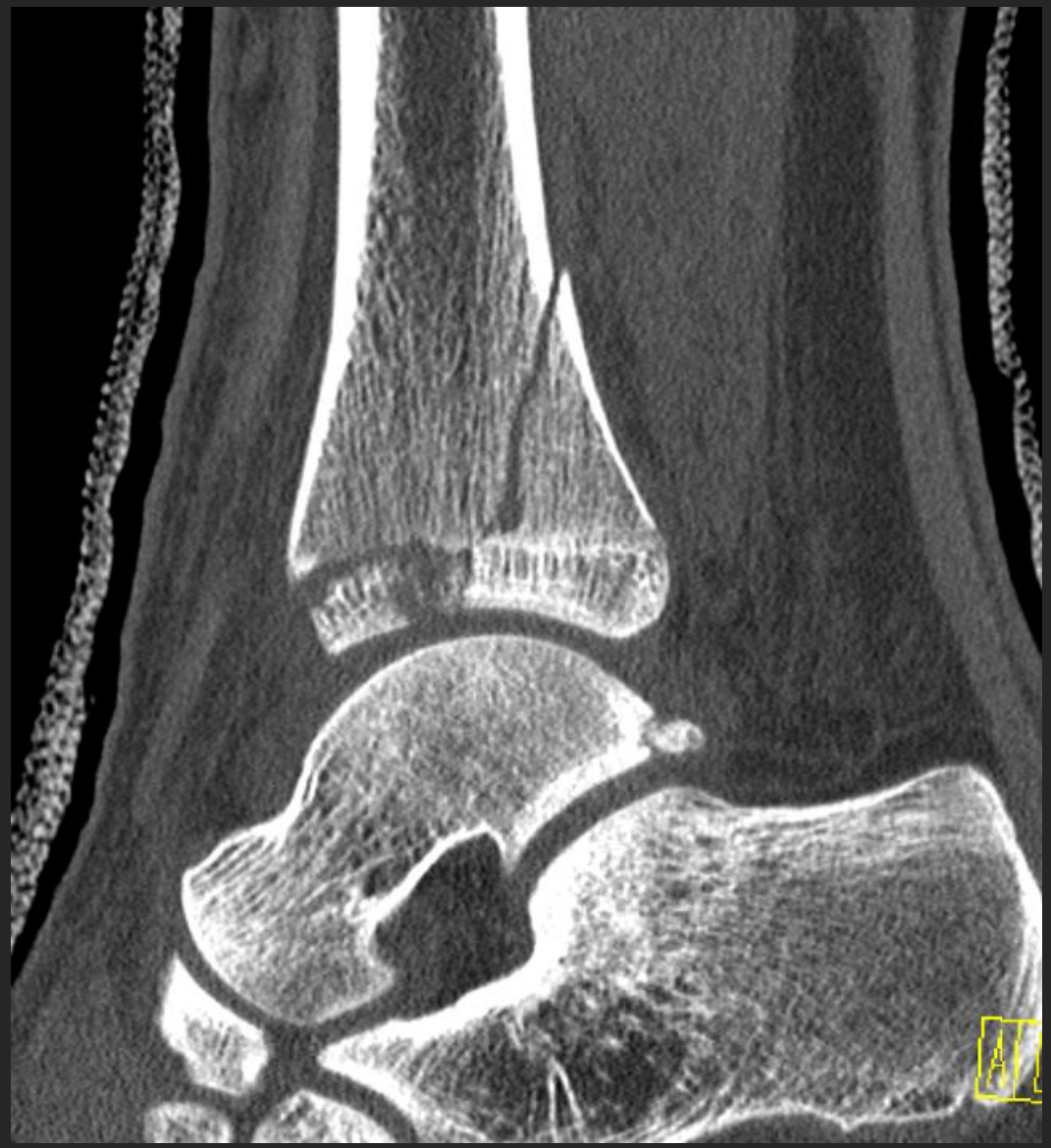
Toddler Fracture

20-month old w/ multiple fractures c/f NAT

- Linear lucency without cortical disruption
- Axial loading with
  - Hyperextension
  - Rotation
- Variants occur in
  - Cuboid bone
  - Proximal tibia
- Alternatively, may result from foot caught in slide

