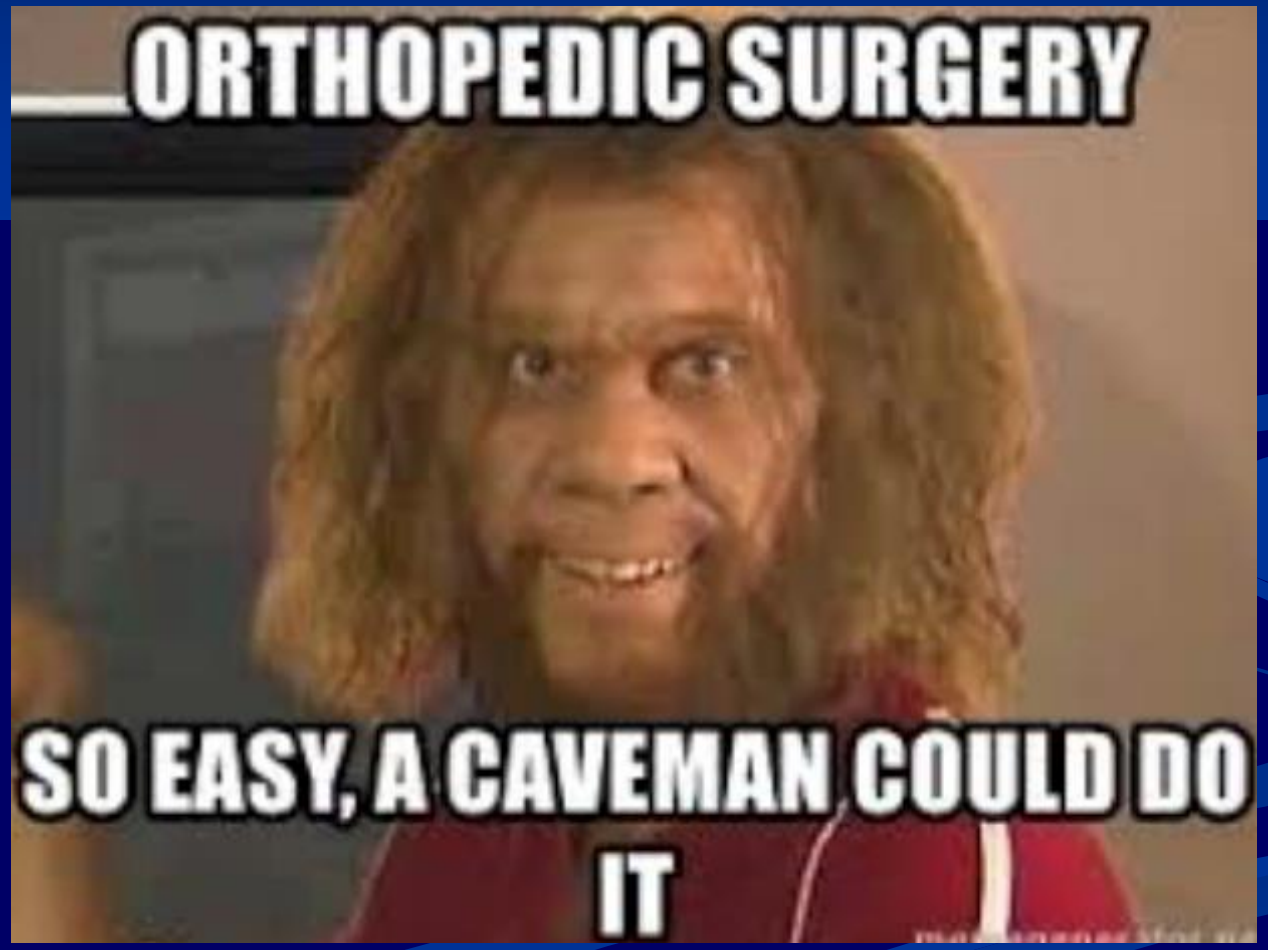
Sedona – Fractures every pediatrician should be familiar with

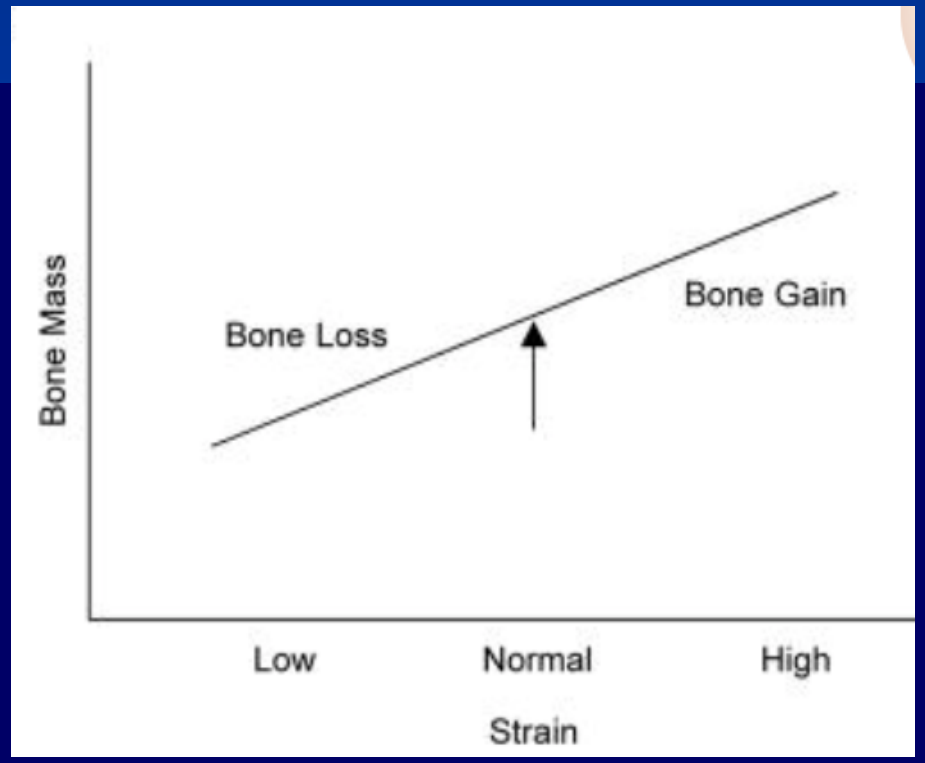
When to treat and when to send out to ER/Ortho?

Video Ortho verses anesthesia

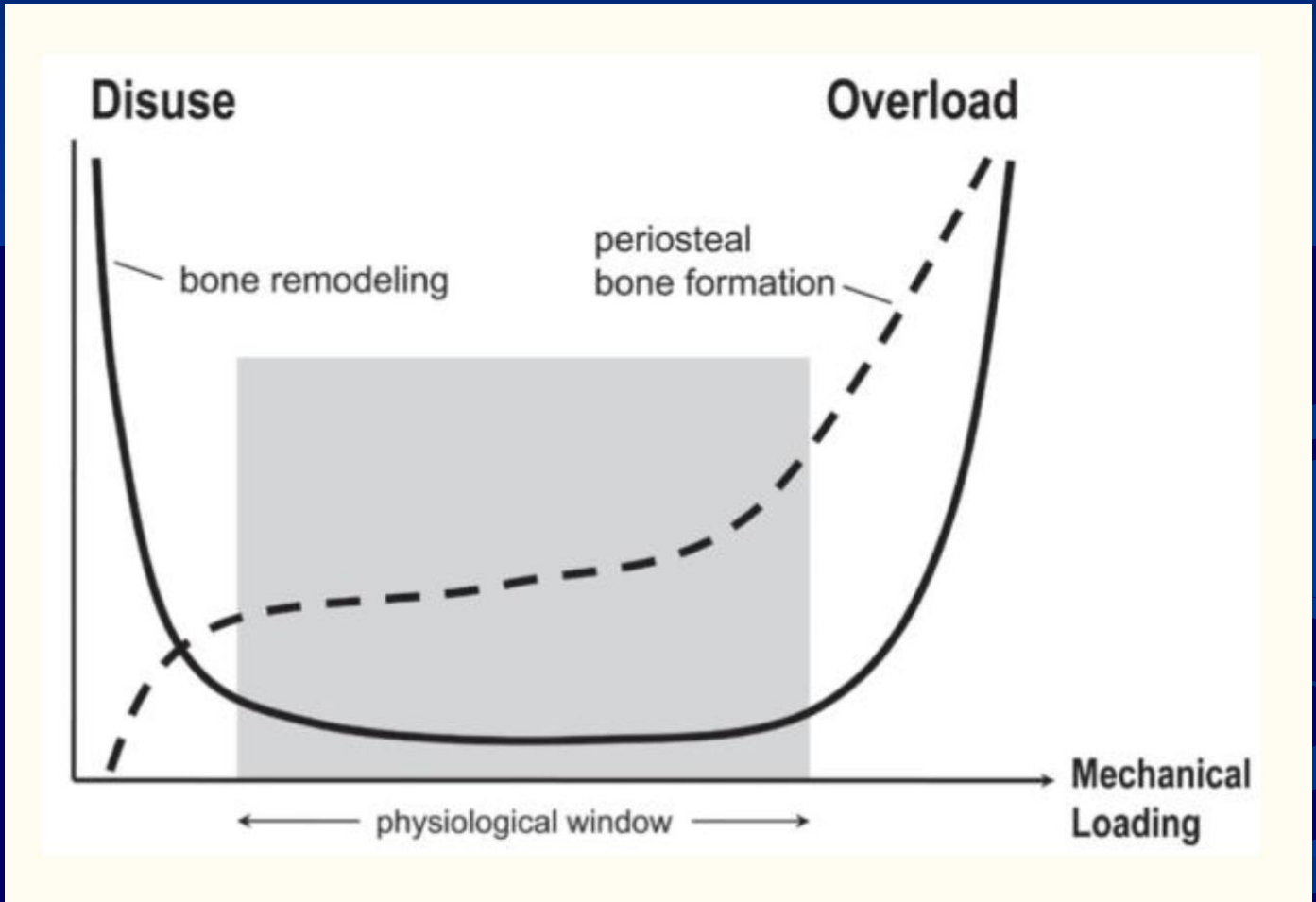
When to treat and when to send out to ER/Ortho?



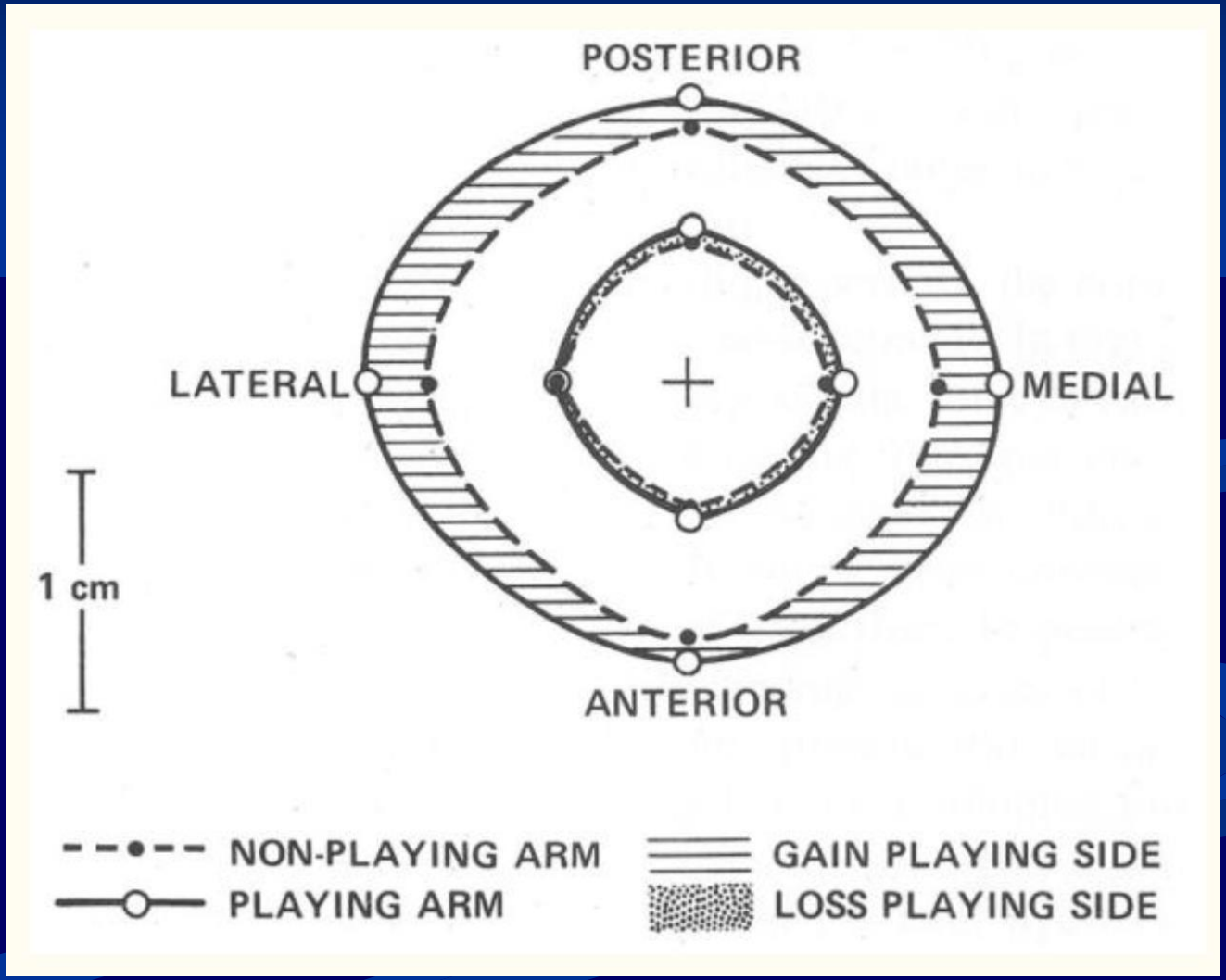
Quick and Interesting Bone facts



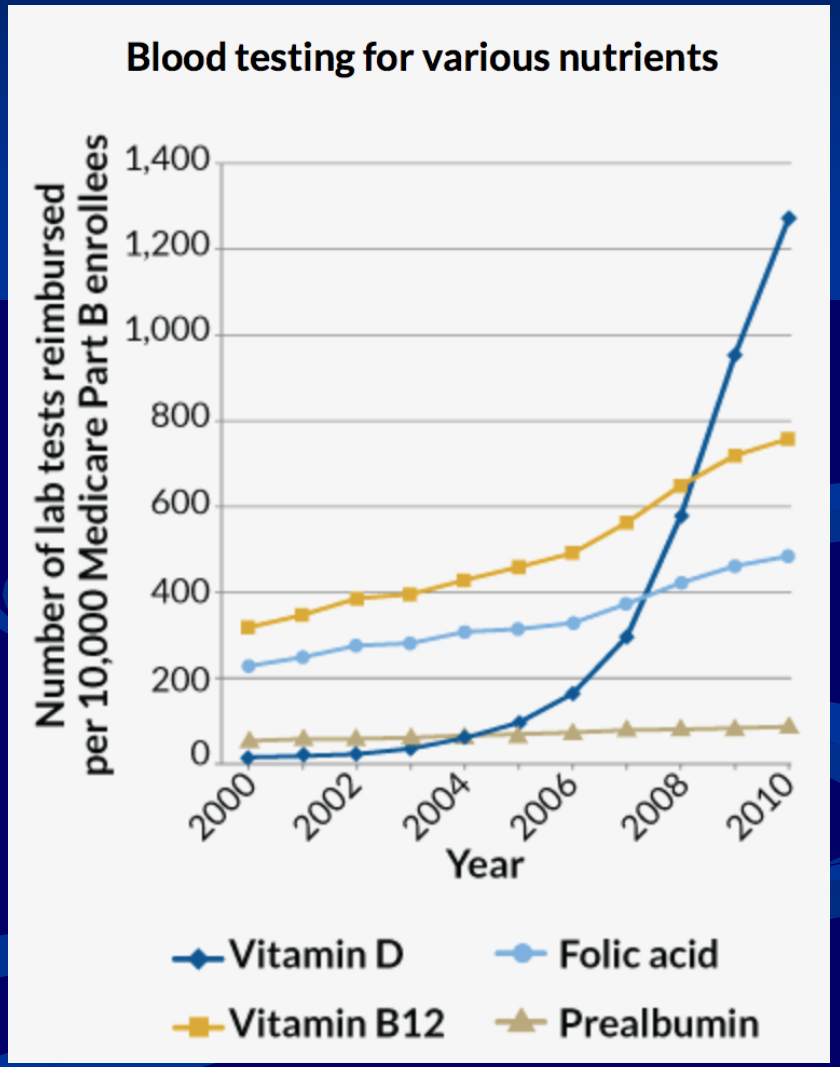
Quick and Interesting Bone facts



Dynamic State of Bone



Vitamin D- “To D or not to D?”

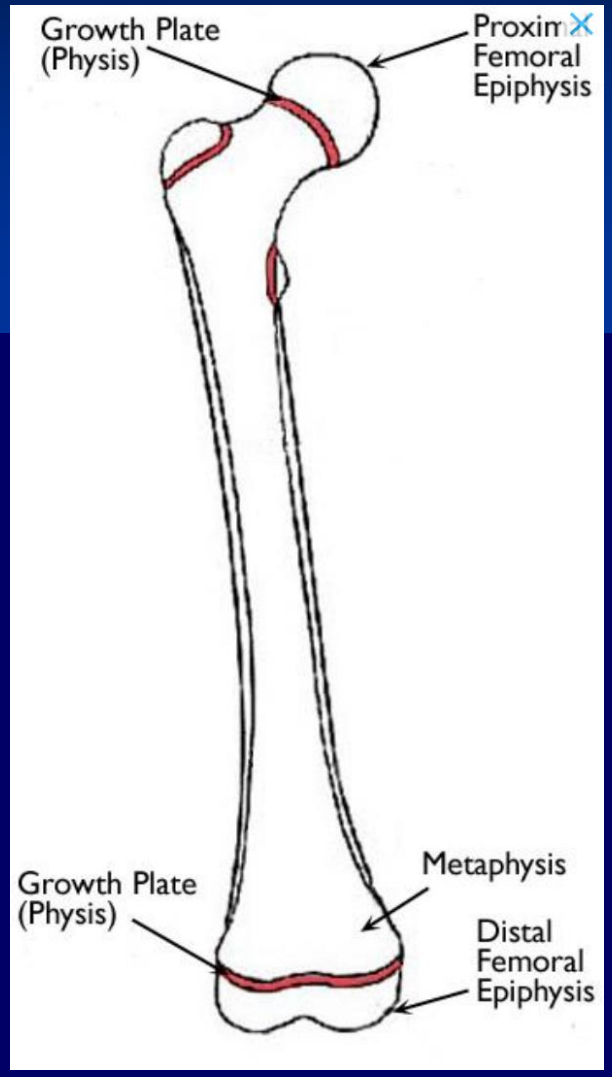


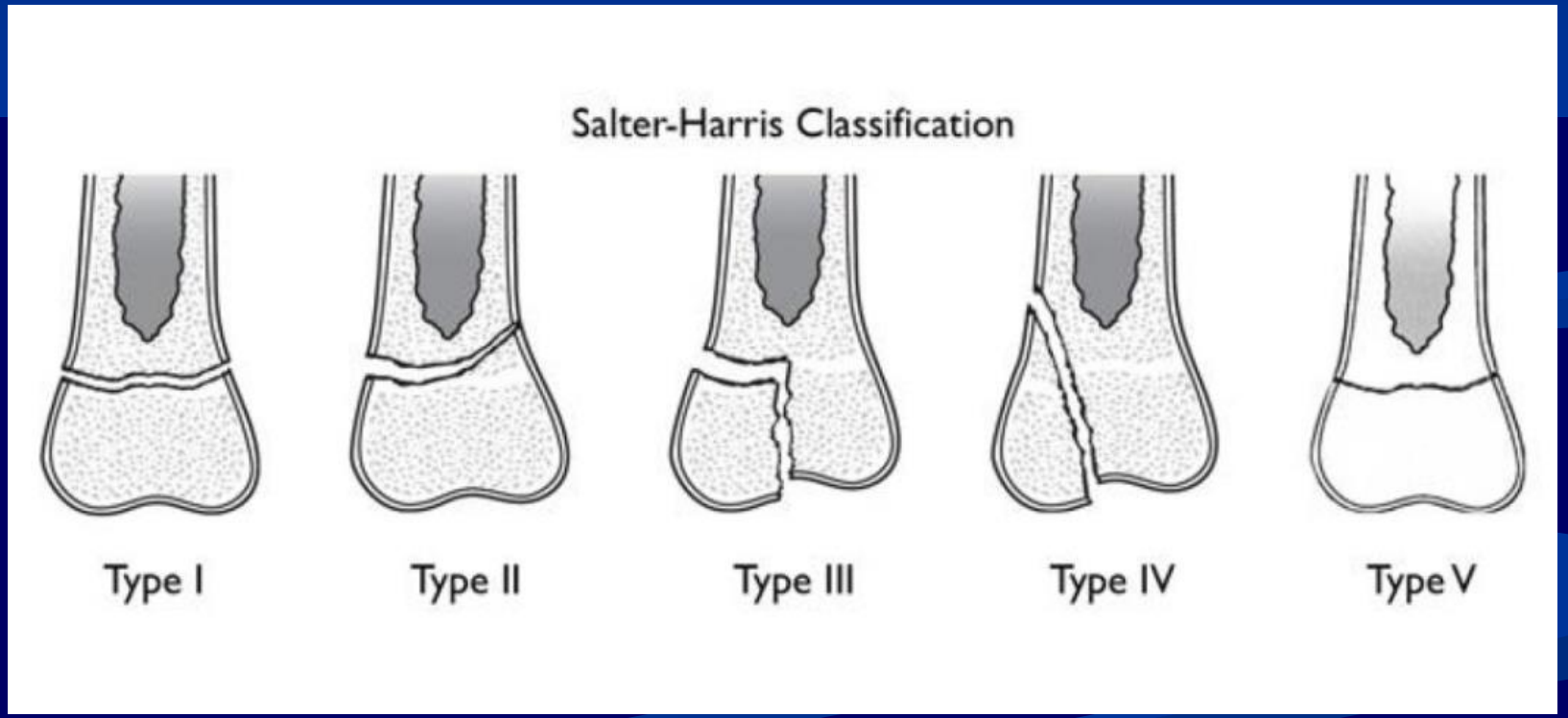
Vitamin D- “To D or not to D?”

This girl had rickets, as shown by her misshapen right leg. Affluence was no protection from this disease of insufficient vitamin D and, in fact, may have promoted the disease because

My kid has had 3 fractures, Does he have an issue?

