

# Evaluation of Common Fractures

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Orthopedics

# Objectives

- Characteristics of pediatric bone and fractures
- Treatment, evaluation, and management of fractures
- Recognize patterns associated with child abuse

# Key Points

1. Obtain at least 2 view X-rays of the area of concern
2. Manage select fractures in your office
  - Birth injuries
  - Buckle fx
  - Toddler fx
  - Clavicle fx
  - Proximal humerus fx
  - Fibula fractures
3. Refer physeal fractures and fractures needing surgery to pediatric orthopedics

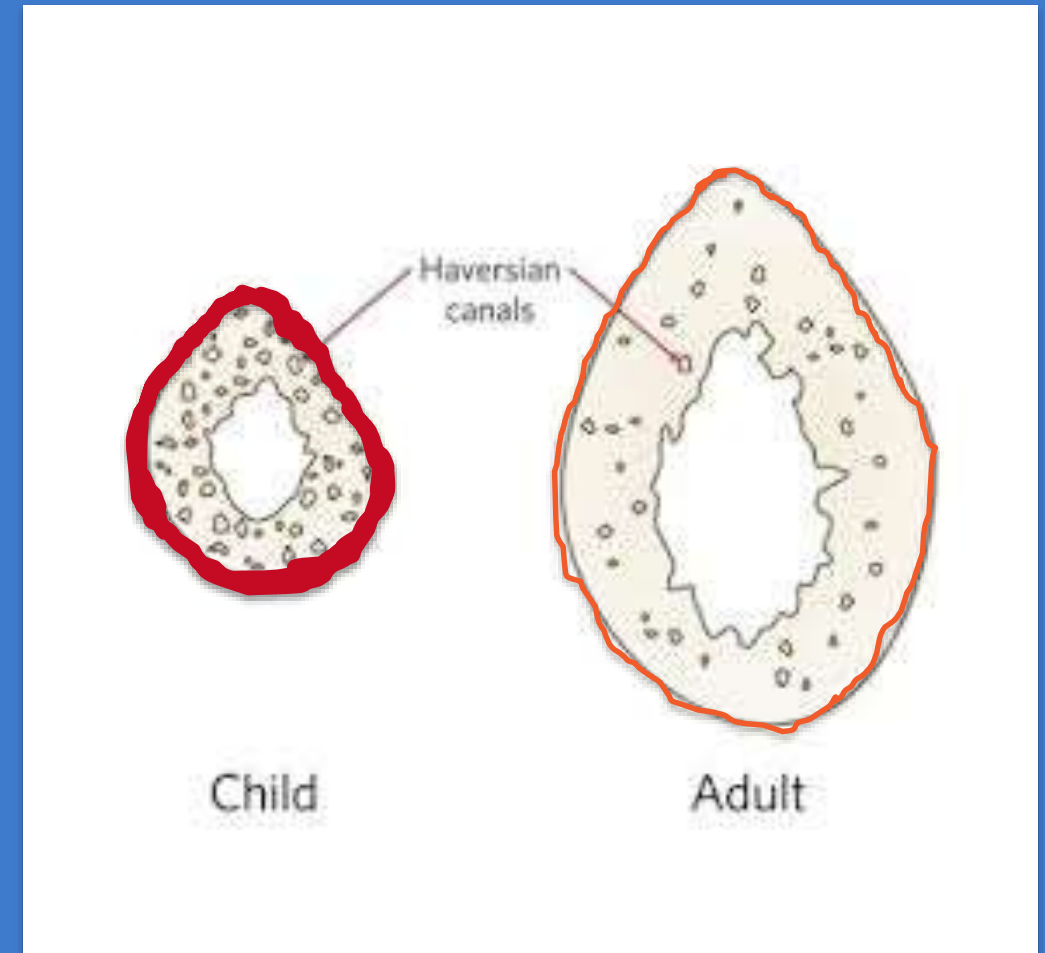


- Fracture rates increasing
  - Sports
  - Obesity
- Male predominance
  - 40% of boys and 25% of girls will sustain a fracture by 16
- 15-30% involve the growth plate



# Properties of an Immature Bone

- More porous
- More flexible
- **Thicker periosteum**  
(lining around the bone)
- Growth plate (physis) is present
- Leads to unique fracture patterns