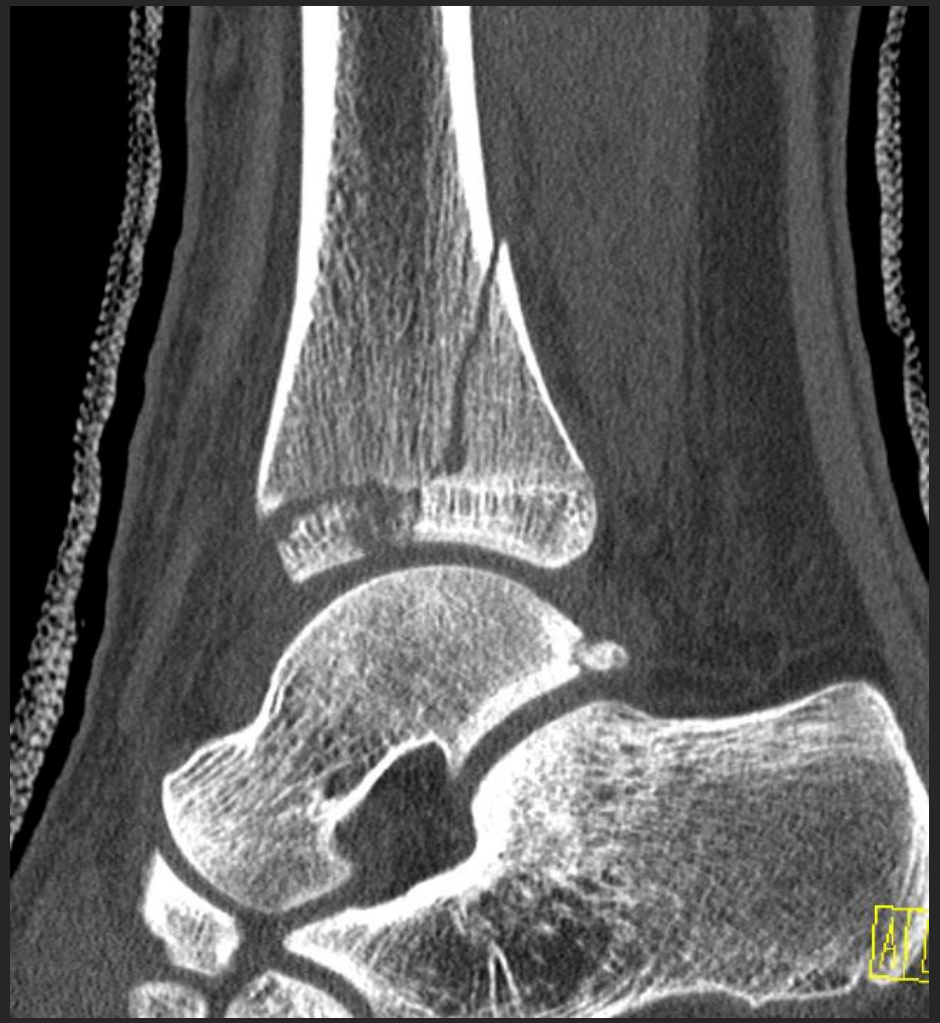
14-year old fell from skateboard

14-year old fell from skateboard



14-year old fell from skateboard

Triplane Frature



14-year old fell from skateboard

- Adolescent
  - 10 – 17-years old
  - Supination + external rotation, “twisted ankle”
- Distal tibial physis fuses medial to lateral
  - Salter-Harris type IV
- Epiphyseal separation < 2 mm can be treated with casting

Tillaux fracture

11-yo, rolled ankle

14-year old w/ trauma

Base of 5th Metatarsal Fracture

14-year old w/ trauma

- "Jones Fracture"
- High non-union rate
  - Vascular watershed area at base of 5th
  - Displaced fractures need surgery
- Differentiate from apophysis

11-yo, tripped over brother

Seymour fracture

11-yo, tripped over brother

- Physeal fracture with associated nailbed injury
- Treat as open fracture
  - High risk for osteomyelitis

Key Points

- Pediatric bone may bend or buckle rather than break
- Think clavicle fracture vs developmental pseudoarticulation
- Posterior rib fractures, metaphyseal corner fractures, fractures of varying ages are all signs of child abuse
- Posterior elbow dislocation associated with radial head/neck and olecranon fractures, medial apophysis displacement
- Distal tibial physis fuses medial to lateral
- Seymour fracture of the distal phalangeal physis associated with osteomyelitis.

Pediatric Fractures

Dr. Summer L. Kaplan, slkaplanmd@gmail.com