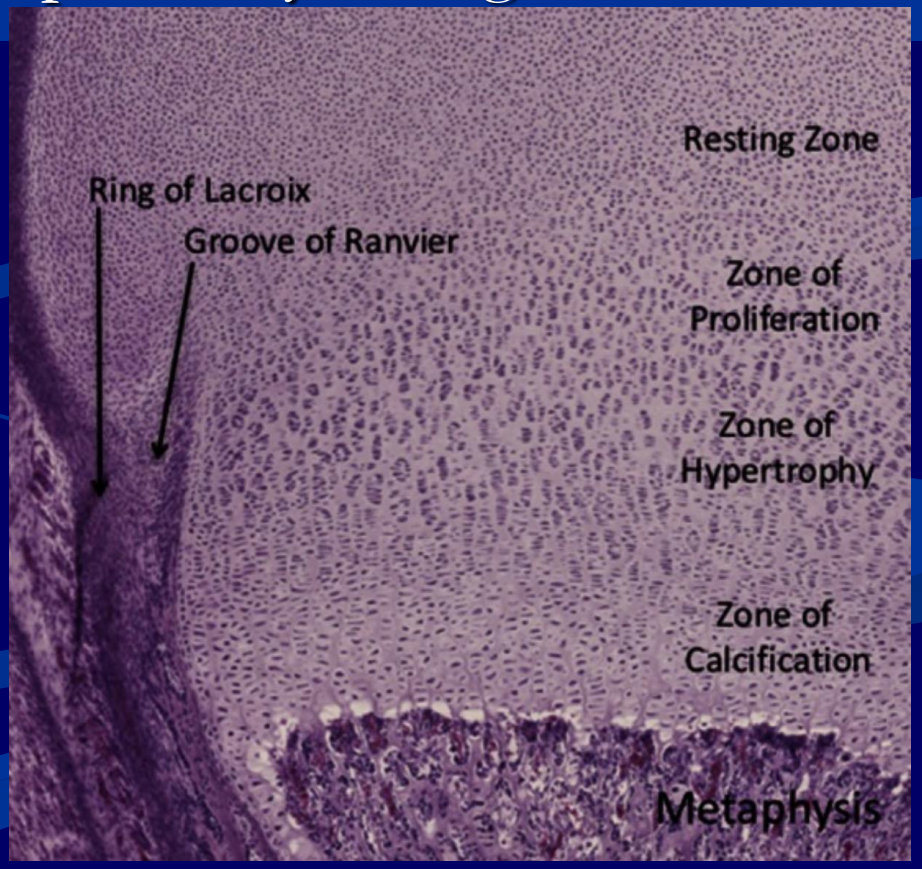
Growth Plate (physes) Fractures





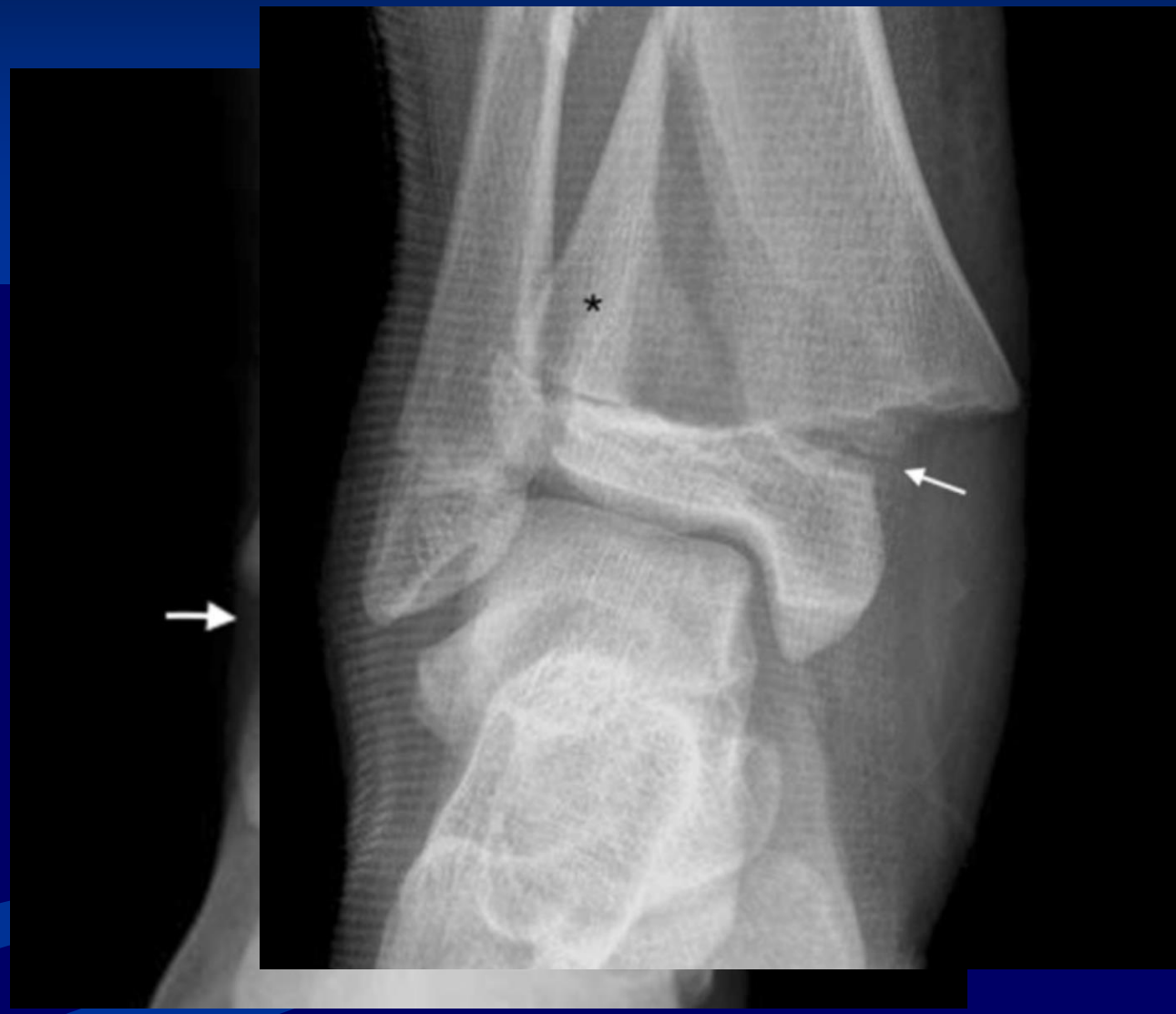
Growth Plate Fractures

- Twice as common in boys verses girls
  - Girls mature earlier so weaker growth plates replaced by stronger bone earlier
- 30% of long bone fractures
- More susceptible during growth spurts



Growth Plate Fractures

- phalanges 37.4%
- distal radius 17.9%
- metacarpals (14%)
- distal tibia 11%
- distal fibula 7.2%
- distal humerus (3.9%)
- all other (10%).



Physeal Growth Arrest

- Distal radius - 5%
- Distal ulna – 80%
- Distal femur - 50%
- Distal tibia – 40%

- Phalanges
  - Unclear
  - Significance?

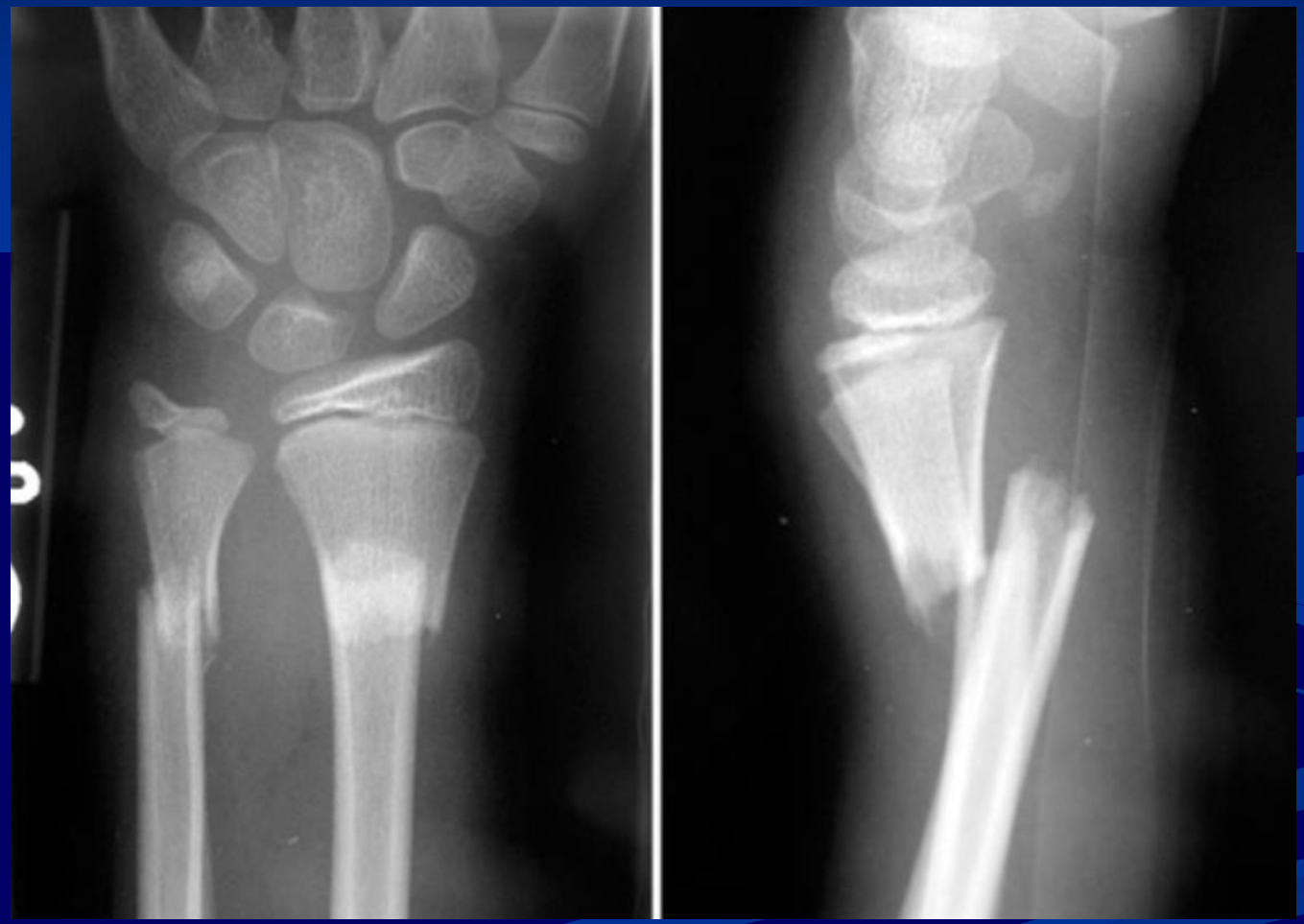
Growth Plate Fractures-Which ones to worry about

- Femur
- Tibia
- Elbow Wrist

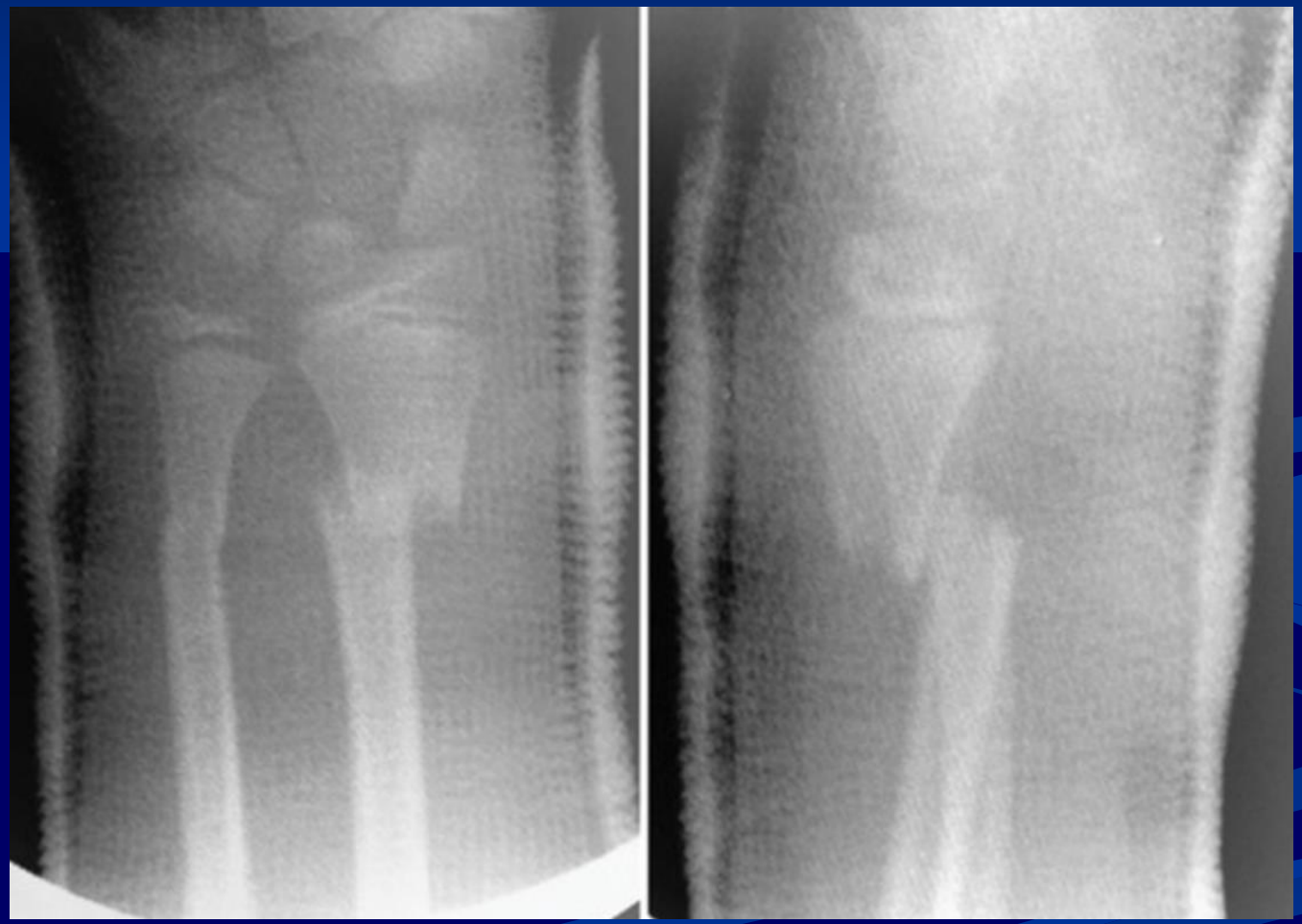
Growth Plate Fractures- Nonconcerning

- fingers
- metacarpal
- Toes, foot
- Proximal humerus

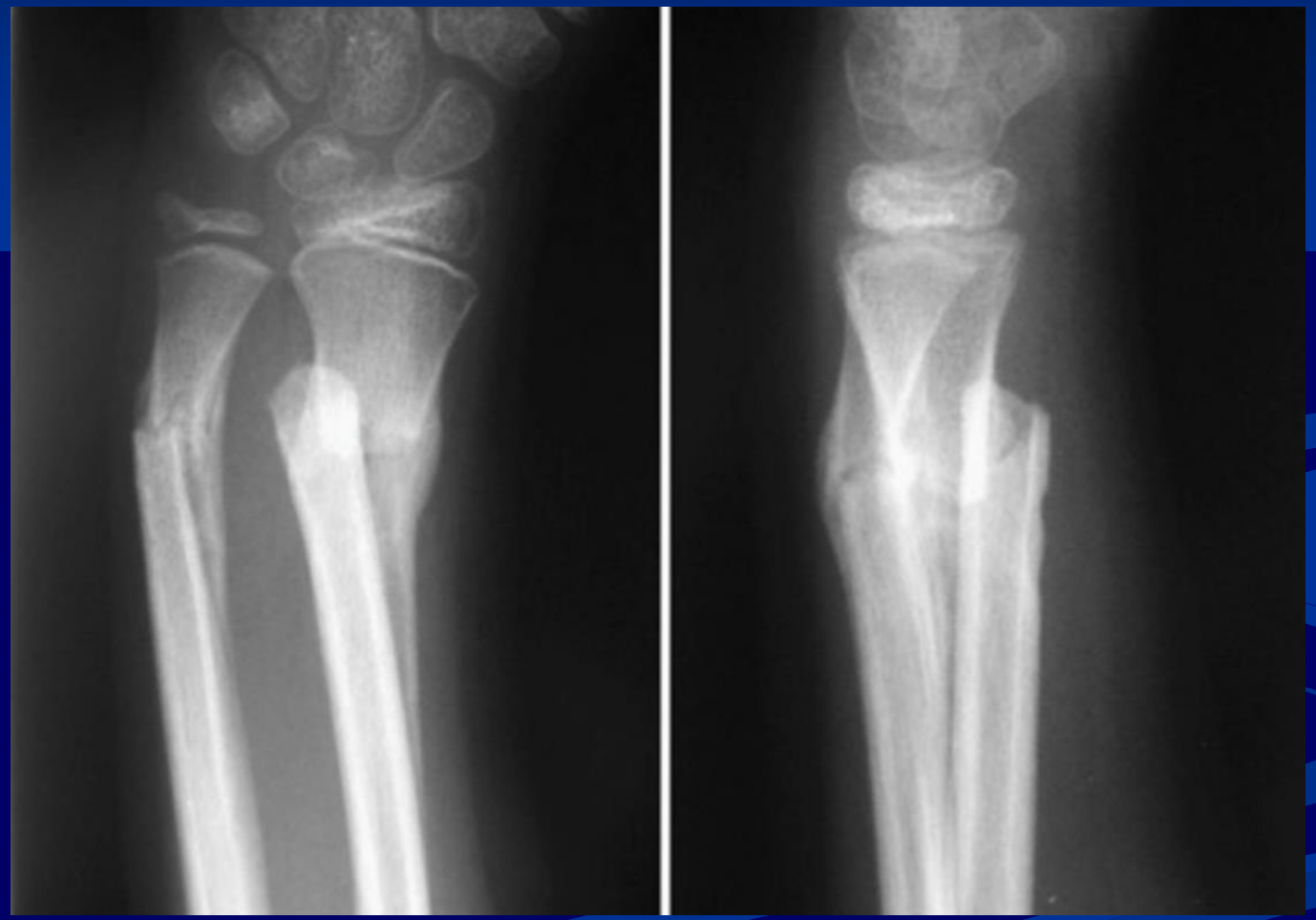
Healing potential of pediatric fractures