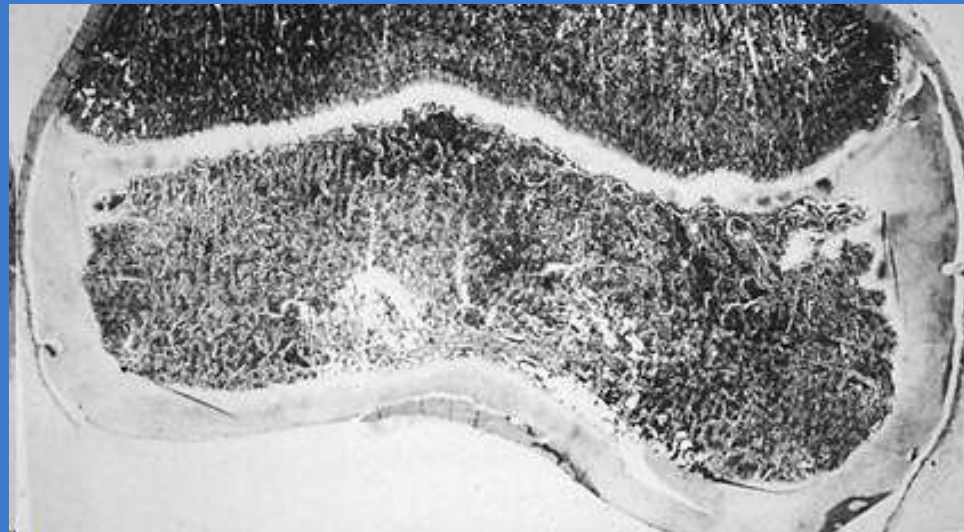
# Fractures Unique to Children

- Buckle fractures
- Plastic deformation
- Greenstick fractures
- Physeal fractures