Healing potential of pediatric fractures

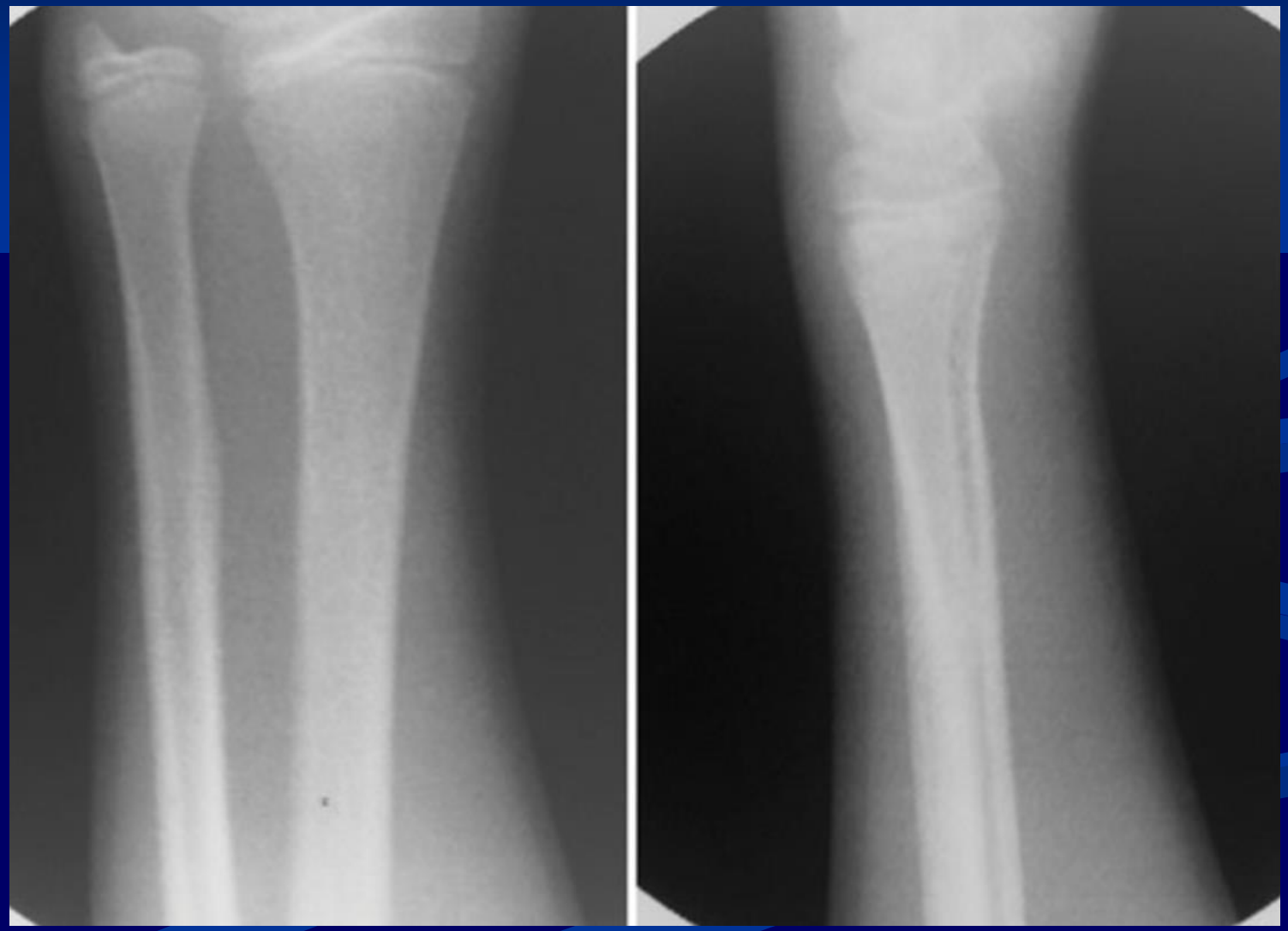


Healing potential of pediatric fractures

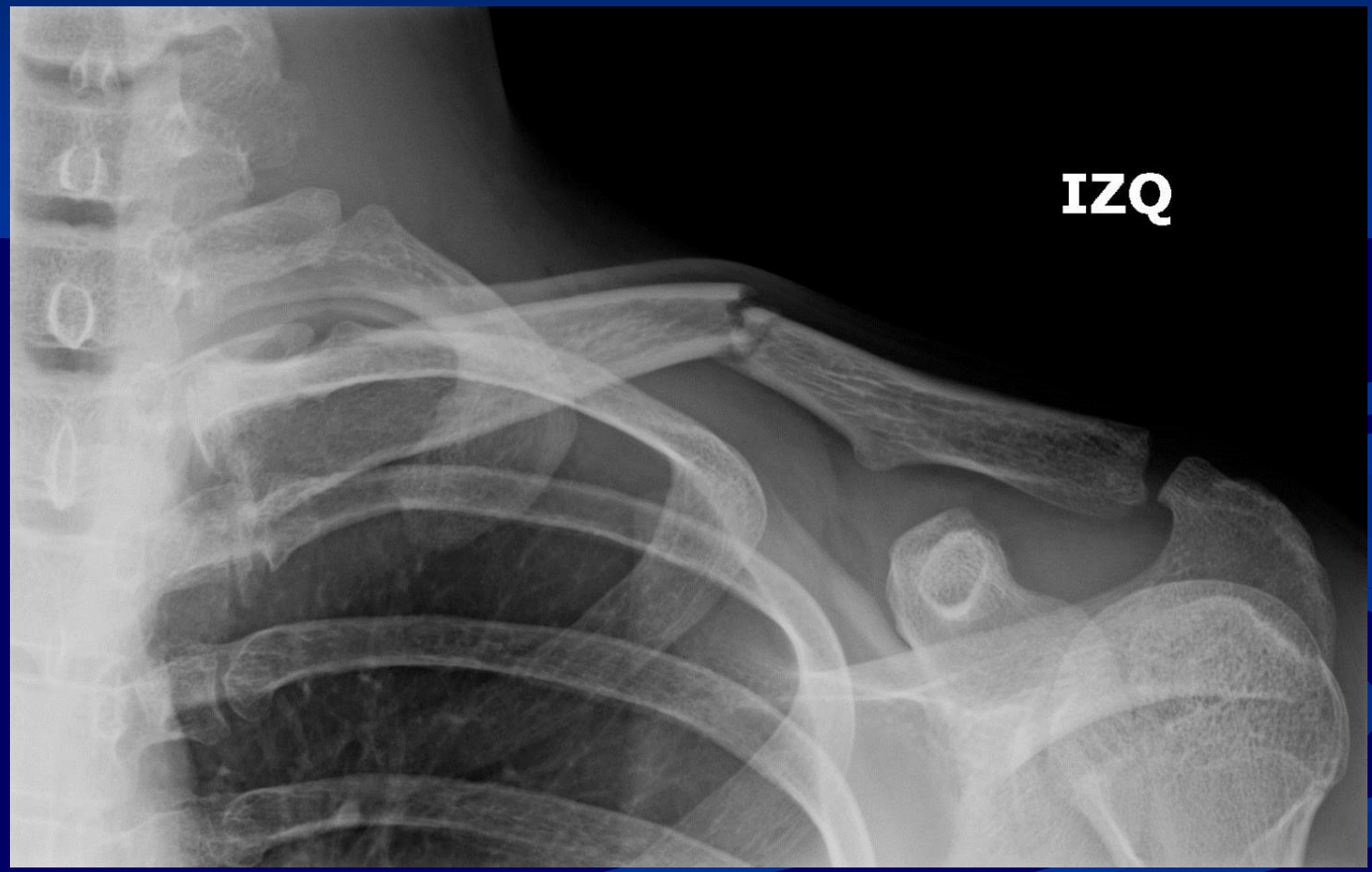


Healing potential of pediatric fractures

- 2 years after

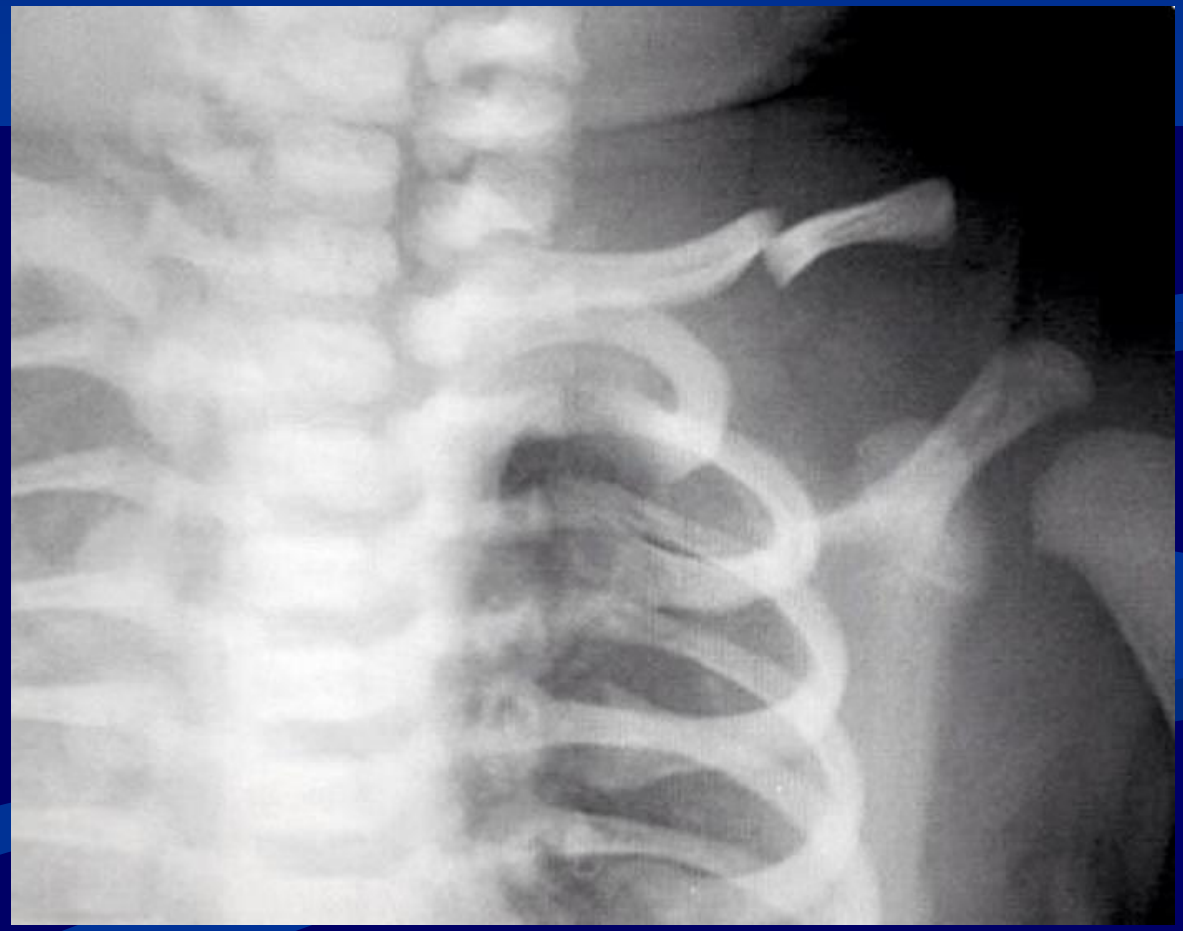


Clavicle Fractures



QUIZ

- Who would send this fracture to Ortho?
- 8 month old fell from table

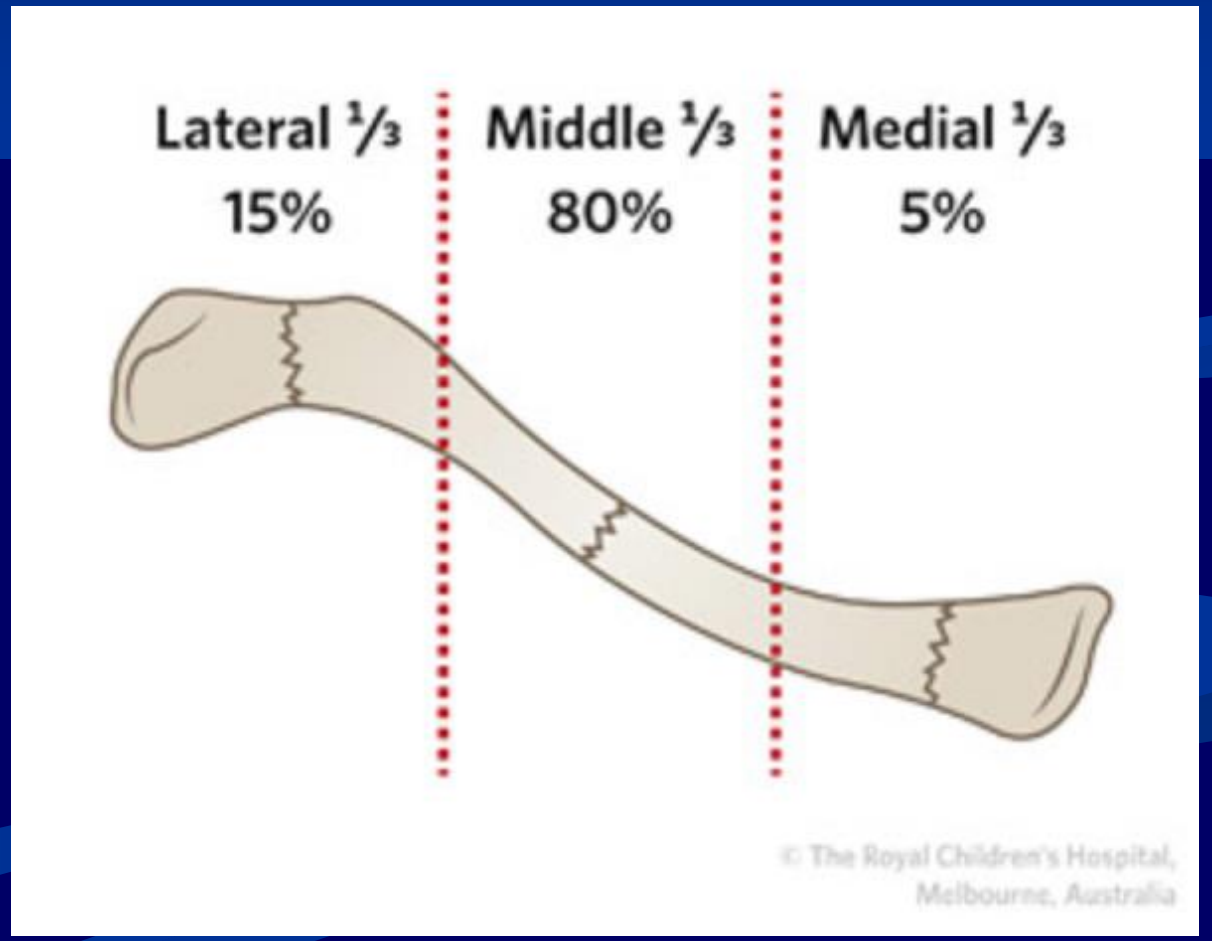


QUIZ

- Who would send this fracture to Ortho?
- 15 year old band member

Clavicle Fractures

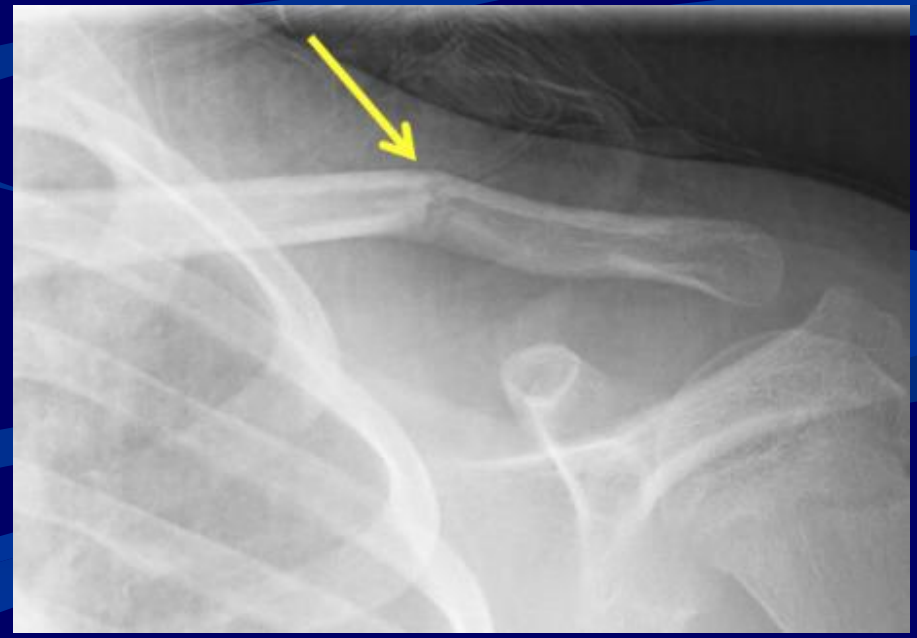
- 80% mid shaft
- 15% lateral (towards shoulder)
- 5% medial (towards sternum)



Pediatrician appropriate clavicles

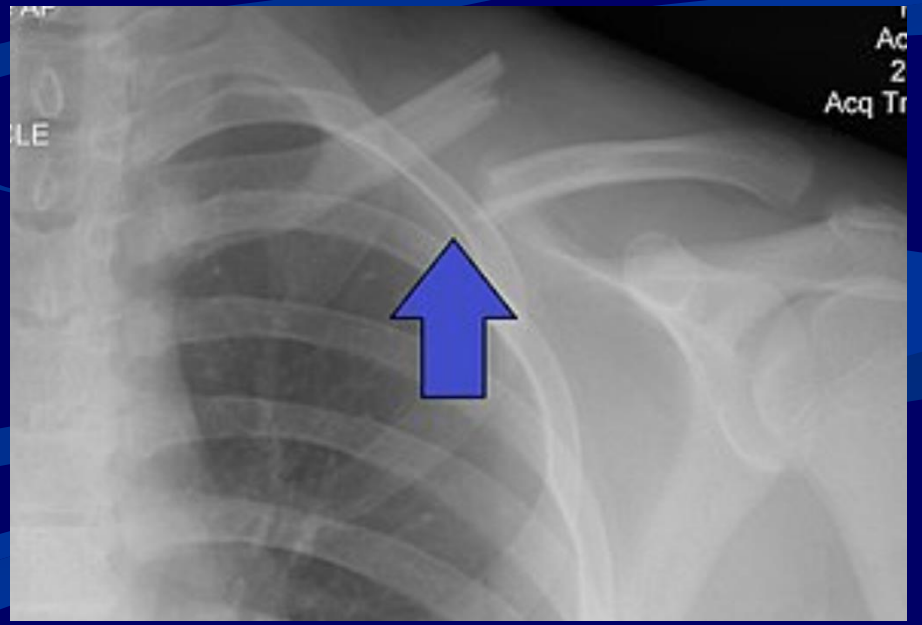
- General rule of thumb
  - If there is contact (even with angulation), OK to treat in your office
  - You can always treat babies

    and anyone under 8 years of age



When to refer to ortho?

- General rule of thumb
  - If the ends aren't touching each other, send it out
  - If there is contact (even with angulation), OK to treat in your office
  - Midshafts are OK to treat, proximal and distal, send out
  - Older patients
  - Patients in contact sports



Clavicle fractures at birth Treatment? (Ace wrap around torso)

- Ace wrap – 1-2 weeks
- Heel VERY FAST!
- Reassurance of Parents
- No need to see Ortho
- One visit problem

When do we operate?

- 2cm of shortening
- Comminution
- Major displacement
- Dominant vs non-dominant arm

Why operate?

- Cavicle is the Lever arm for shoulder girdle
  - Shotening leads to decrease strength (>2cm)
  - Optimal length for sarcomere (muscle contractile unit)

Open Reduction with Internal Fixation

Clavicle - Healing time

- Infants and toddlers – around 6-8 weeks
- All others avoid activities where there is a fall risk for 3-4 months
- Football – out at least 3-4 months

Proximal Humerus fractures- Quiz

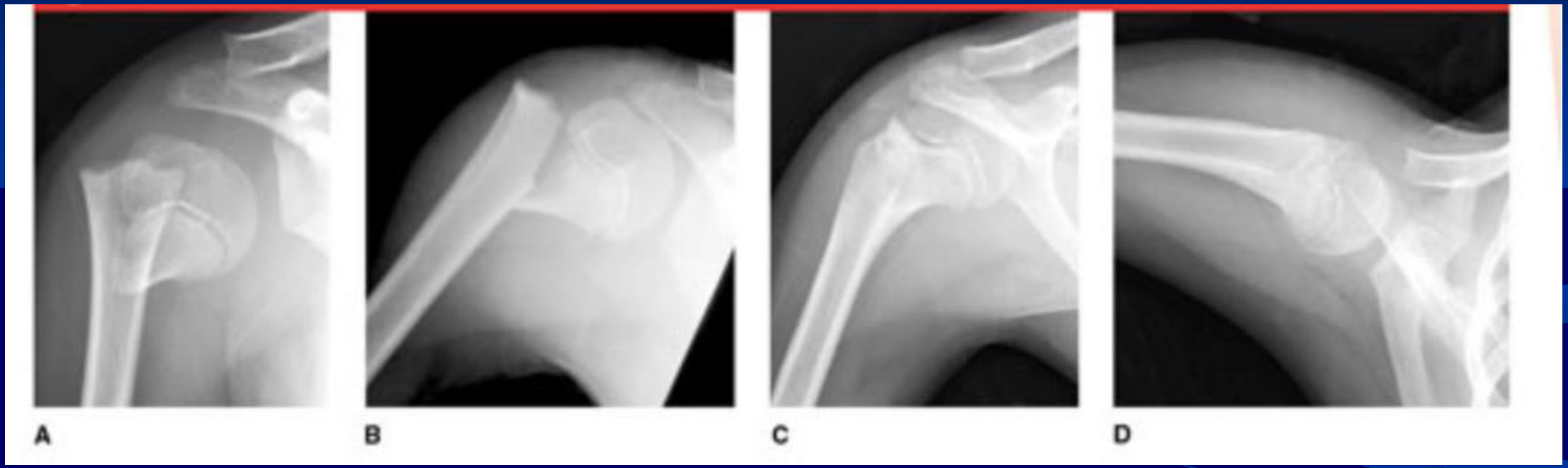
- Who would refer this 5 year old to ortho?

Proximal Humerus fractures- Quiz

- 9 y/o fall from bike
- FIX ???

Proximal Humerus- The Great Remodeler

Proximal Humerus- The Great Remodeller



Proximal Humerus fractures

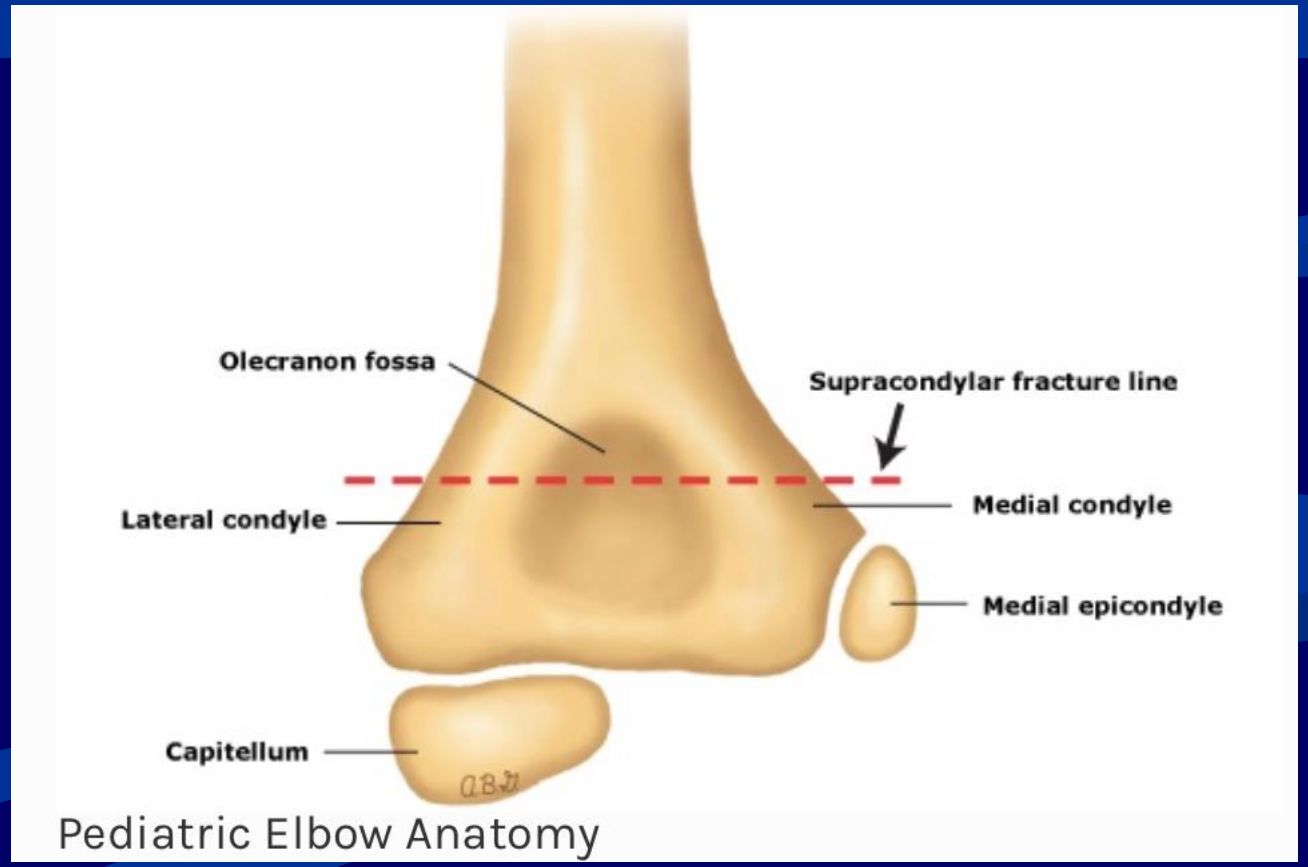
- OK for pediatrician to treat in 10 and under
- Tremendous remodeling potential
- Acceptable non-op guidelines
  - 75 degrees angulation < 7 years of age
  - 60 degree of angulation 8-11 years of age
  - 45 degrees – 12-14 years

What does ER tell parents?