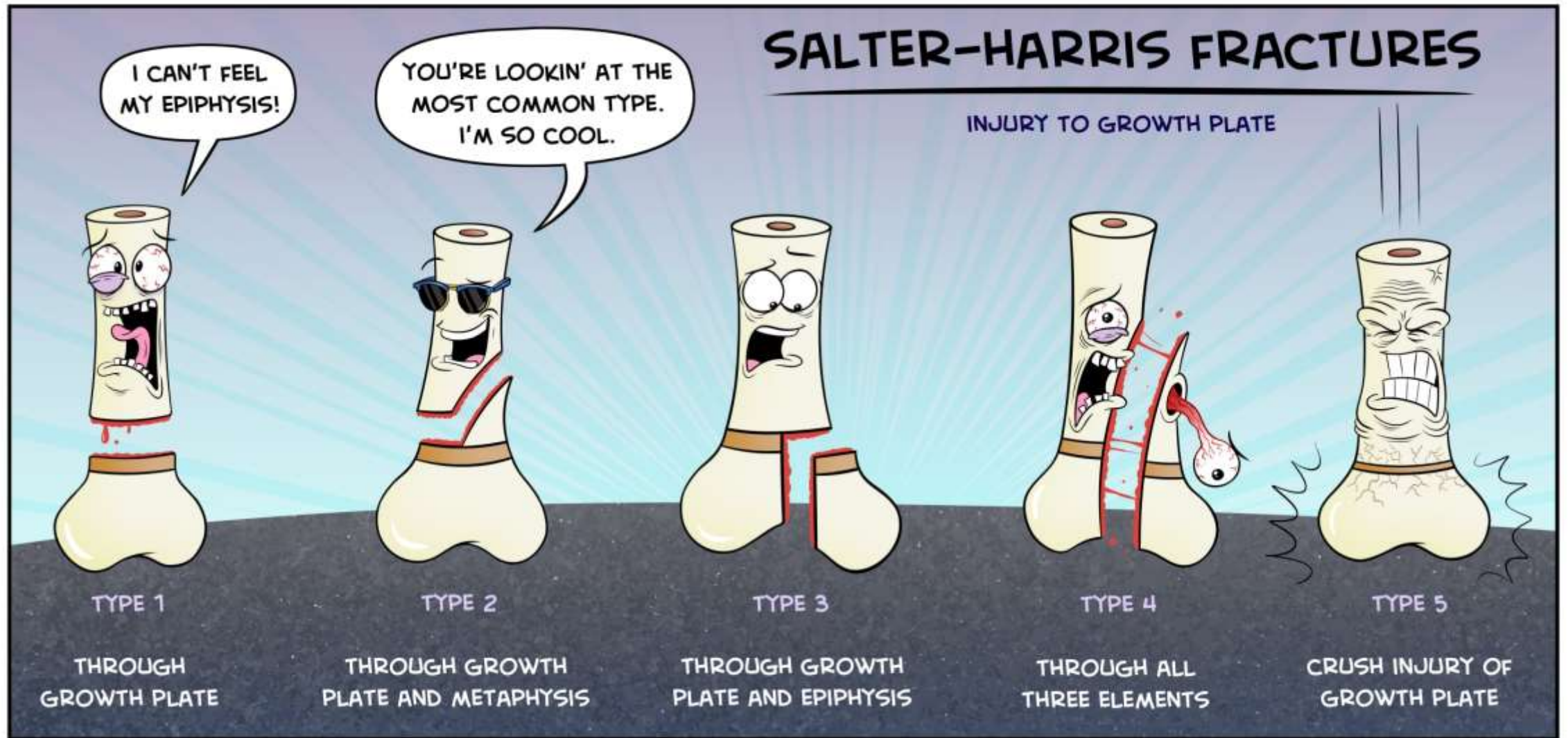
# Physis

- The physis is made of cartilage
- Responsible for longitudinal growth
- Area of relative weakness





# Classification of Physeal Injuries: Salter Harris







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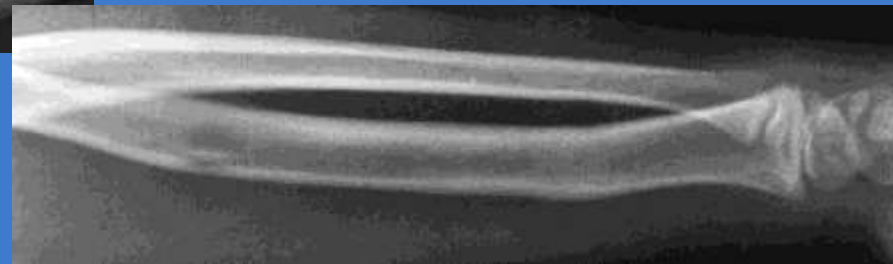
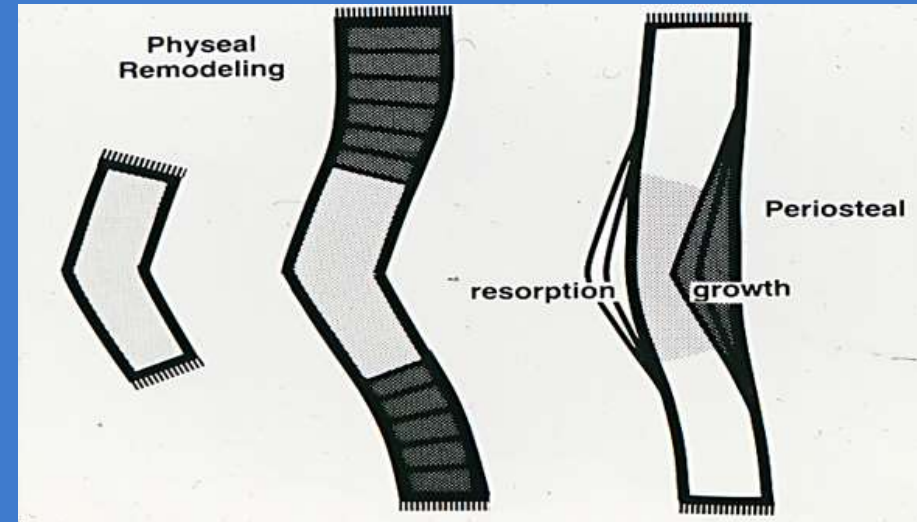
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# Physis is Our Friend

When the bone is angulated,  
the physis will guide growth so  
that the physis will become  
parallel REMODELING



# The Physis is Our Friend



4 + 8



4 + 9



5 + 0



5 + 10

- Process is more robust in younger patients
- Remodeling is faster closer to the physis