Reassurance key for proximal humerus fracture

Elbow Fractures

- Supracondylar Humerus Fractures
- Lateral Condyle Fracture
- Radial Head fractures
- Medial Epicondyle fracture



Pediatric Elbow Anatomy

Elbow Fractures

- In General – send almost all elbow fractures to…

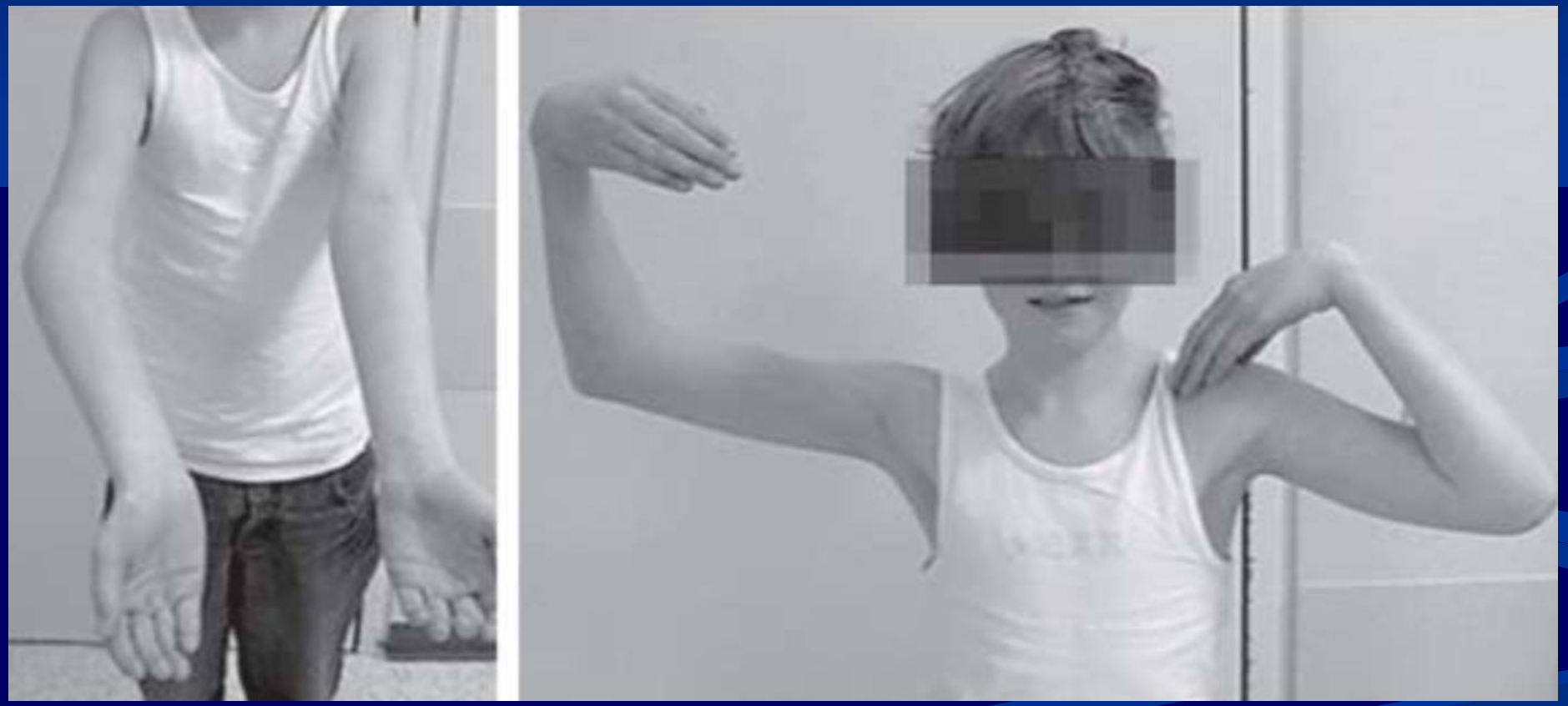
Elbow Fractures

- In General – send almost all elbow fractures to… Your local friendly orthopaedic friend

Elbow Fractures

- They get stiff
- You can get deformities
- They are unforgiving
  - don't remodel as well as other fractures

Elbow Fractures



Elbow Fractures

- Supracondylar Humerus Fractures
- Lateral Condyle Fracture
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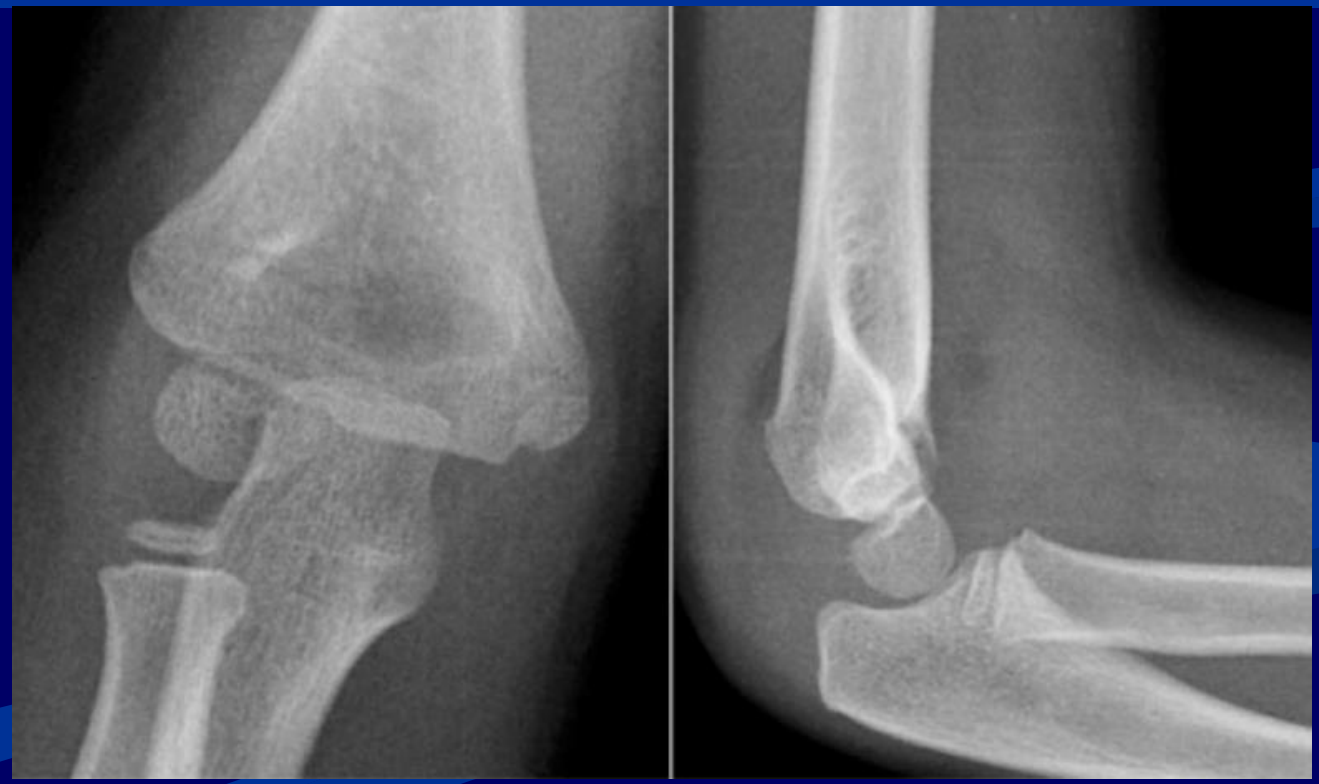
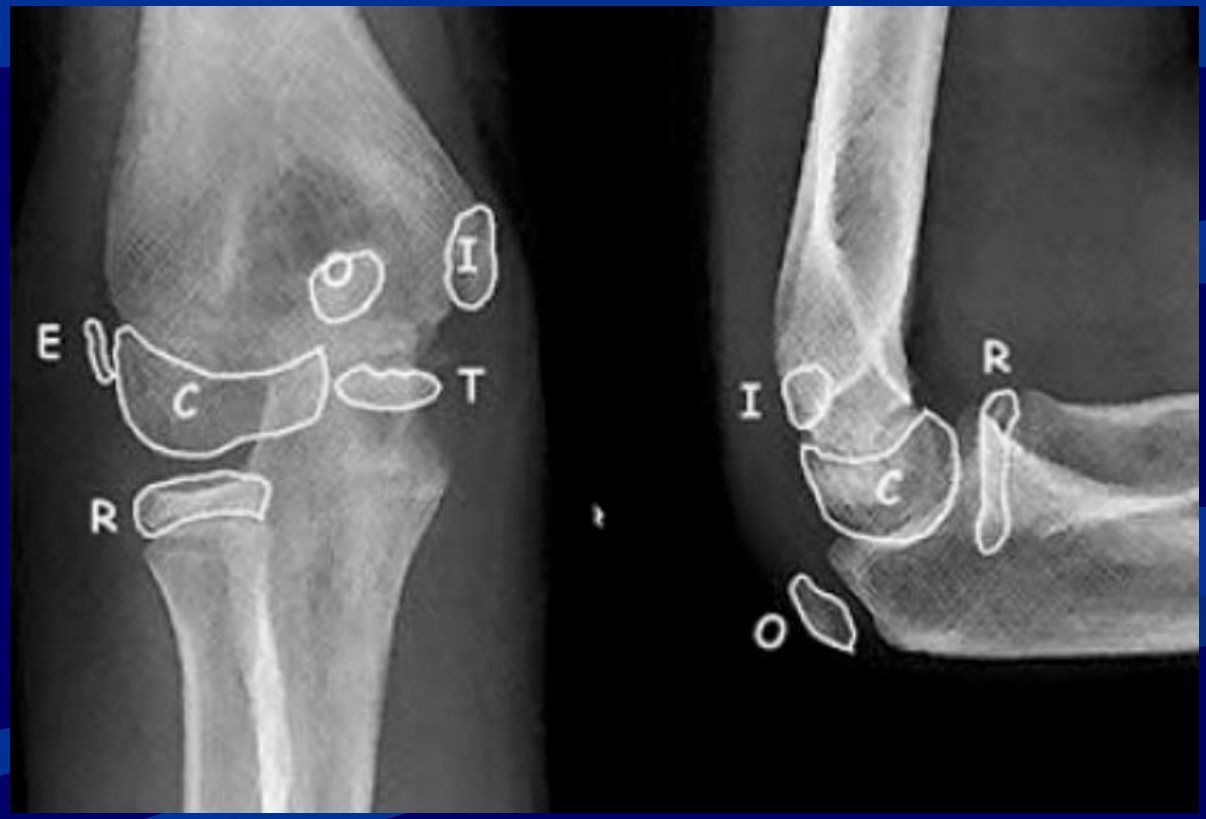
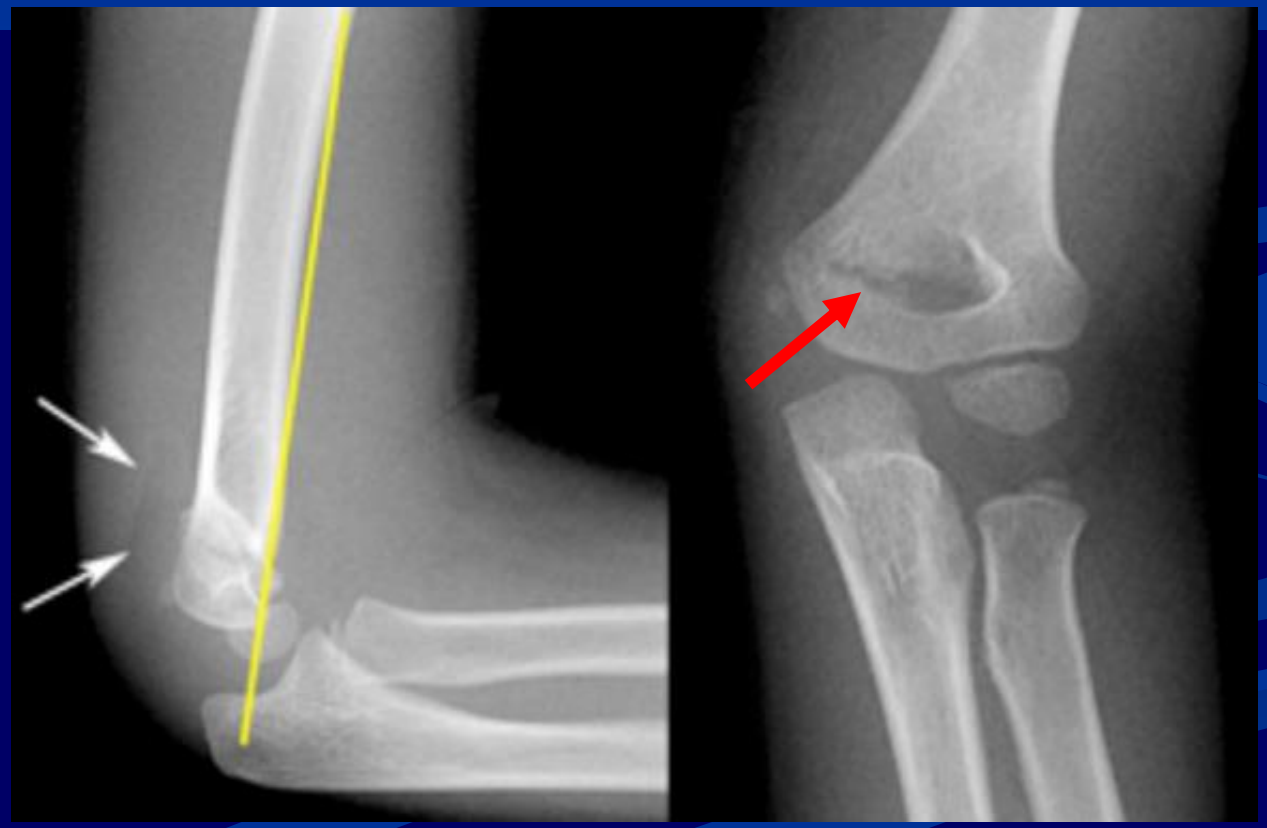


Elbow Growth Centers



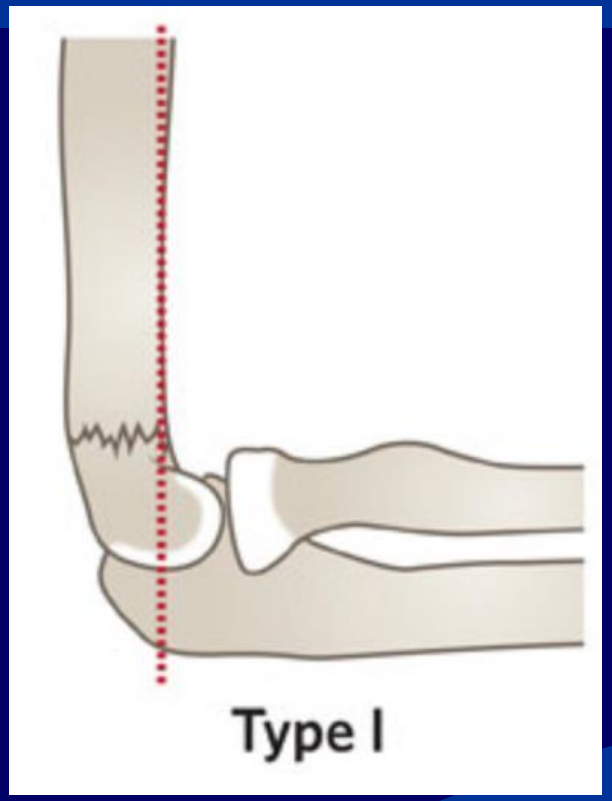
Elbow Fractures

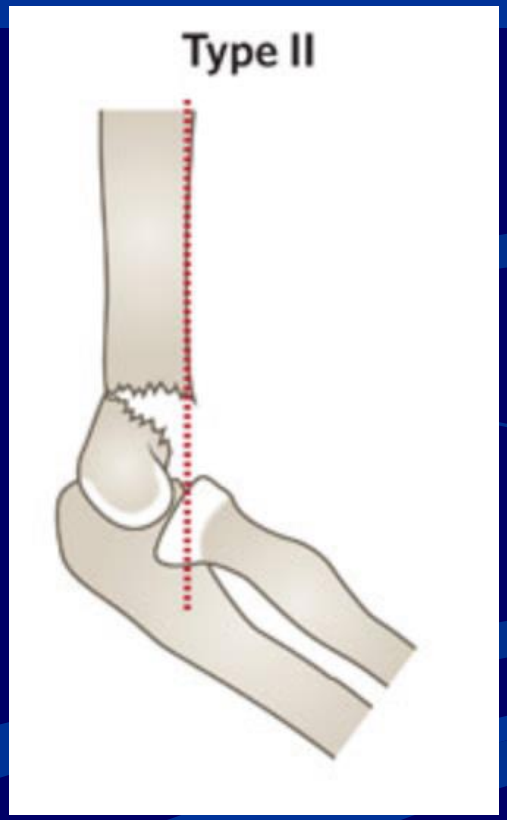
- Supracondylar Humerus Fractures

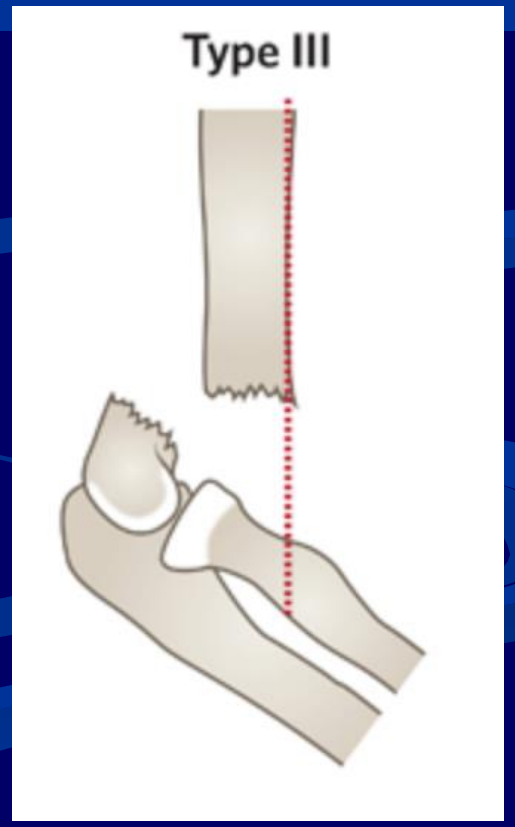


Supracondylar Humerus Fractures

- Non-operative in type 1 (3 weeks cast)
- Surgery with type 2 and type 3







Supracondylar Humerus Fractures

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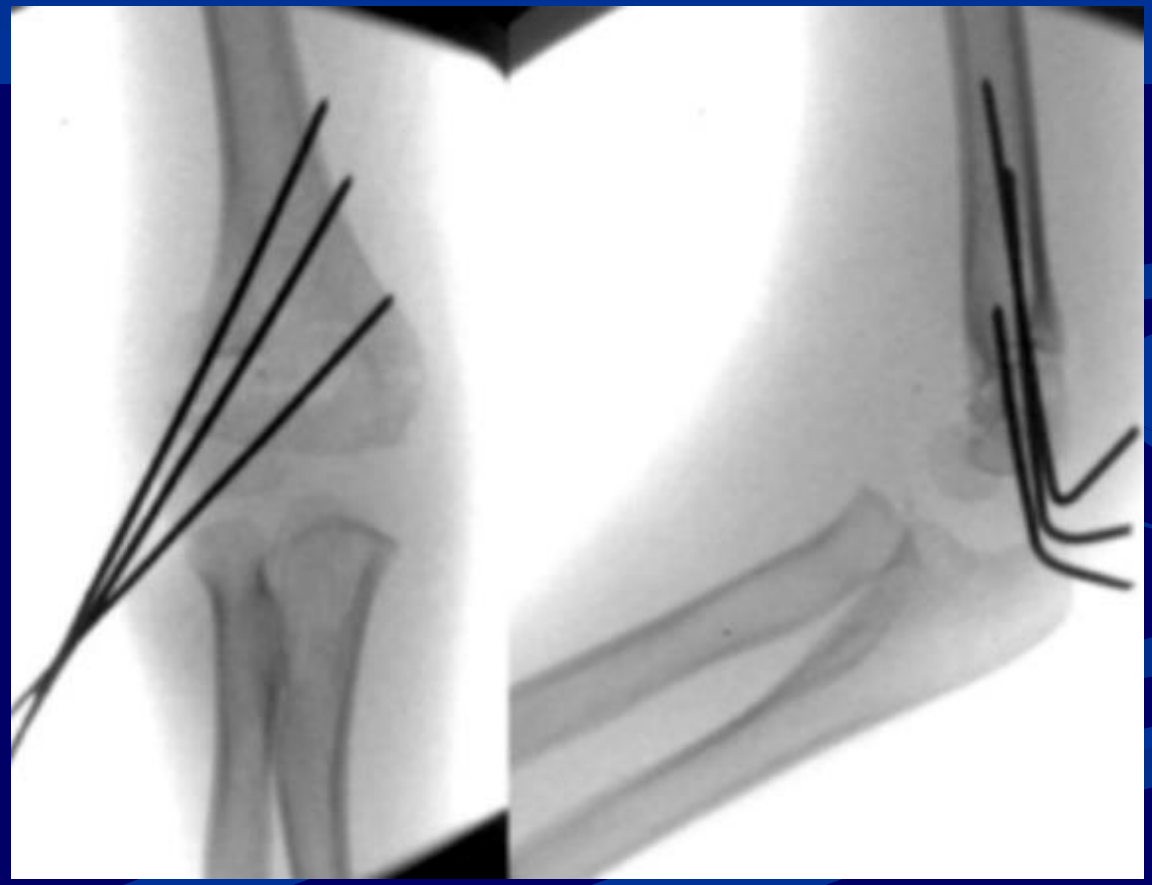
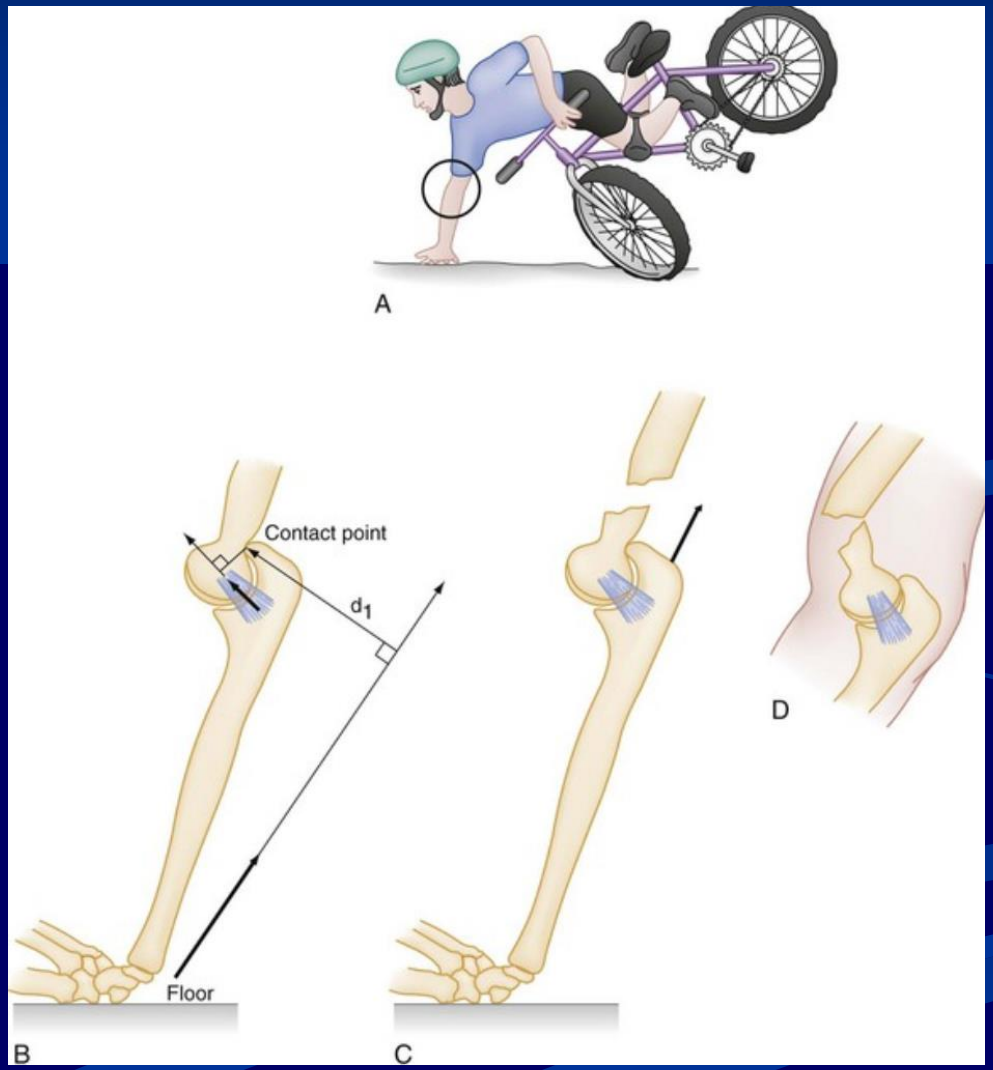


Supracondylar Humerus Fracture

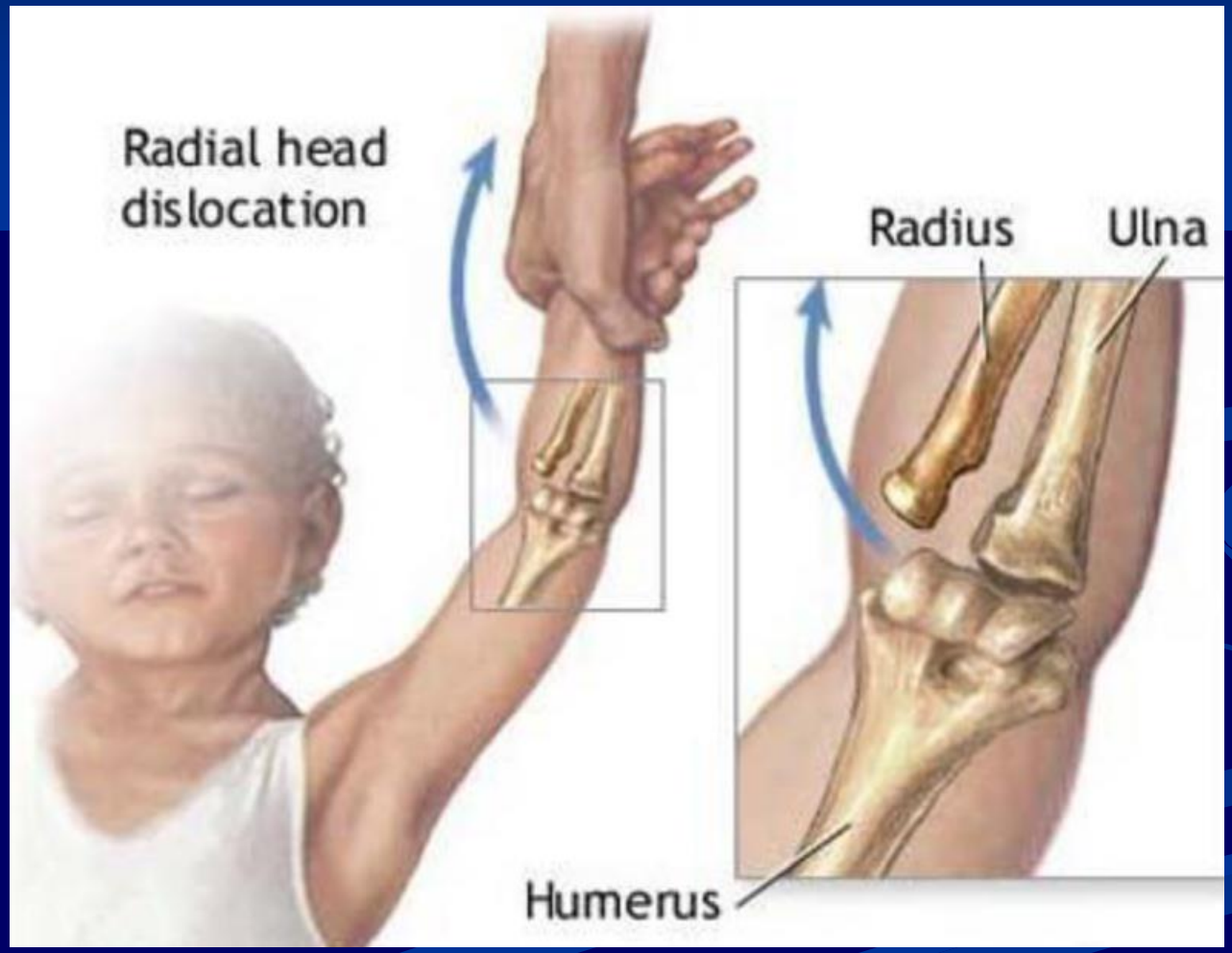
Occult Supracondylar Humerus Fracture
The Misdiagnosed Nursemaids elbow

- Pay attention to history
  - Fall = Fracture
  - Axial traction (tug on arm) = Nursemaid
- Frequent misdiagnosis in urgent care

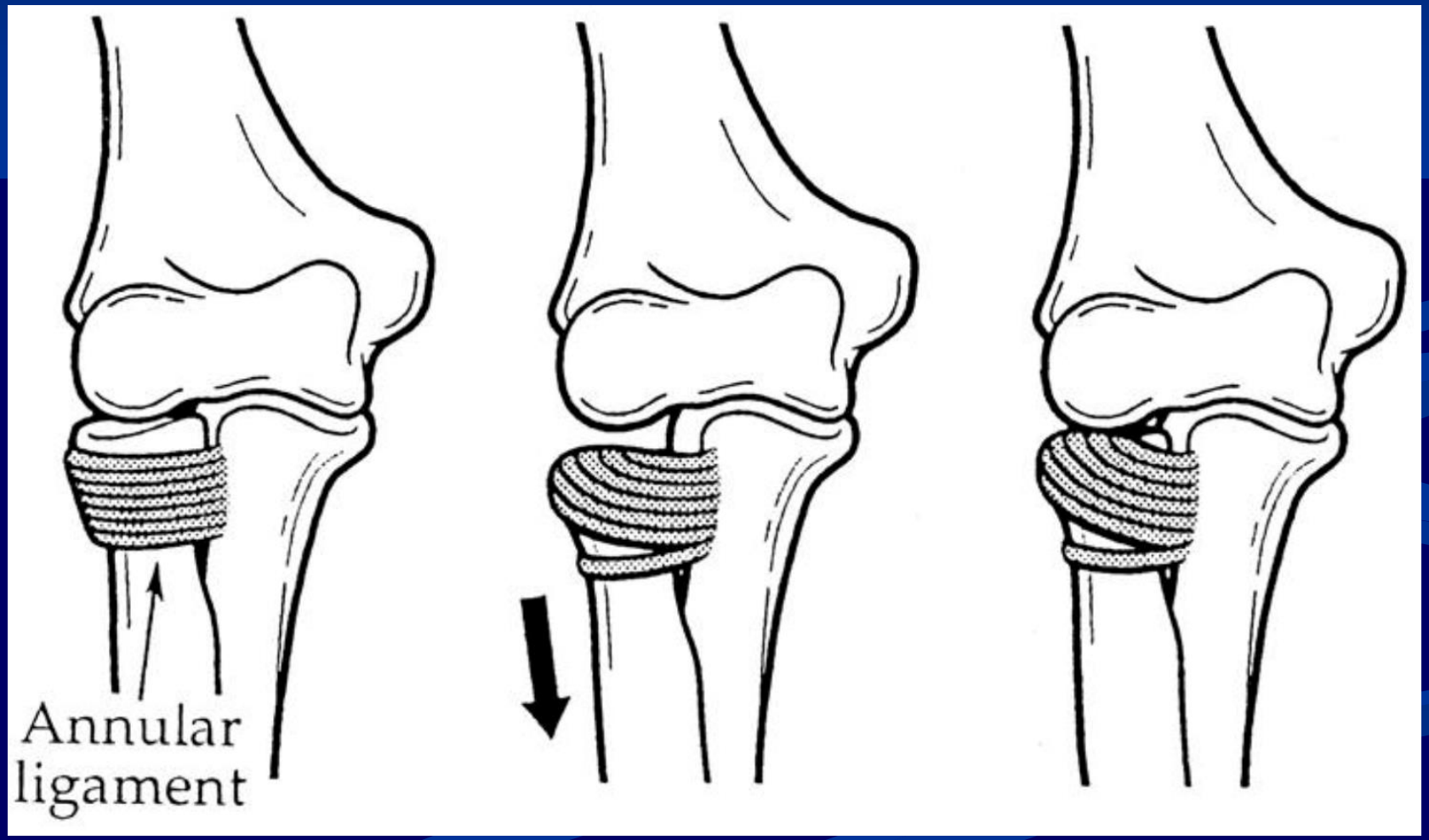
Occult Supracondylar Humerus Fracture
The Misdiagnosed Nursemaids elbow



Occult Supracondylar Humerus Fracture
The Misdiagnosed Nursemaids elbow



Nursemaids elbow



Nursemaids elbow reduction

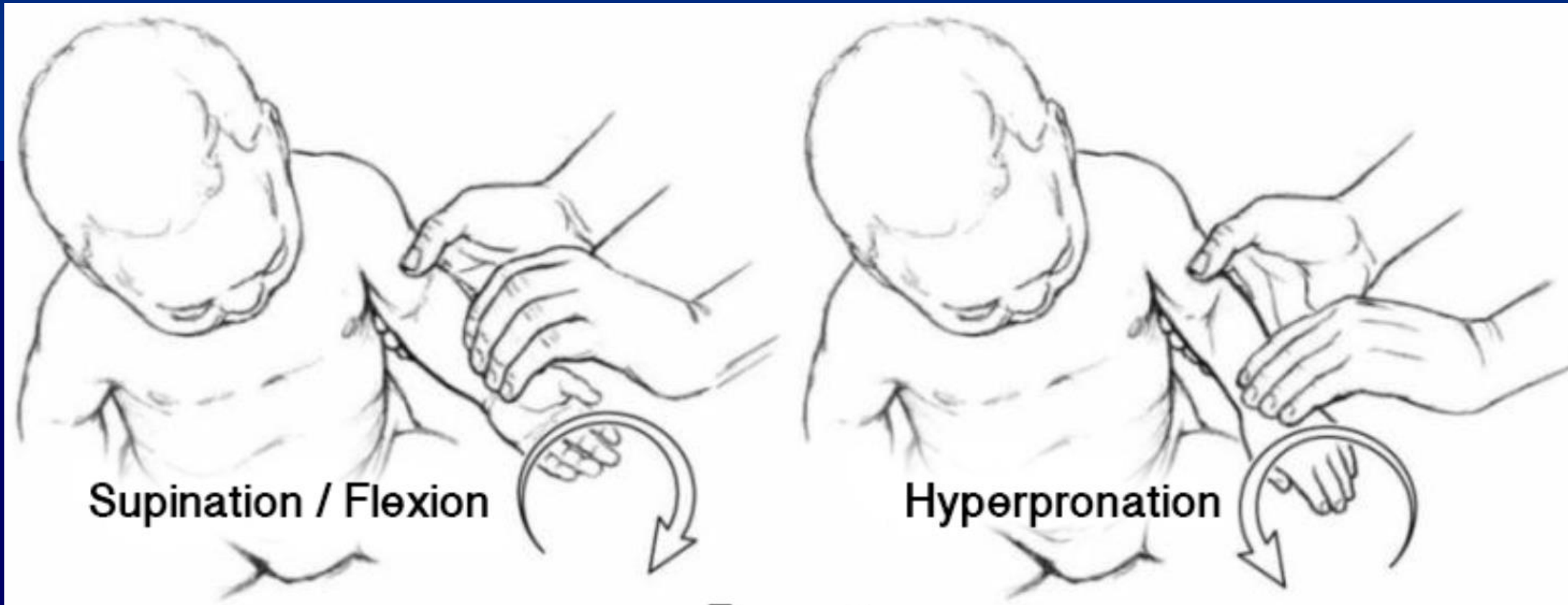
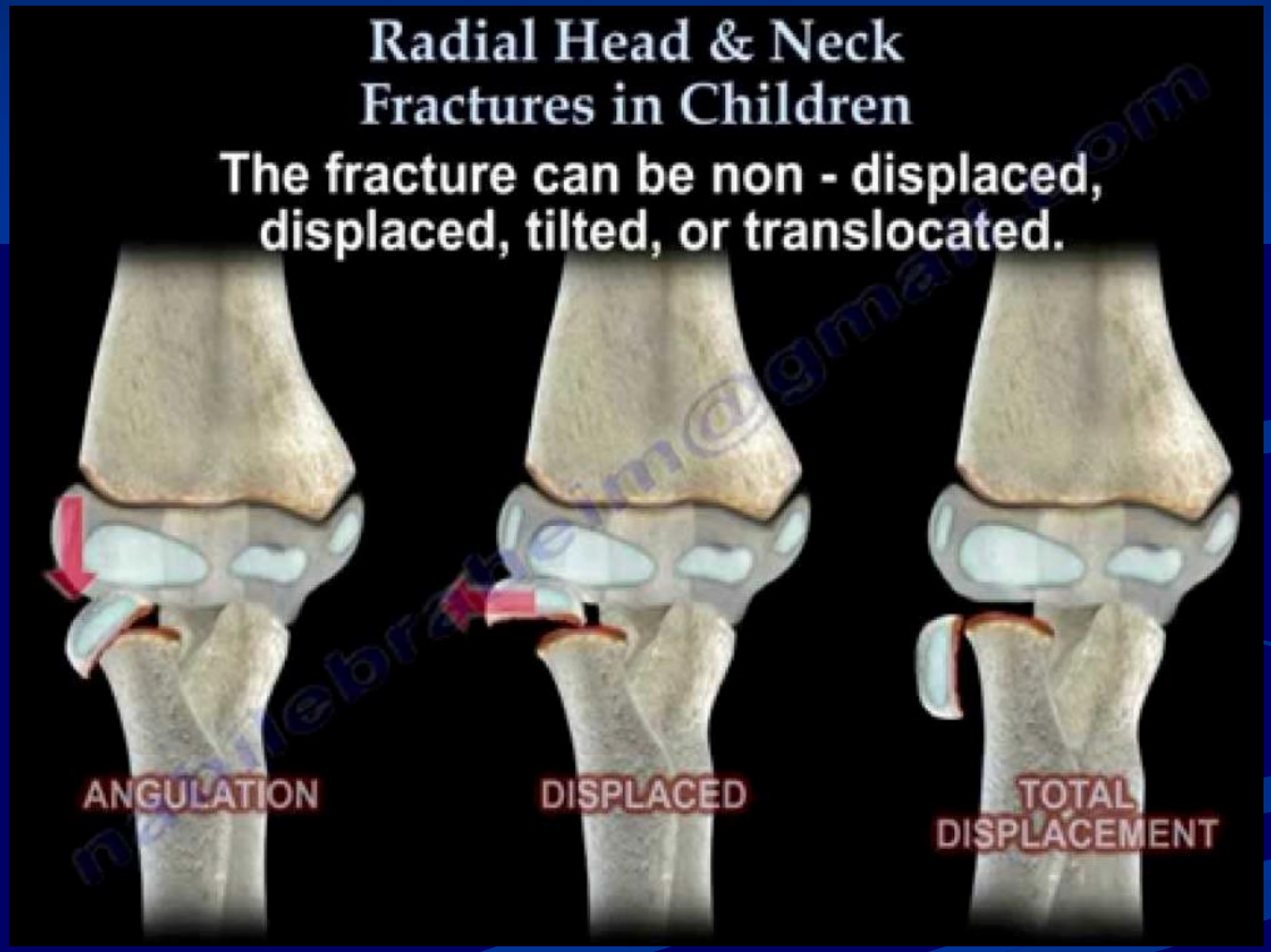


Figure 2

Lateral Condyle Humerus Fracture

- Intraarticular fracture
- Often surgical
- ALWAYS refer out. Many times operative

Radial Head/Neck Fracture

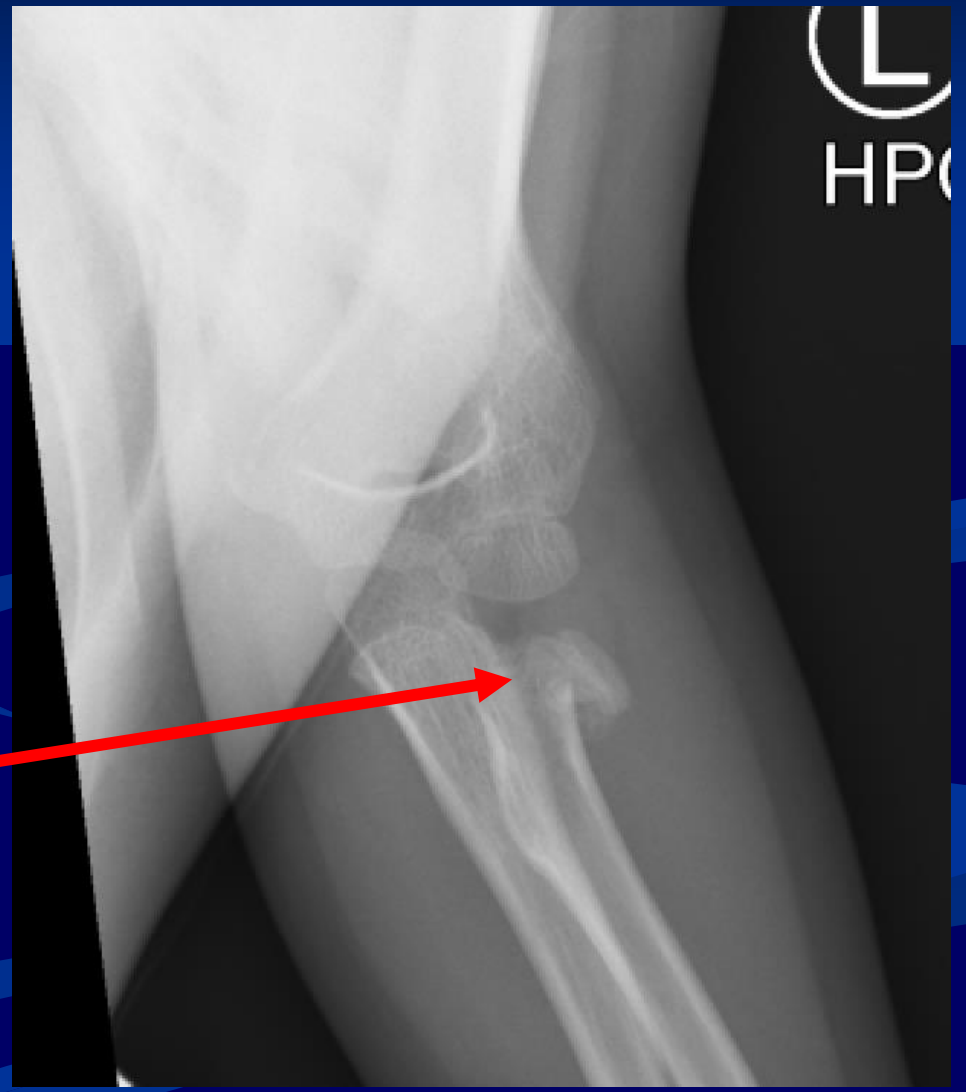


Radial Head/Neck Fracture

- Small fractures can be treated non-op
- All others may need surgery

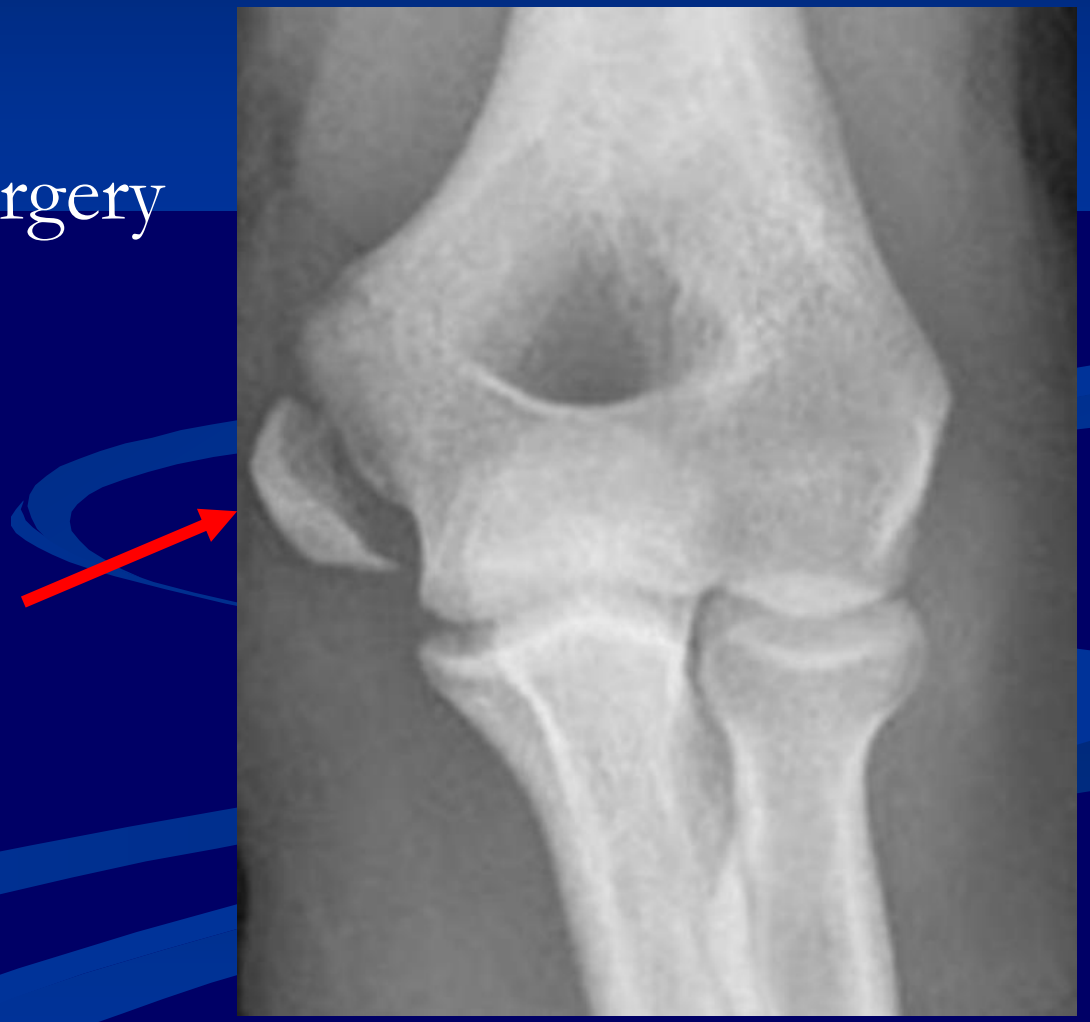
Radial Head/Neck Fracture

- Displaced Radial head fracture
  - 6 y/o fall from height
- In need of surgery



Medial Epicondyle Fracture

- The gymnast fracture
- Displacement more then 3-5mm = surgery

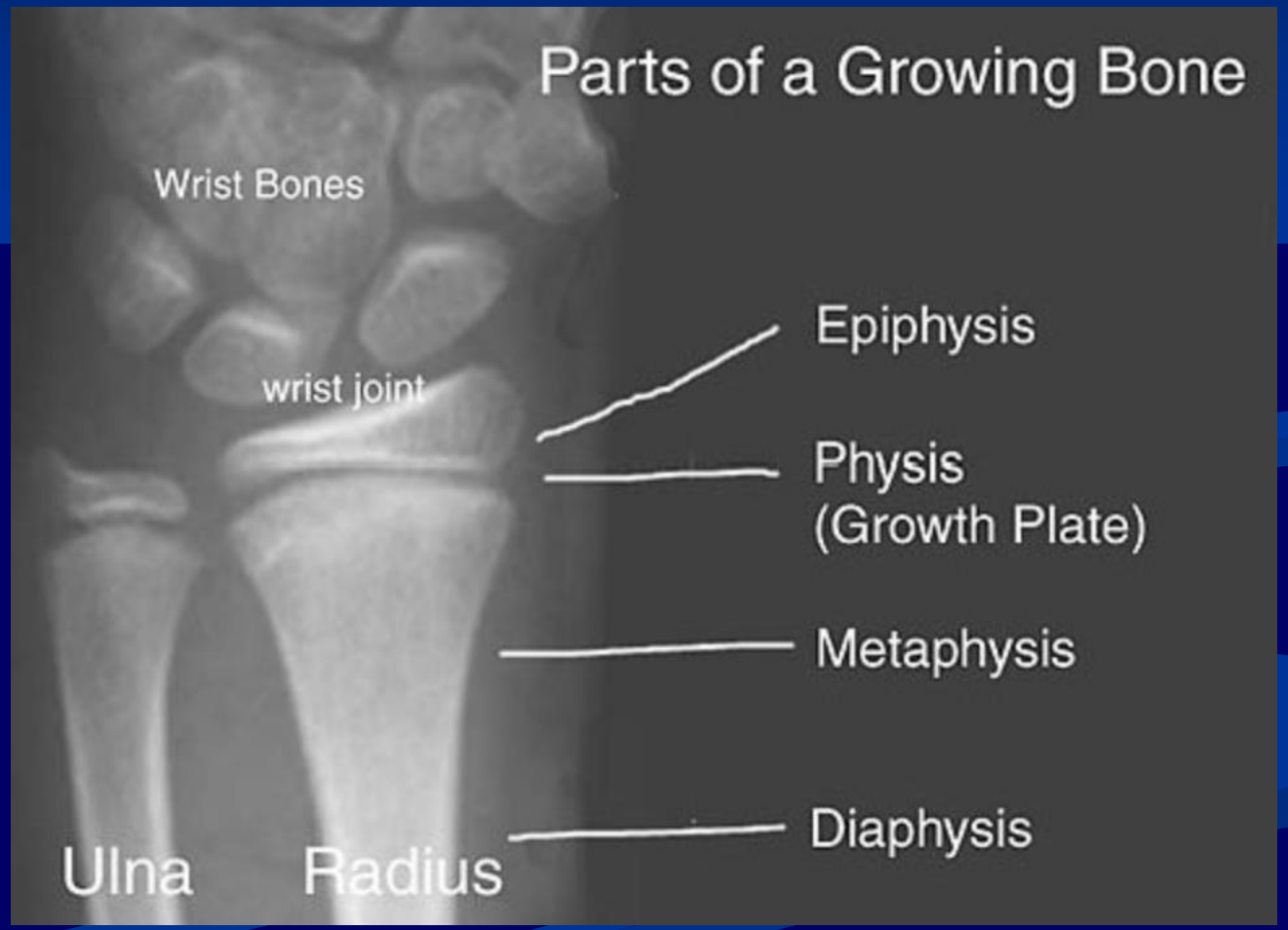


Forearm Shaft Fractures

- Diaphyseal bone healing
  - Slower
  - Remodels more poorly
- Should all be casted
- Cut off for surgery varies