# The Pysis can be our FOE

- Damage to the physis can be irreversible
- Resulting in progressive deformity



## Mechanism of injury?

- Home
- Sport
- MVA
- Unknown?
  - Abuse



# Signs of Fracture

- Pain
- Swelling
- Warmth
- Refusal to move extremity





# Physical Exam

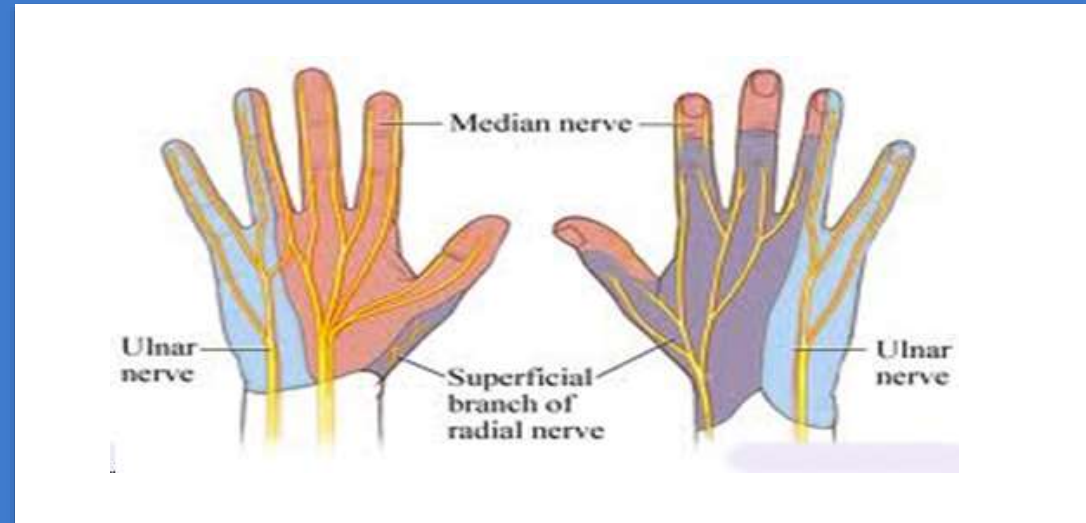
- Examine on parent's lap
- Encourage active rom
- Neurovascular exam
- Inspect and palpate opposite extremity first
- Palpate suspicious area last focusing on joint about and below



# Upper Extremity Nerve Exam

## ROCK (Median Nerve)

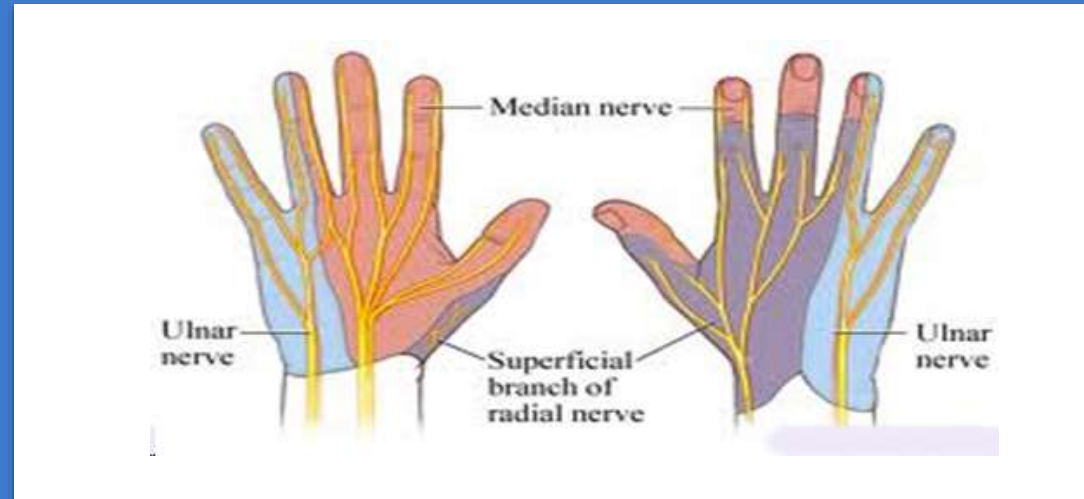
- Motor: opposition of thenar muscles, FPL, FDP
- Sensory: index finger pulp