Distal radius Fractures

- Metaphysis and epiphysis



Healing Potential of Radius

Metaphysis

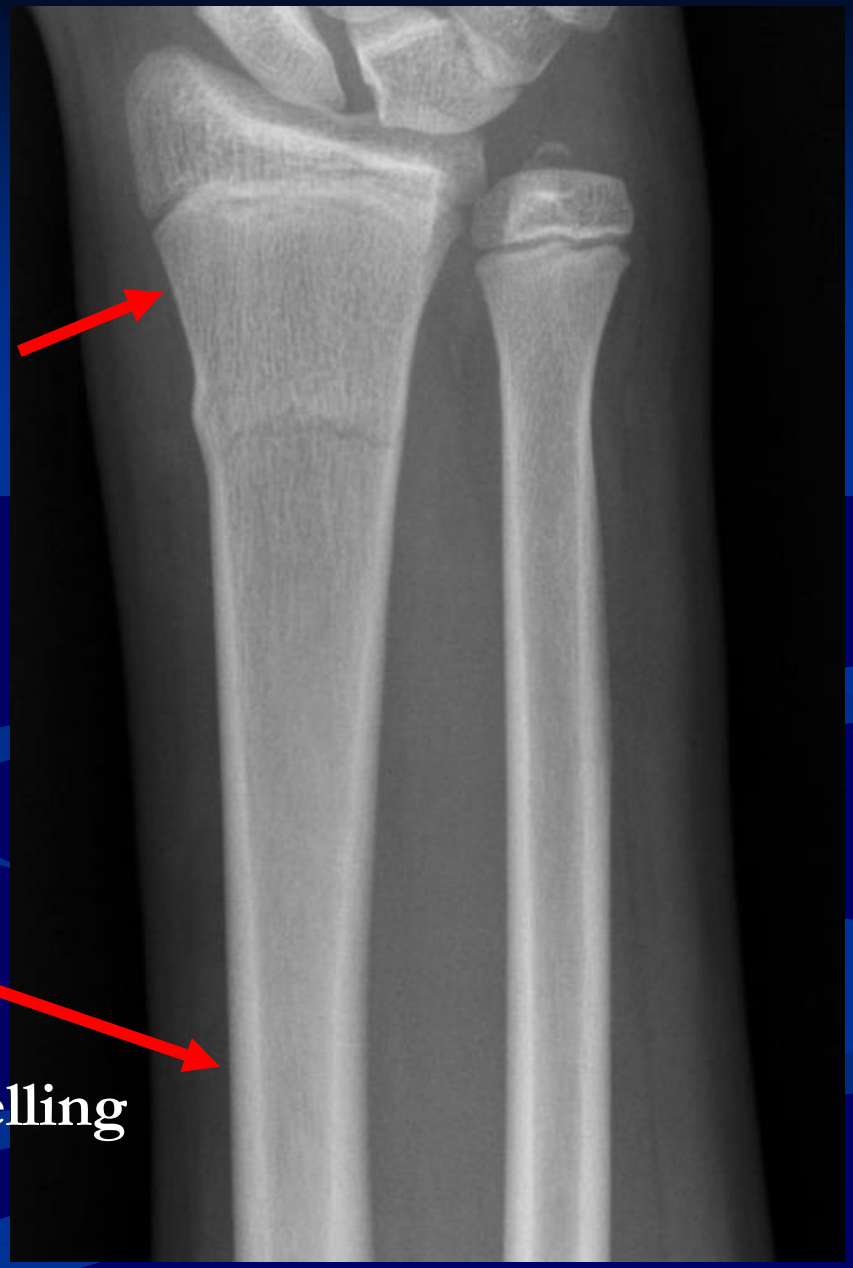
Thin outer cortex with spongy medullary bone

Greater healing and remodeling capabilities

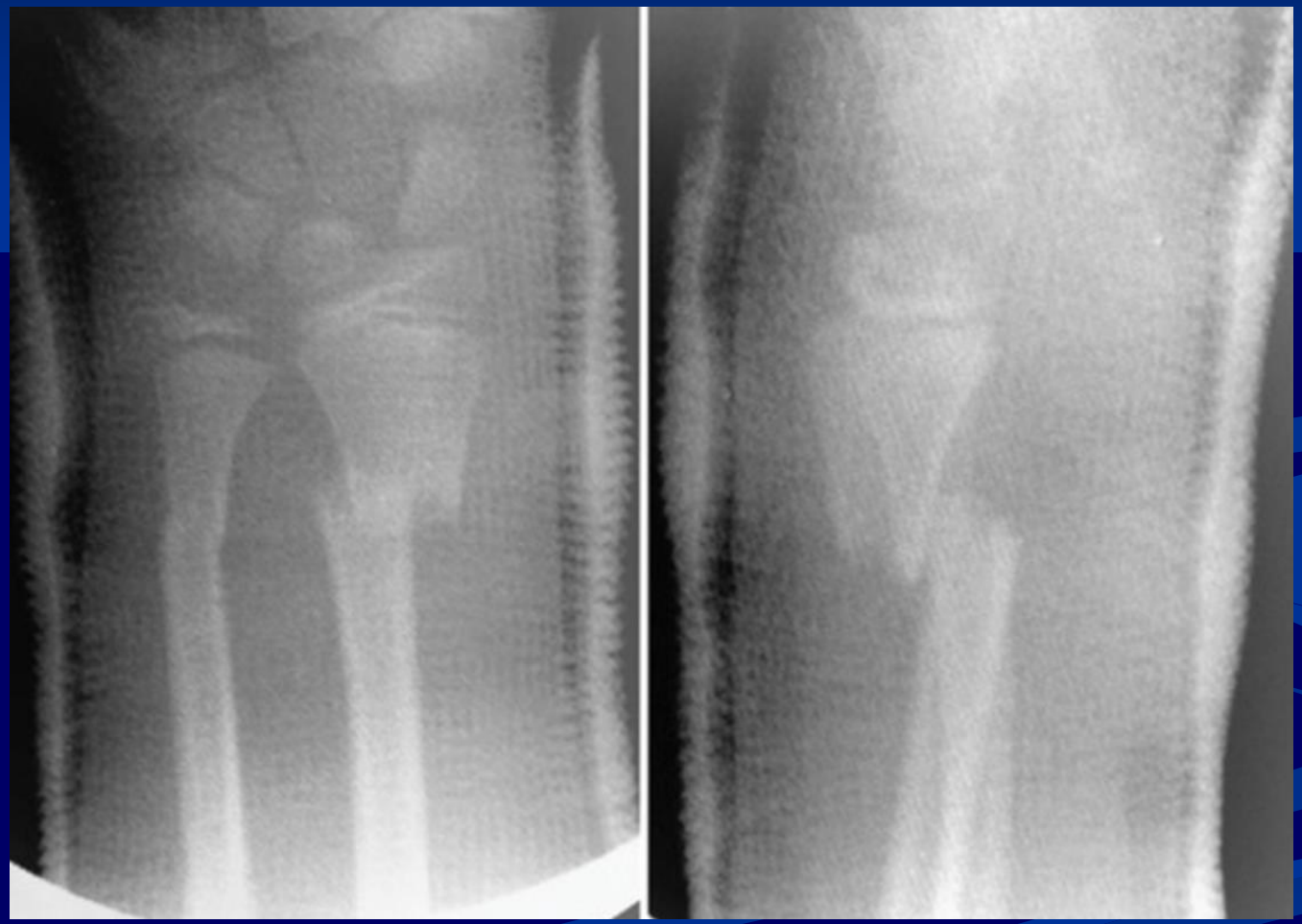
Diaphysis

Thick, hard outer cortex

Slower healing time and poor remodelling



Healing potential of distal radius fractures



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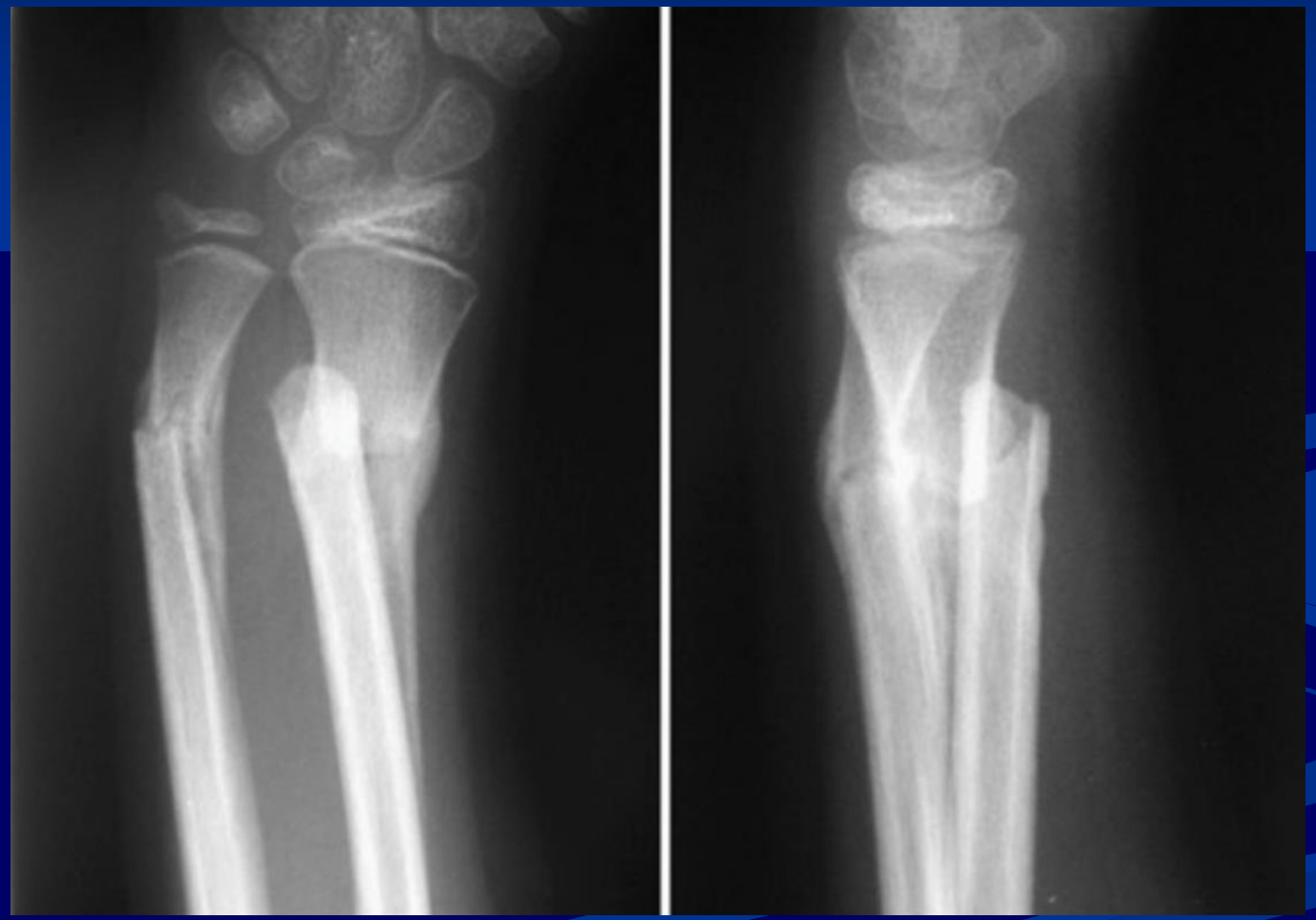
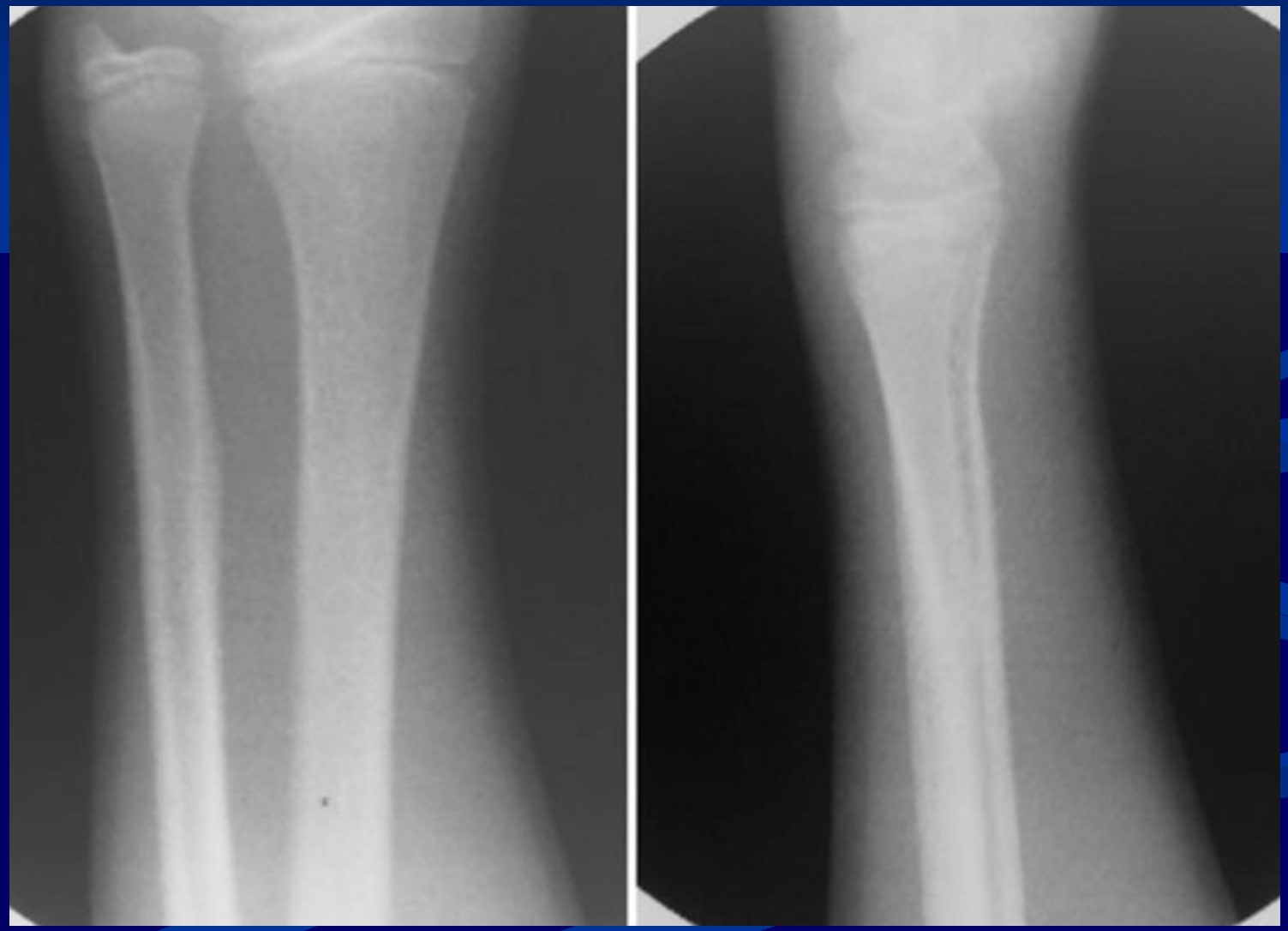


Healing potential of distal radius fractures

- 2 years after



Closer Proximity to growth plate=Greater Remodelling

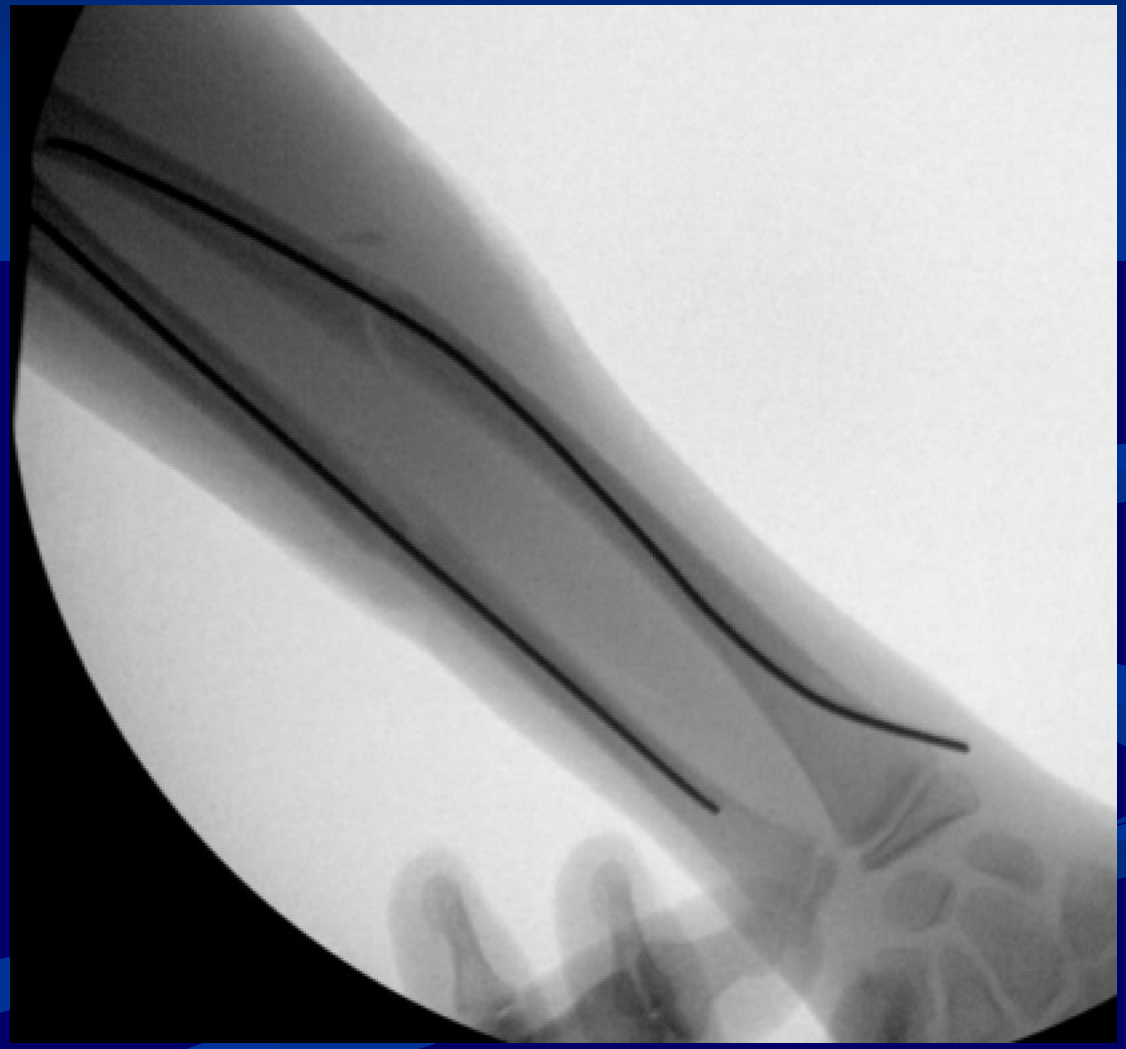
- Same fracture mid-shaft = surgery

farther from growth plate=Poorer Remodelling

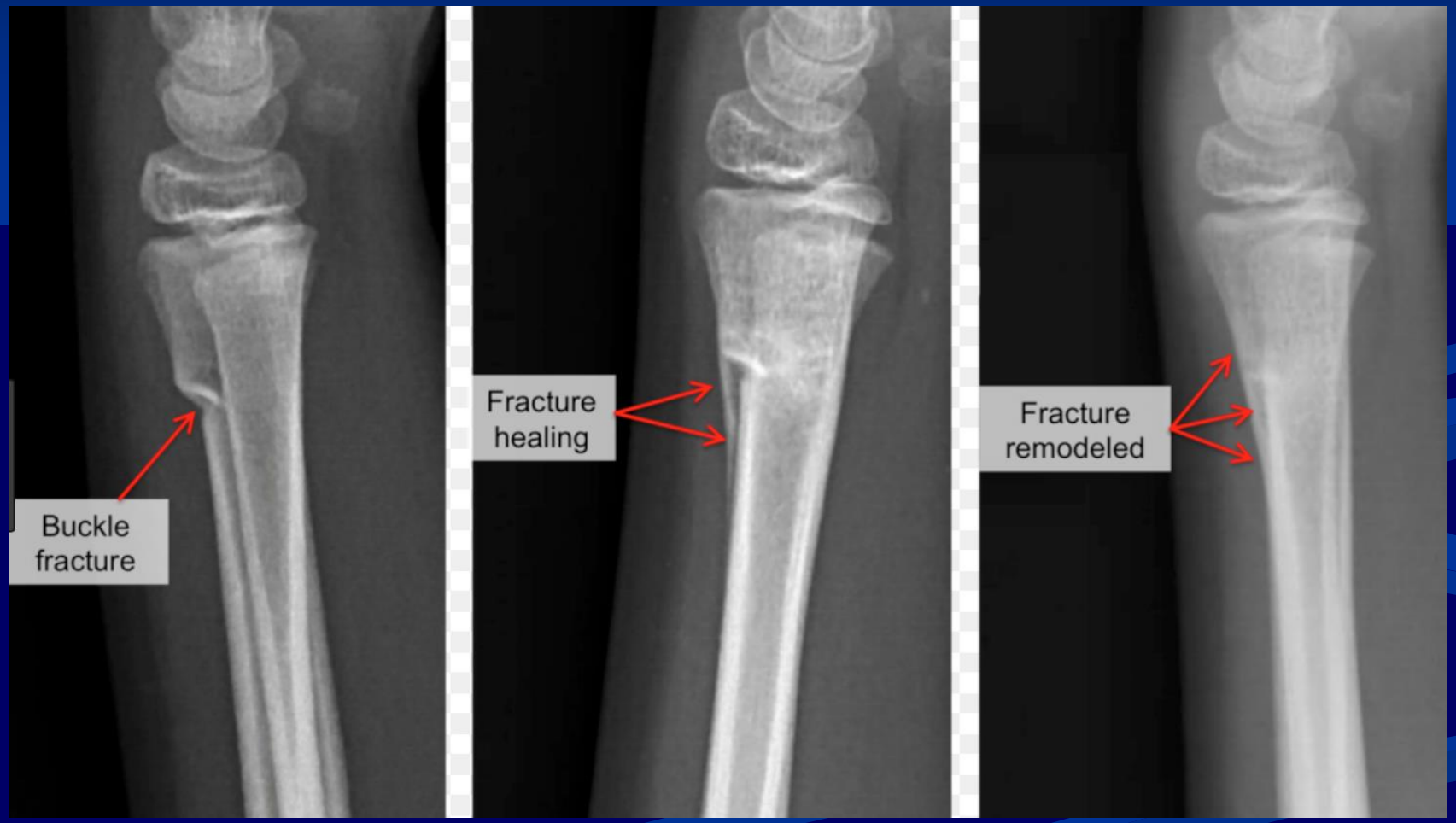
- Similar fracture mid-shaft = surgery

Closer Proximity to growth plate=Greater Remodelling

- Similar fracture mid-shaft = surgery



Distal Radius Buckle Fracture



Distal Radius Buckle Fracture

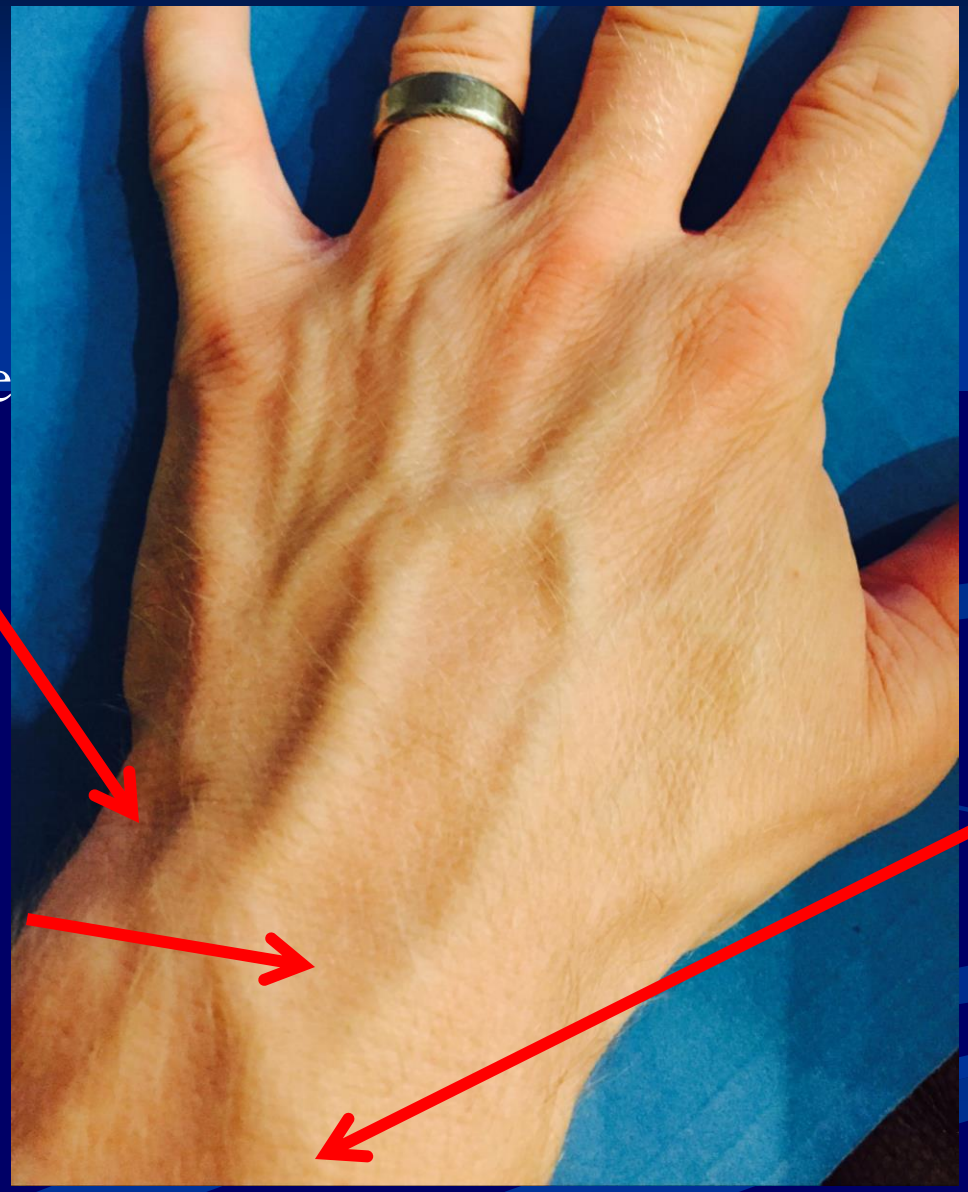
- Very stable
- Cast and splint both options
  - If an athlete cast may be more appropriate
- Only need immobilization for 1-3 weeks
- No need for ortho if pediatrician comfortable

To refer or not to refer?

- Any angulation or displacement refer out
- Buckle Fractures
  - We always love to see, but…..Pediatrician can treat if desired
  - Brace an option, some parents insist on cast
  - The younger the patient, the less cast is a necessity

Ulnar and Dorsal Wrist pain

Triangular Fibrocartilage Complex (TFCC)



Ganglion Cyst

Growth Plate Injury

Growth Plate Fracture distal radius

- Pain 2cm proximal to wrist joint
- Diagnosis – Xrays
- Salter Harris 1 fractures not visible
- Treatment- Brace verses cast
- 4-5% chance of growth arrest

Radial Sided Pain

- Snuffbox pain
  (Scaphoid injury)

Flexor (DeQuervan's)
Tenosynovitis

17 year old s/p motocross crash

Scaphoid fracture

Wrist fracture

Scaphoid Fractures

- Thumb spica cast needed
- Any snuffbox pain =

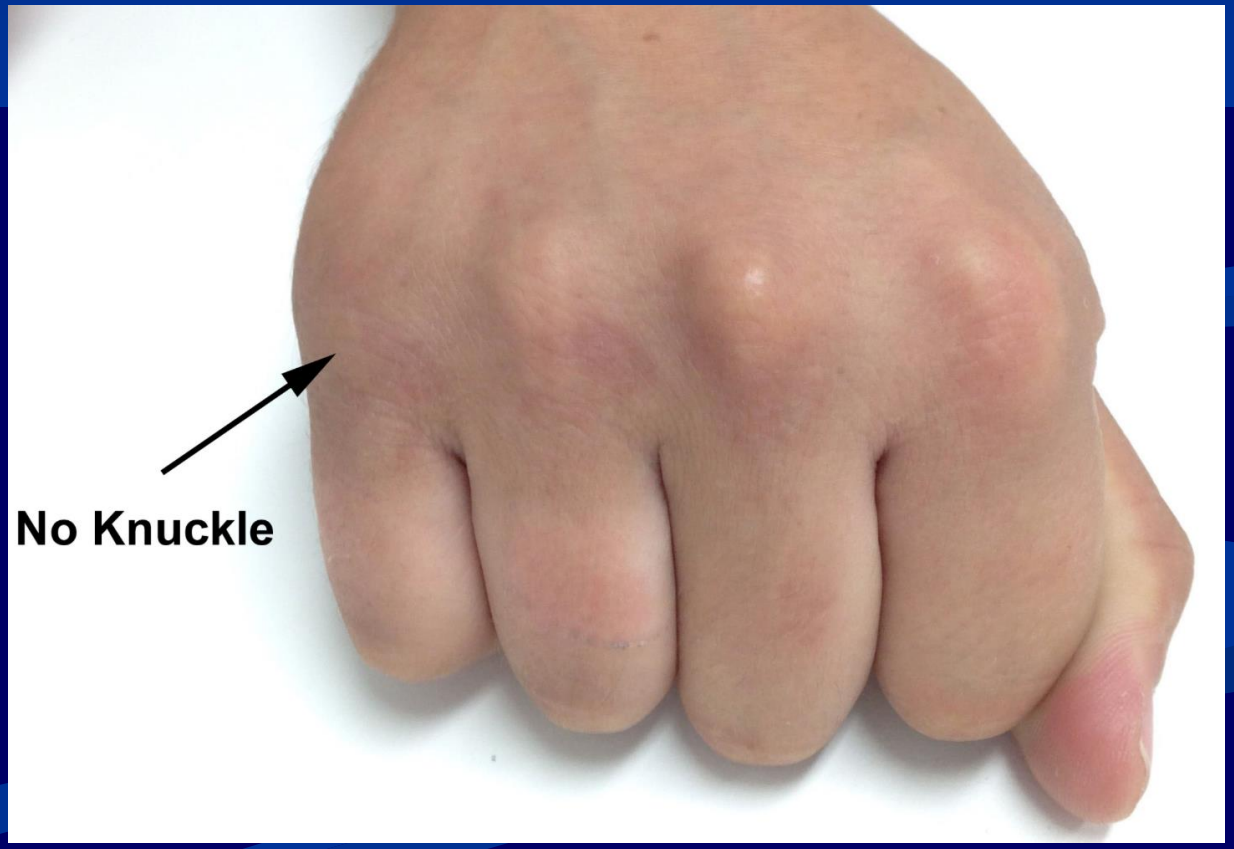
Spica cast regardless of xrays

Metacarpal Fractures

- Fifth Metacarpal "boxer" fracture
  - Cast 2-3 weeks then brace is ok
  - Angulation up to 40-60 degrees is ok

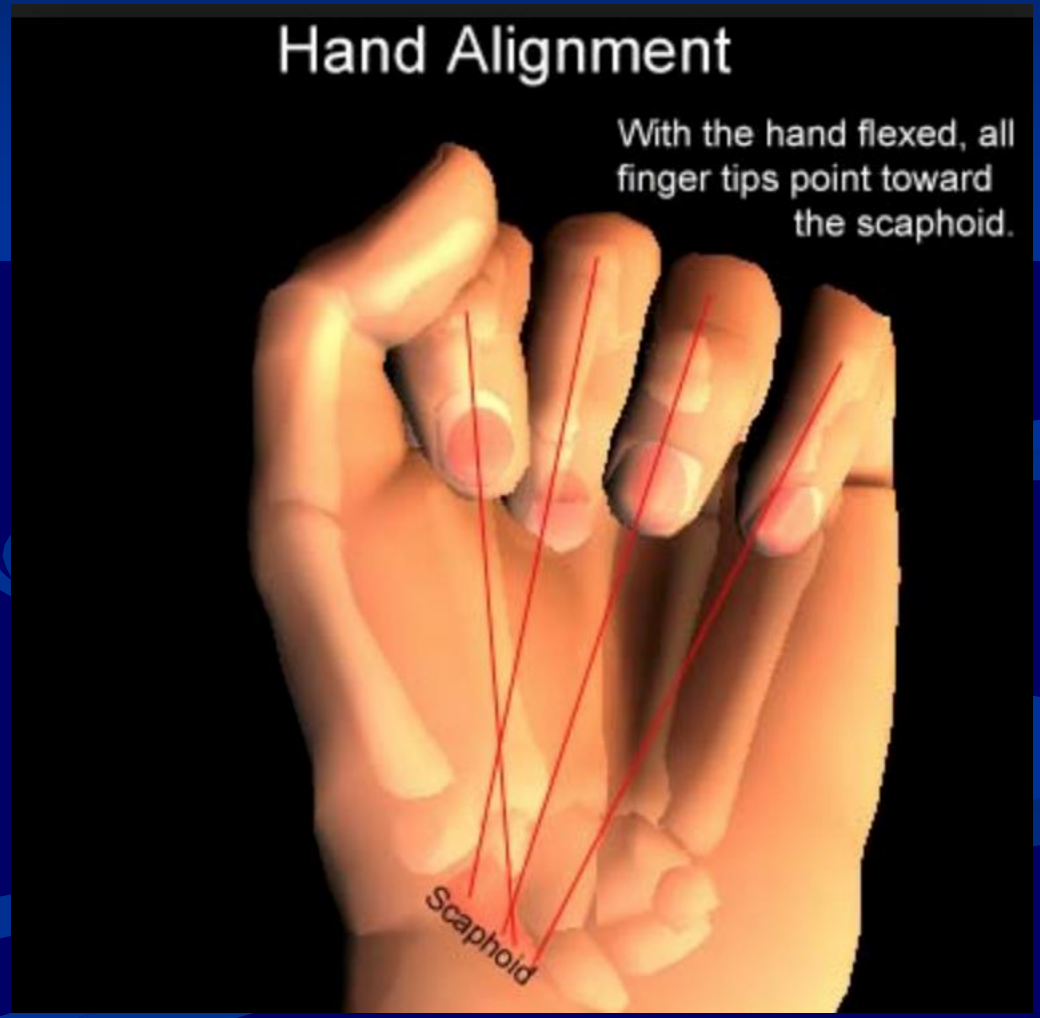
Metacarpal "Boxer" Fractures

- Decrease in knuckle prominence
- Minimal functional problems



Metacarpal Fractures

- Beware of rotation with hand fractures



Metacarpal Fractures

- Most need casts
- Any rotational deformity needs surgery

Scissoring in Hand Fractures

- Can occur in metacarpal and phalanx Fractures
- Always check rotation palm up, and slow flexion

Finger fractures that can cause problems

- Long Oblique fractures = rotational prob
- Check for rotation with palm up and flex

Finger fractures that don't need to be referred

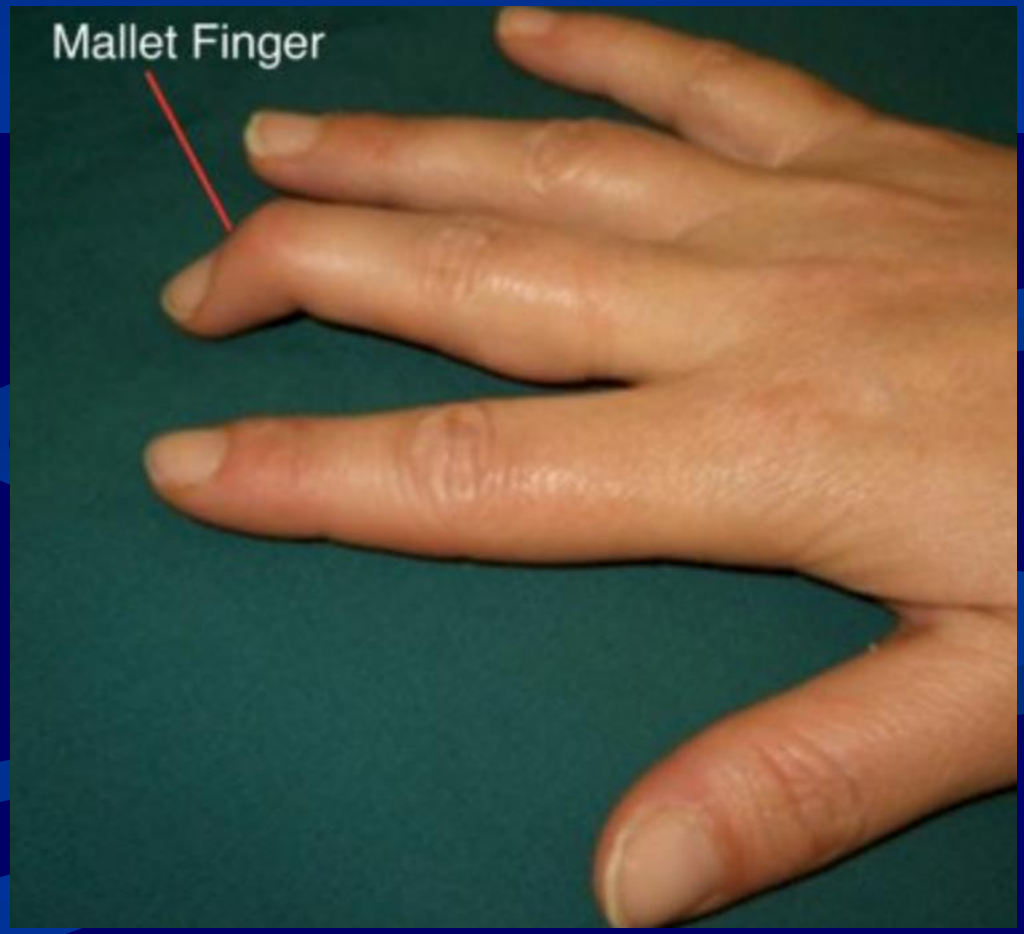
- Base of phalanx small fracture
  - Buddytaping appropriate treatment

Finger fractures that don't need to be referred

- Volar avulsion fractures
  - Need to check for ability to straighten finger
  - Buddy tape is appropriate treatment

Mallet Finger

- Mechanism – Forceful flexion of finger tip
  - Treatment – Stack splint 12 weeks



Mallet Finger

- Can have accompanying fracture or may just be soft tissue injury

Mallet Finger

- Treatment – Stax splint 12 weeks
  - Keeps finger tip hyperextended
  - Very easy to treat
  - DON'T MISS – tough to treat late

Lower extremity fractures

- Pelvic Avulsion Fractures
- Femur Fractures
- Fractures about knee
- Tibia fractures
- Ankle fractures
- Foot Fractures

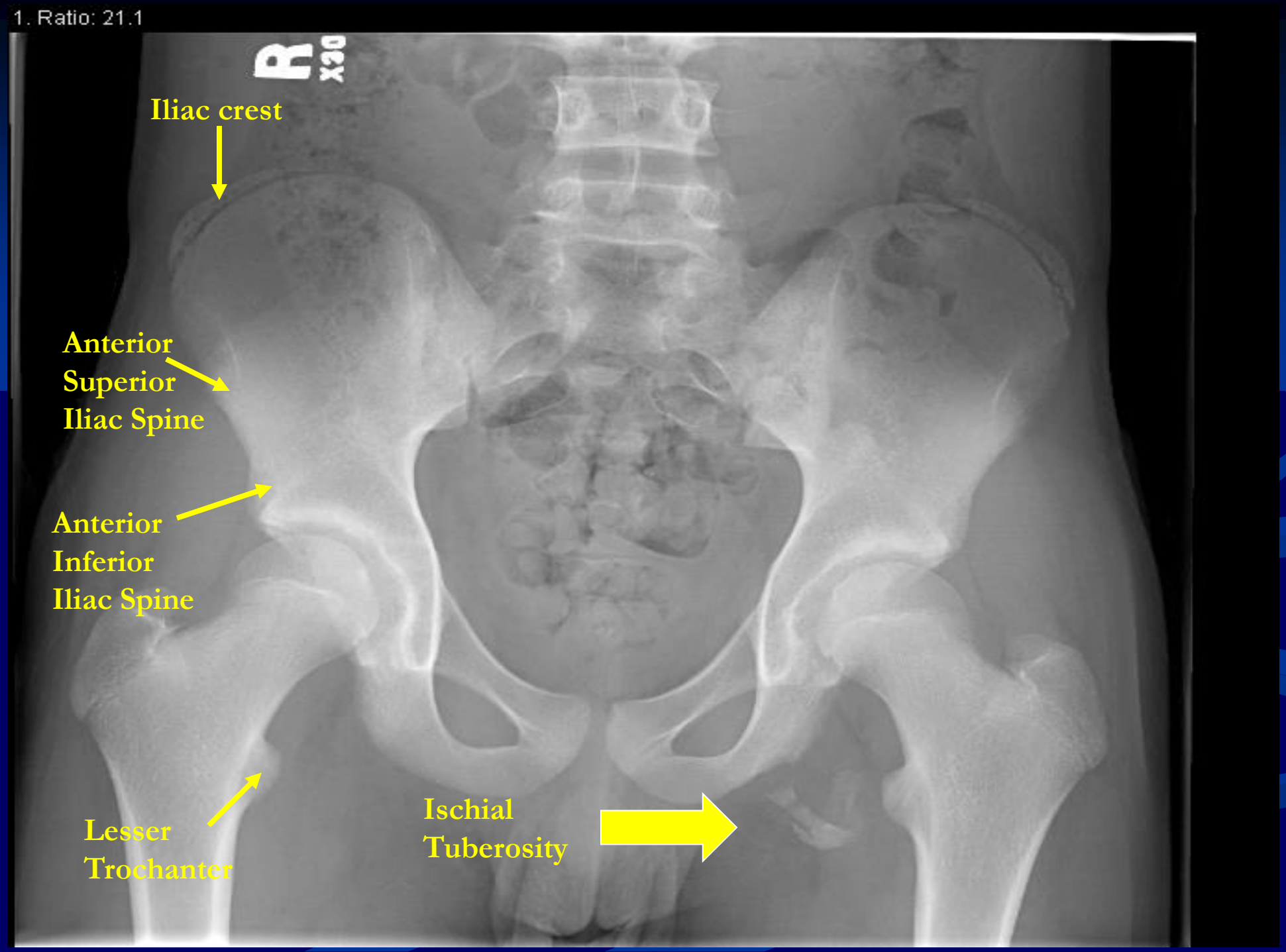
Pelvic Avulsion Fractures

- Most common in boys between age 12-14 years

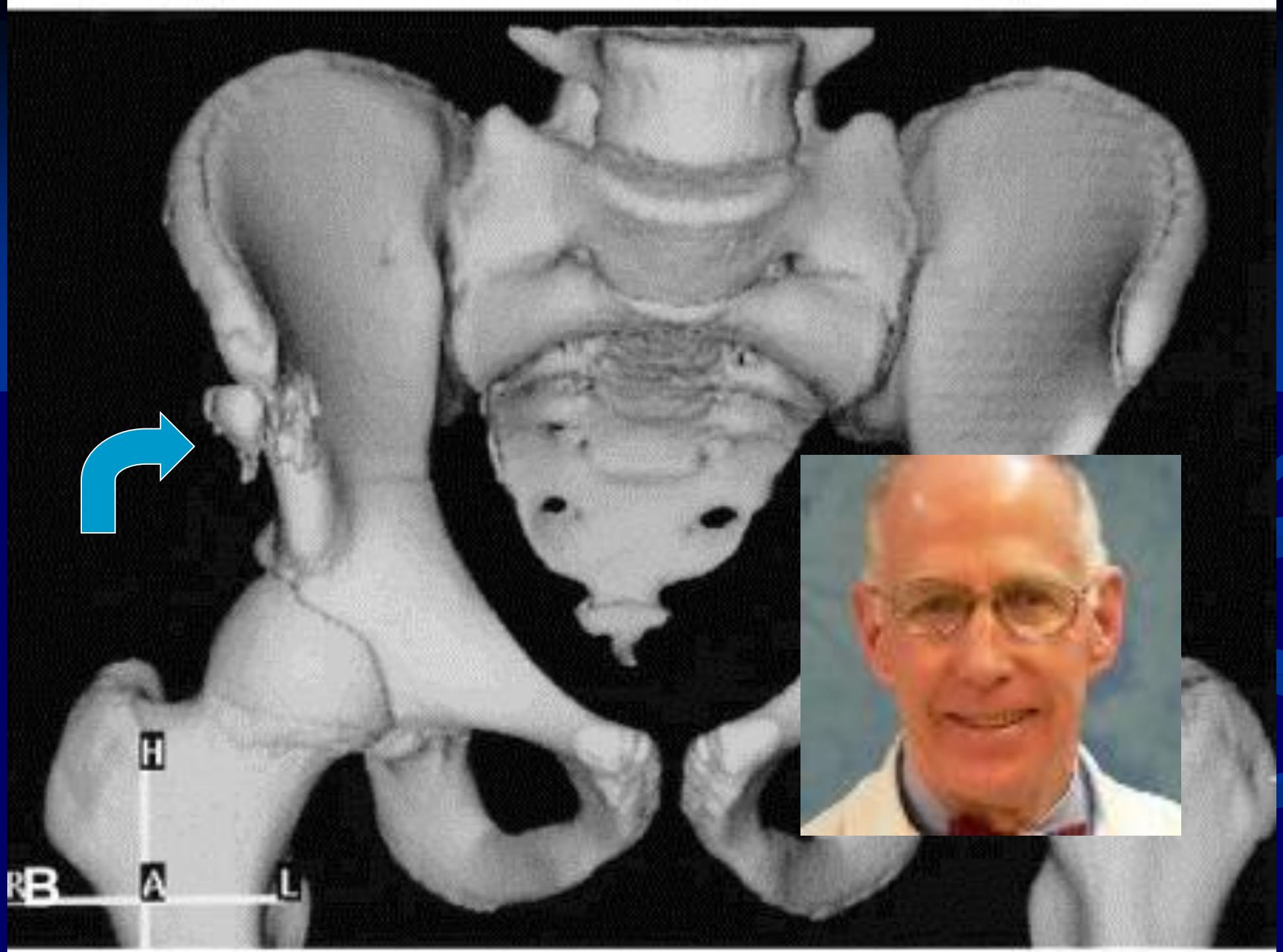
- Mechanism : forceful contraction (sprinting, kicking, jumping)
  - Often an eccentric load (landing)