# Upper Extremity Nerve Exam

## PAPER (Radial Nerve)

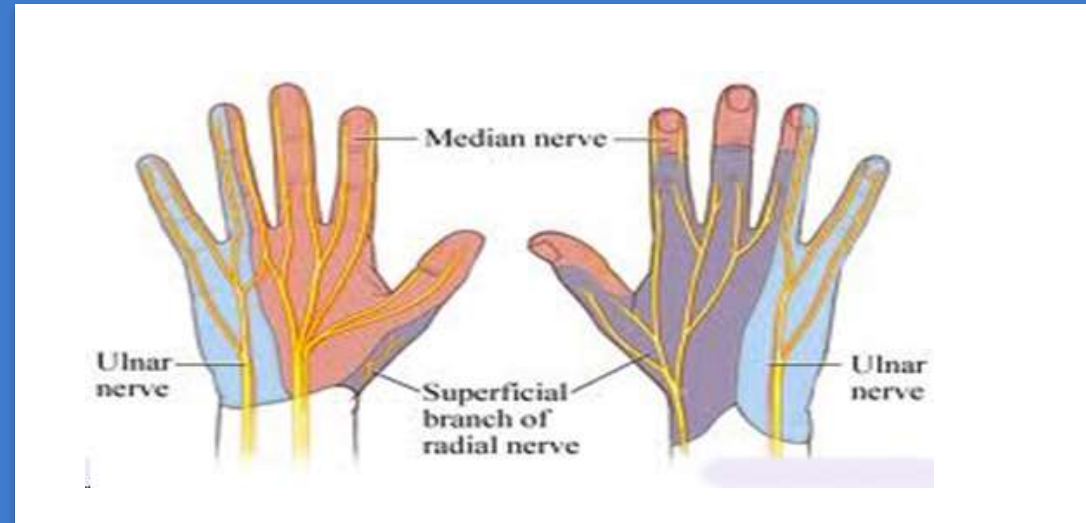
- Motor: wrist, finger, thumb extension
- Sensory: 1<sup>st</sup> dorsal webspace



# Upper Extremity Nerve Exam

## SCISSORS (Ulnar)

- Motor: abduction/adduction of fingers
- Sensory: small finger pulp



# Lower Extremity Nerve Exam

- Femoral nerve
  - Motor – quadriceps – knee extension
  - Sensation – anterior knee
- Tibial nerve
  - Motor – gastroc-soleus and post tibialis – plantarflexion, foot inversion
  - Sensation – plantar aspect of foot





# Lower Extremity Nerve Exam

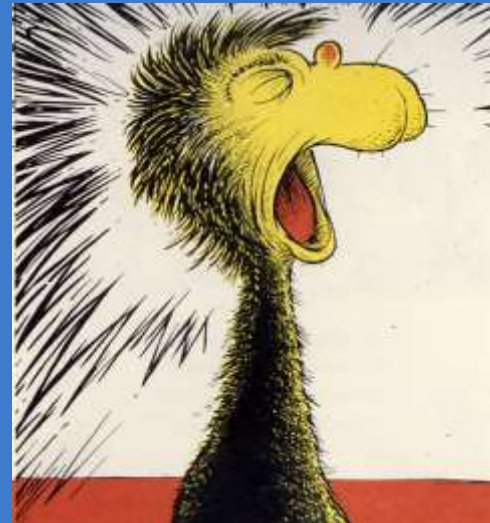
- Superficial peroneal nerve
  - Motor – peroneals – foot eversion
  - Sensory – dorsum of foot
- Deep peroneal nerve
  - Motor – tib ant – ankle dorsiflexion
  - Sensory – 1<sup>st</sup> dorsal webspace





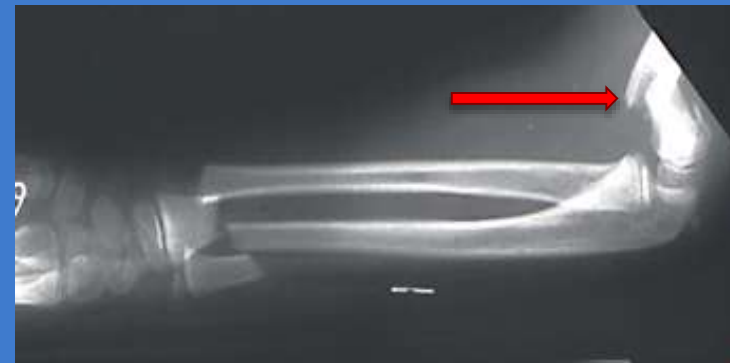
# Who Needs X-rays?