Pelvic Avulsion Fractures

- Localized tenderness on physical exam
- Pain with stretch of affected muscle
- Antalgic Gait, Limping, Pain worse with activity
- Radiographs are diagnostic


1. Ratio: 21.1
R
X30
Iliac crest
Anterior
Superior
Iliac Spine
Anterior
Inferior
Iliac Spine
Lesser
Trochanter
Ischial
Tuberosity

Iliopsoas Avulsion Fracture


H
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Femur Fractures

- Beware of the femur fxs in patients <2 y/o
  - Up to 60 % are due to non-accidental trauma

Femur Fracture Treatment Based on age

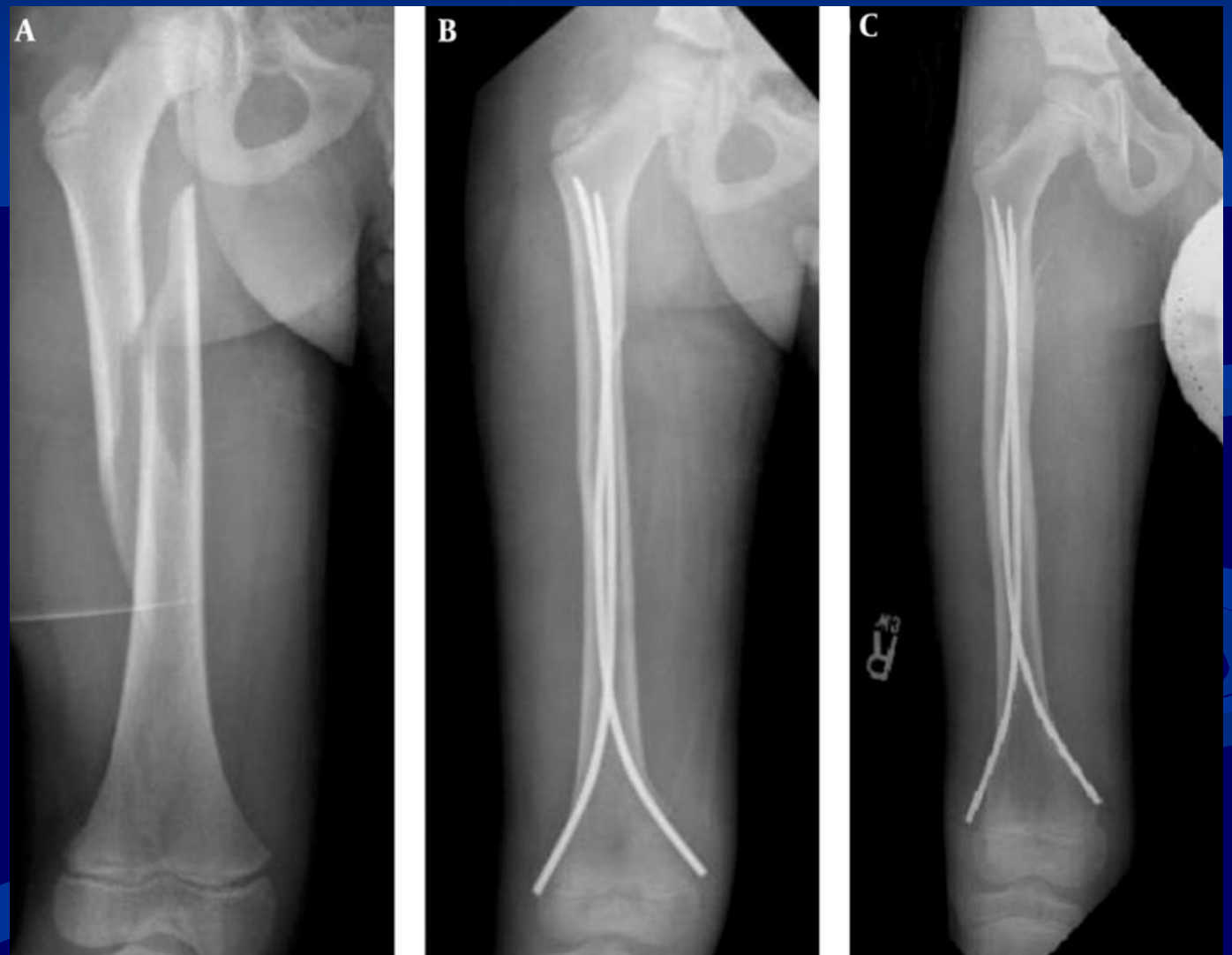
- <1 year old = Pavlik harness
  - Lines bone ends up in flexion and abduction

Femur Fracture Treatment Based on age

- Spica Cast 12 month – 5 y/o
  - Usually 4-5 weeks

Femur Fracture Treatment Based on age

- Ages 5-10 flexible nails



Femur Fracture Treatment Based on Age

- Ages 10 and up rigid nails

Femur Fracture Treatment Based on Age

Femur Fracture Treatment Based on Age

Femur Fracture Treatment Based on Age

Tibia Shaft fractures

- If displaced, typically addressed surgically in patients 8 and up

Tibia Shaft fractures

- If displaced, typically addressed surgically in patients 8 and up

Tibia tubercle Fracture

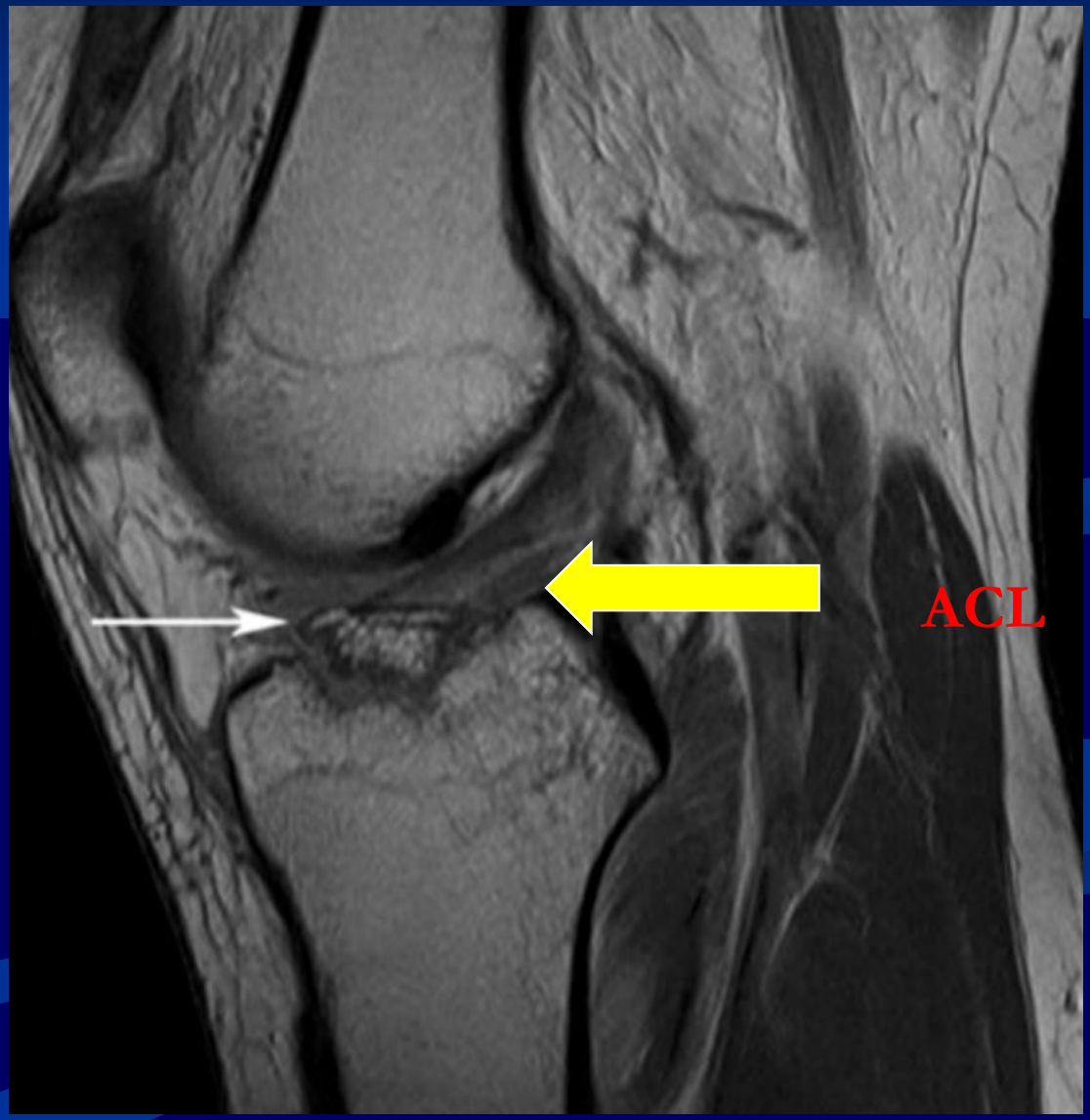
- Tibia tubercle fracture
  - They all need surgery
  - An avulsion of the tubercle from patellar tendon
  - Osgood Schlatter gone bad

Fractures about the knee

- Tibia spine avulsion fracture
  - Similar to ACL tear.
  - If displaced, need surgery

Tibia Spine Avulsion Fracture

- Tibia spine avulsion fracture
  - ACL avulses the bone fragment from shaft



Ankle Fractures

- Medial malleolus Fracture
- Lateral Malleolus Fracture
- Bimalleolar Fractures
- Tillaux fractures
- Triplane Fractures
- ANY OF THESE WITH DISPLACEMENT NEEDS SURGERY

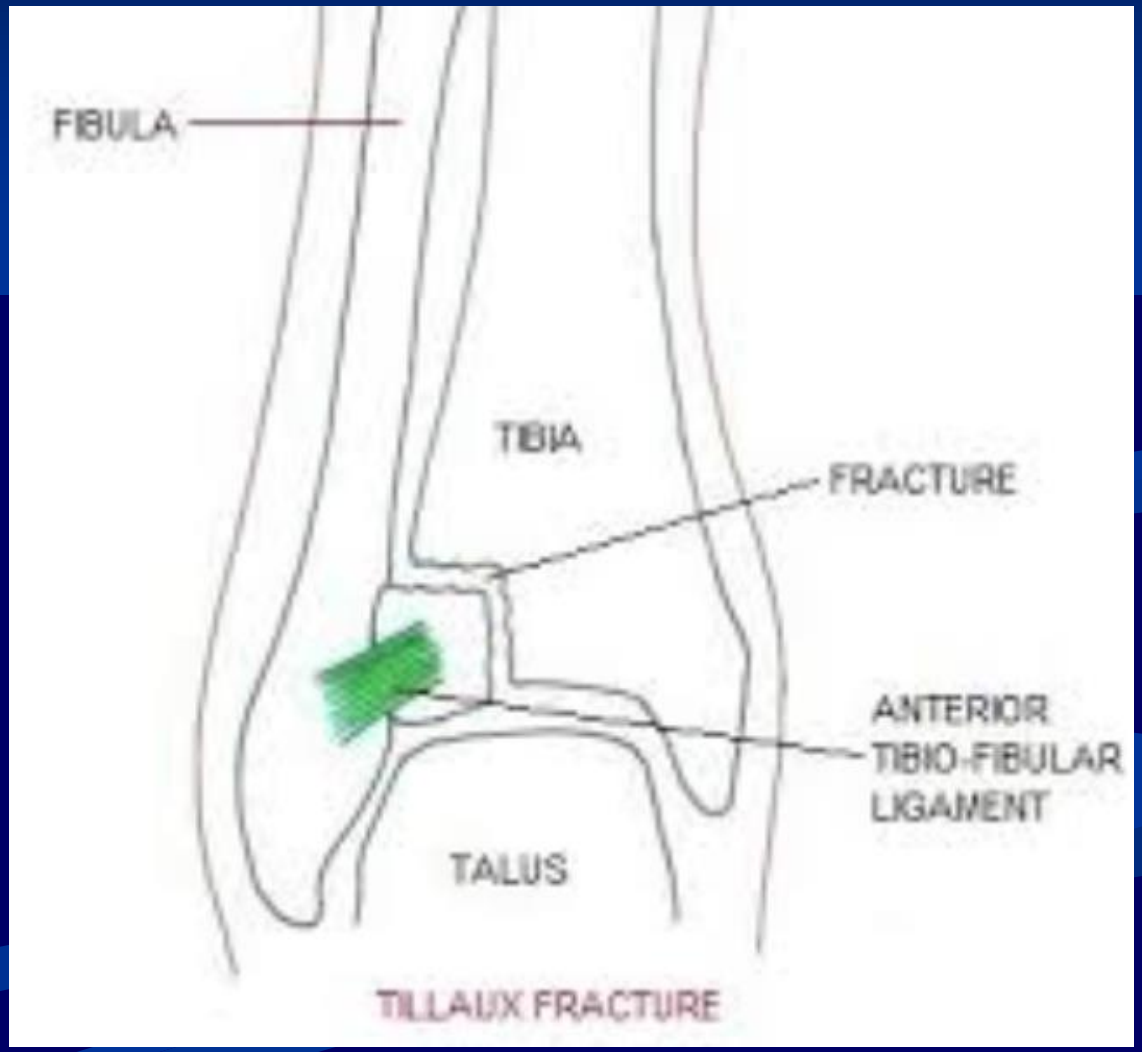
Ankle Fractures

- Up to 40-50% growth plate arrest
  - BIMALLEOLAR FRACTURE

Tillaux Fractures

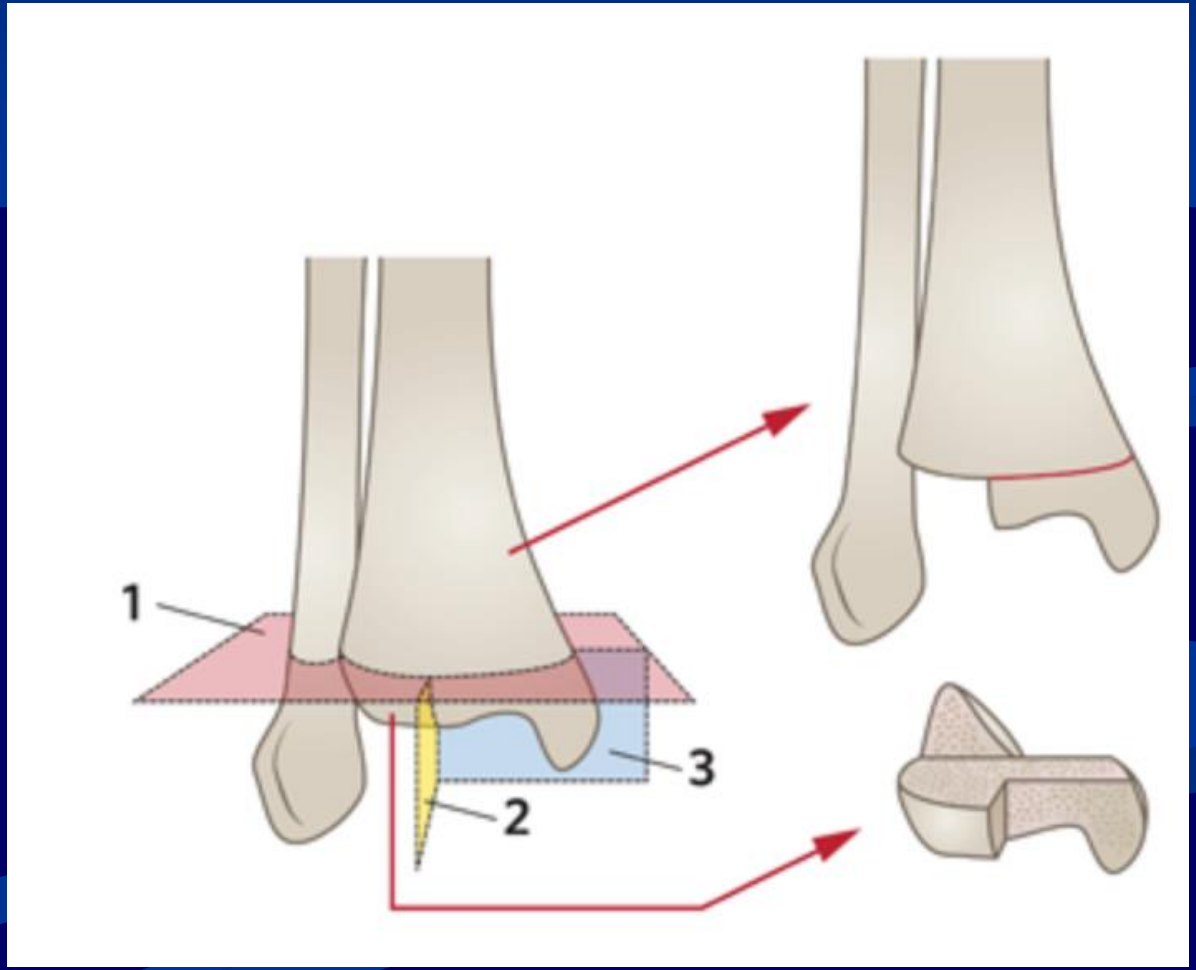
- Occurs just before physes close
- It is a fracture going into joint

  Any displacement needs surgery



Triplane Fractures

- Fracture travels in 3 planes
- Almost all need surgery
- Physeal arrest high
  - Long term follow up



Triplane Fractures

- Fracture travels in 3 planes
- Almost all need surgery
- Physeal arrest high
  - Long term follow up

Foot Fractures

- Metatarsal fractures
- Toe Fractures
- “Calcaneus Fractures”
- Tarsal Bone fractures
- Growth plate fractures

Foot Fractures

- Metatarsal fractures
  - More Forgiving then metacarpal FXS
  - Most treated nonoperatively

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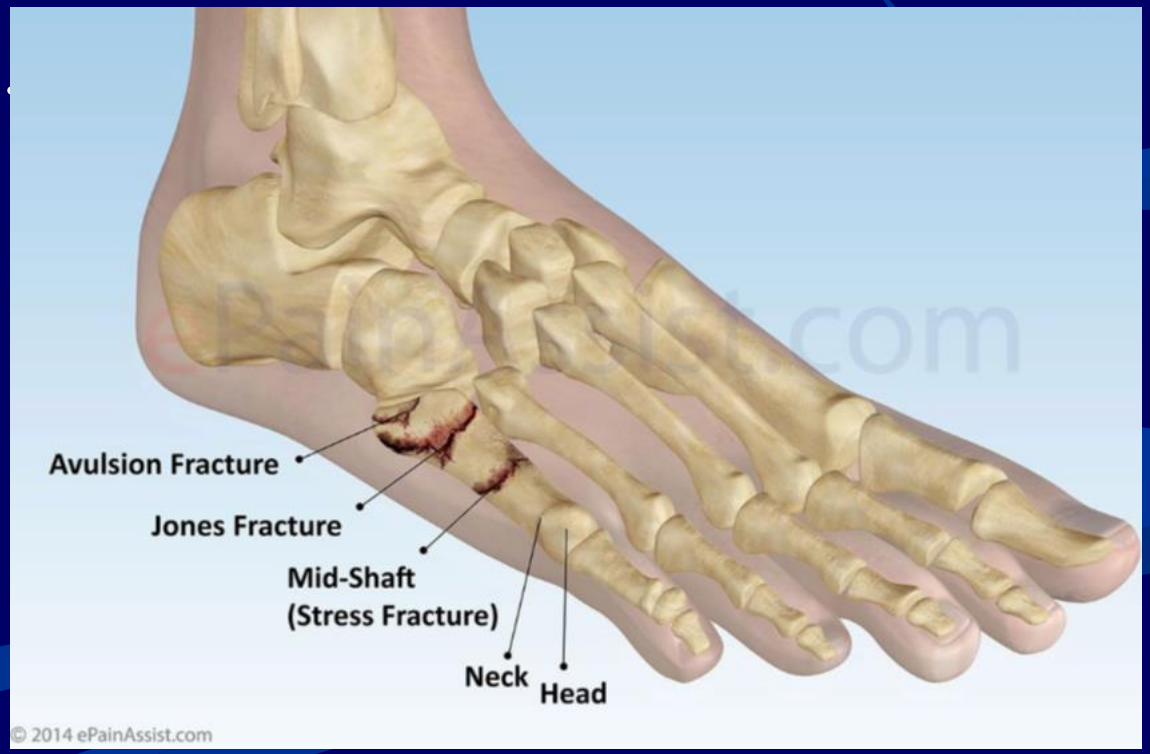
  - JONES FRACUTRE
    - Base of 5th metatrsal



Jones Fractures

- Metatarsal fractures
  - More Forgiving then metacarpal FXS
  - Most treated nonoperatively, except….
  - JONES FRACUTRE
    - Base of 5th metatarsal
    - If displaced needs surgery
    - If nondisplaced cast for extended time

Jones Fractures

- Metatarsal fractures
  - More Forgiving then metacarpal FXS
  - Most treated nonoperatively, except….
  - JONES FRACUTRE
    - Base of 5th metatarsal
    - If displaced needs surgery
    - If nondisplaced cast for extended time

Base of 5th Metatarsal Growth Plate

- Not true fracture
- Comparison xrays contralateral can help
- Boot as needed till asymptomatic

Toe Fractures

- Only ones to worry about…
  - Great toe
  - Intraarticular fractures
- Treatment
  - Rigid fracture shoe
  - Cam boot
  - No ortho follow up needed