- Obvious deformity
- Loss of function/unwilling to use extremity
- Still hurts the following day



# X-rays

- Always get at least 2 views of the area of interest – AP/Lateral view
- Consider X-rays of neighboring joints based on tenderness and swelling



# Simple Fracture Immobilization

- Splints – prefab material
- Use pillows/towels with tape or ace wrap
- Splint in the position of comfort



# When and Where to Refer

- **Urgent:** To the ER – Significant swelling, neurovascular compromise, open fracture
- **Semi-urgent:** Office visit (w/i 3 days of injury) – fracture involving the physis or joint surface, anything you think may need surgery
- **Within a week:** All other fractures that you are not going to definitively manage

# Open Fracture Management

- If there is an open wound – cover with sterile gauze
- Further evaluation in ER
- Avoid giving food or drink as patient may require surgery or sedation for further treatment
- Ideally send all imaging studies with the patient



# Management of Common Fractures

1. Distal radius – buckle fracture
2. Humeral shaft – newborn fracture
3. Clavicle
4. Proximal humerus
5. Toddler fx (Tibia)
6. Fibula fractures –  
avulsion/non-displaced





# Distal Radius Buckle Fractures

- Torus fracture
- Bone is compressed on one side
- Stable fracture
- Treatment: removable wrist brace for 3-4 weeks



# Buckle Fracture

- Ideal fracture for treatment by Primary Care
- No follow up needed
- Brace is easy to apply
- Cost savings to family



# Plastic Deformation

- These can be subtle injuries
- Bone has a gradual bend
- May not have much pain after a couple of days
- REFER: May require operative treatment because it doesn't remodel



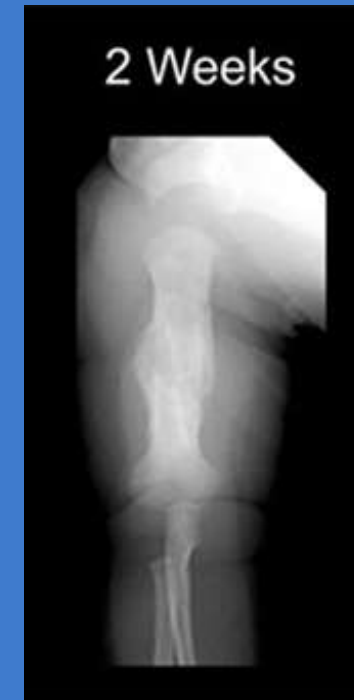
# Clavicle/Humerus Birth Fractures

- Associated with a larger baby, difficult delivery
- May be associated with brachial plexus injury
- Exam may reveal “pseudo paralysis” in the neonate



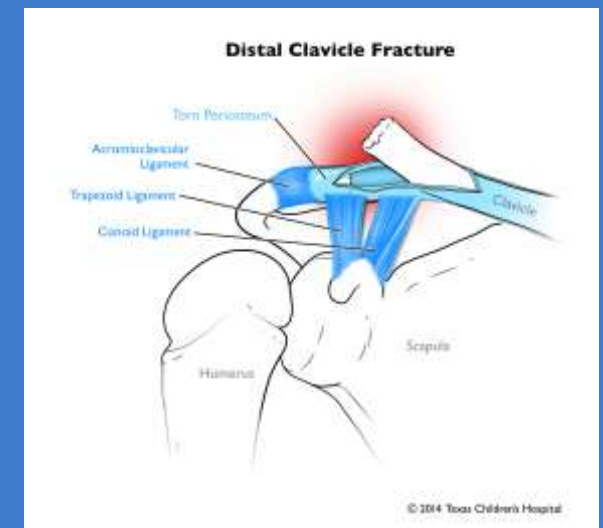
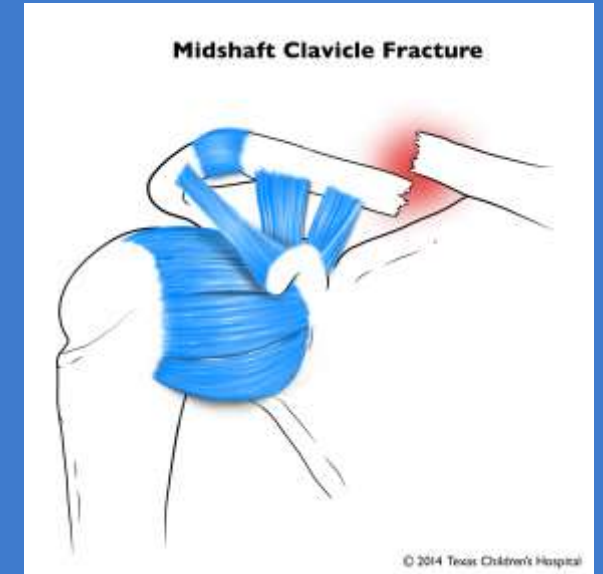
# Clavicle/Humerus Birth Fractures

- Heal rapidly in 2-4 weeks
- Treatment: Safety pin the sleeve at the wrist to the chest



# Clavicle Fractures

- Second most common fracture
- Typical mechanism is fall onto the shoulder
- Exam: pain, swelling, crepitus
- Treatment: sling
- Very few operative indications
- Inform parents of “bump” – callous related to healing





# Promimal Humerus Fractures

- Children < 8 y/o can all be treated non-operatively
  - Significant remodeling potential and shoulder joint compensates for displacement
- Treatment: sling
- Older patients with significant displacement – referral



# Toddler Fracture

- Subtle fracture of the tibia
- May only see the fracture line on one X-ray view
- Child reluctant to bear weight
- Mechanism: low energy
- Differential: infection if no evidence of fracture



# Toddler Fracture

- Treatment is a splint or a CAM boot
- Important to apply the splint appropriately
- Avoid equinus at the ankle and appropriately pad the heel

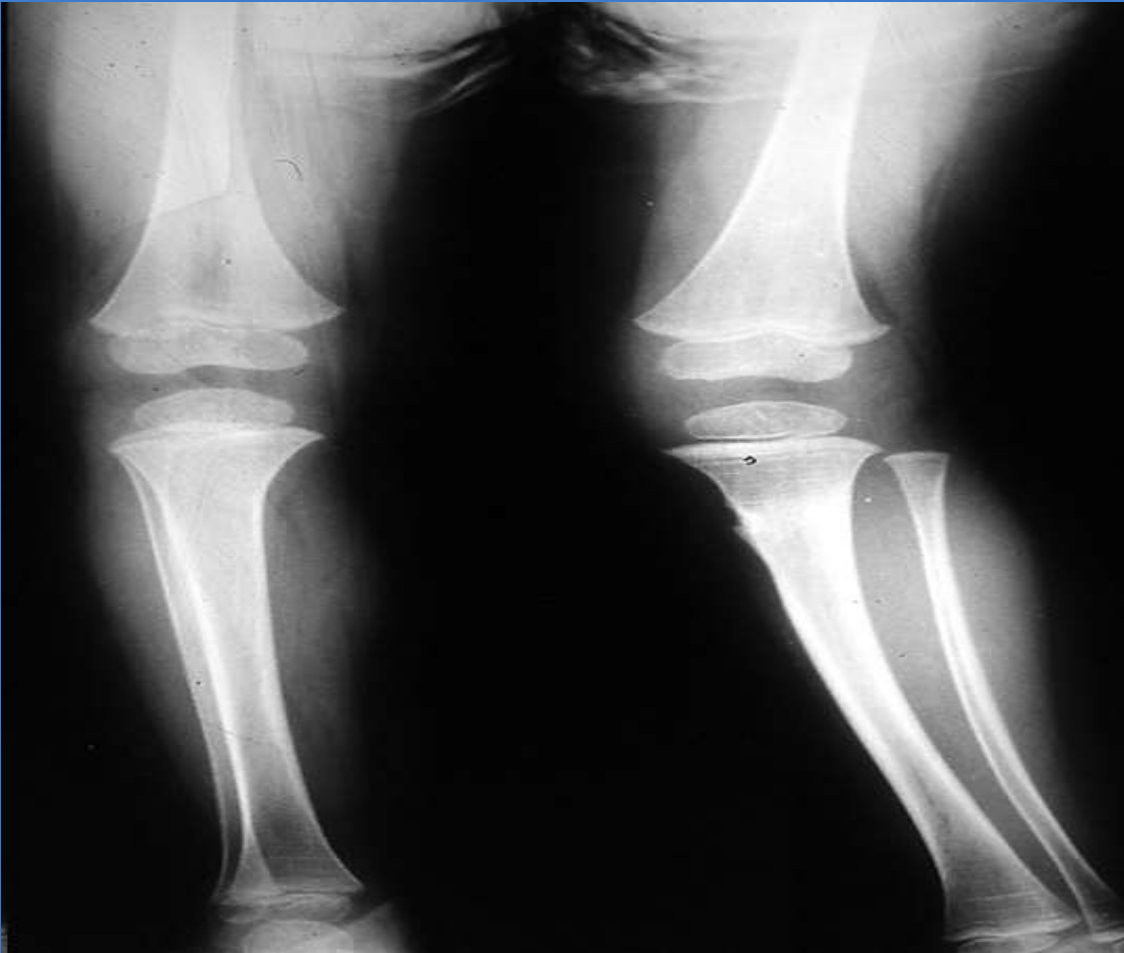


# Greenstick Fractures

- Incomplete fracture
- Fails on the tension side
- Treatment is with a cast
- Refer to orthopaedics



# Greenstick Fracture



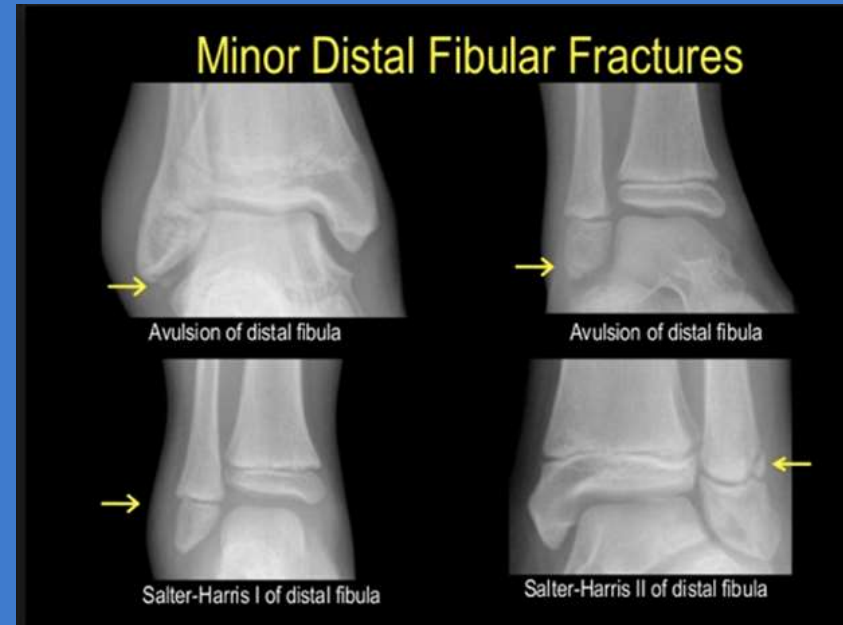
## 9 months later

- Proximal tibia is known for developing this deformity
- Unhappy family

We didn't know  
this could  
happen

# Ankle Injuries

- Typically an inversion injury
- Tenderness to tip of fibula or 1-2 cm proximal (fibular physis)
- Avulsion fx=ankle sprain
  - Lace up ankle brace
    - 2-4 weeks
- SH I/II fracture – CAM boot
  - 4 weeks



# Child Abuse

- Remember child abuse has no zip code
- 50% of fractures in children under the age of 1 are child abuse
- 30% of fractures in children under age 3 are child abuse
- Femur and tibia fractures are rare in children who are not walking





# Child Abuse

- History may be inconsistent or not seem plausible to cause injury
- May seek care in several different facilities
- Delay in seeking care
- X-rays: fractures in various stages of healing, corner fractures



# Summary

- Always obtain at least 2 X-rays to evaluate for fracture
- Many fractures can be safely managed by primary care providers
- Prompt referral for displaced or physeal fractures

