Fractures in Pediatric skeleton

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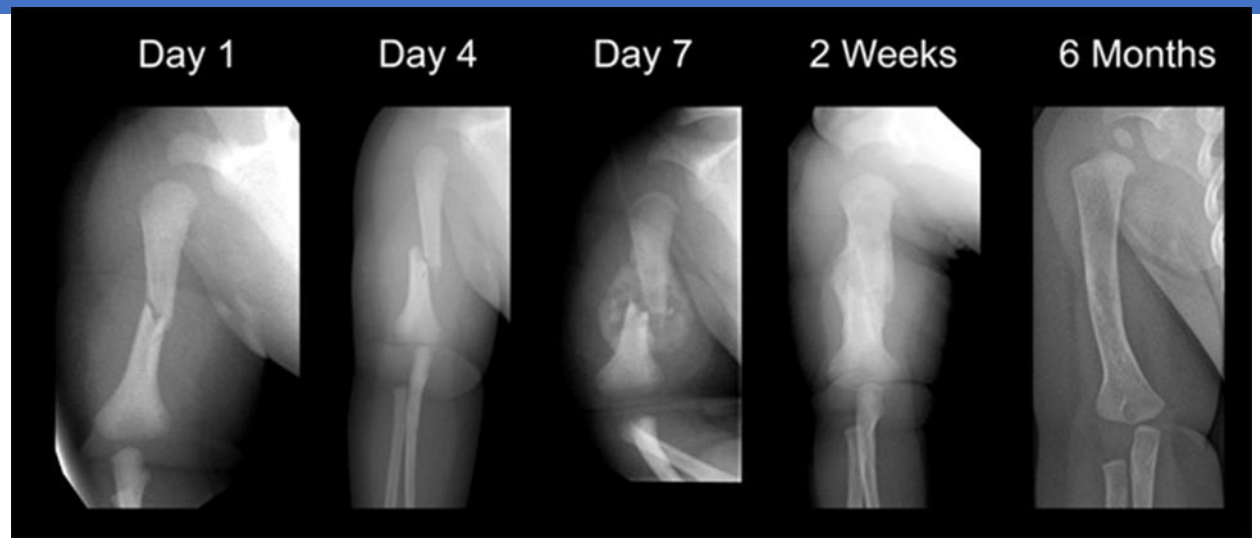
Fractures in Pediatric skeleton

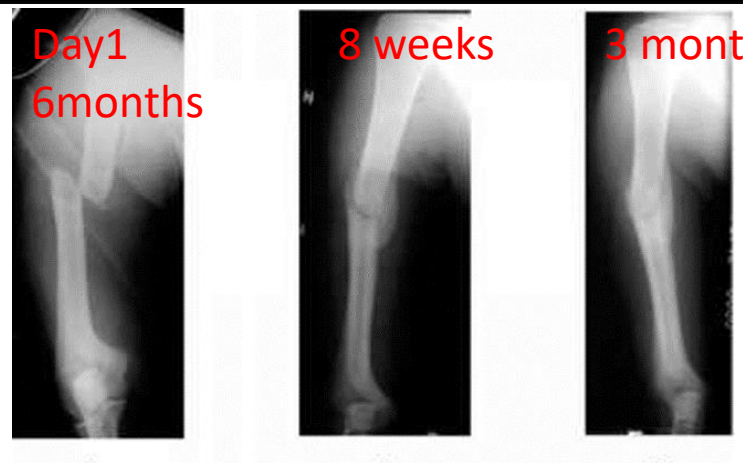
now we present the this case for the child who was a 6 year old & had a history of trauma to her right wrist and developed fracture at the distal radius he was treated first by open reduction and wire fixation. 4 weeks later ,ah she had also another trauma or a falling down and got another refractor at the distal radius which was complicated by malunion as we see now the patient was followed conservatively for six months I know presented to you for your opinion now my question how can we deal with this patient and in general we have two options when is surgical is to go for the operation room to do surgery and this is or this can be done by cutting the bone in your tummy realignment and then prefixation so we have an acute correction for this one of course we have a different other modalities for gradual correction by using an external fixator and cutting the bone with a gradual correction overtime all of these are surgical options and still we have another option that is conservative management just we follow this patient and to see if the Bourne has an on capability of realignment I mean self realignment in a process called remodeling . and in order to depend on this process of remodeling there are certain factors related to the special characteristics orbicular here it is the pediatric skeleton has in order to proceed in this process in the next few slides we will come across these characteristics and we see how we can use them when we face a case of an acute fracture in children or a deformity like the one we have here in this example so let us proceed in the next slide to see what are the main outlines that we need to discuss in this lecture.

Fractures in Pediatric skeleton

- Understand the features of the immature skeleton
- Understand the anatomy of the physis in the immature skeleton
- List different types of growth plate fractures
- Recognize the difference of treating injuries in the growing skeleton, when not to operate ?
- Define the differences in the anatomy and the physiology of the growing skeleton
- List the indications for operative treatment in the growing skeleton
- Understand the different fixation techniques available to treat these injuries

Fractures in Pediatric skeleton





https://www.rch.org.au/fracture-education/fracture_healing/

https://www.barnardhealth.us/humeral-shaft/v-nonoperative-management.html

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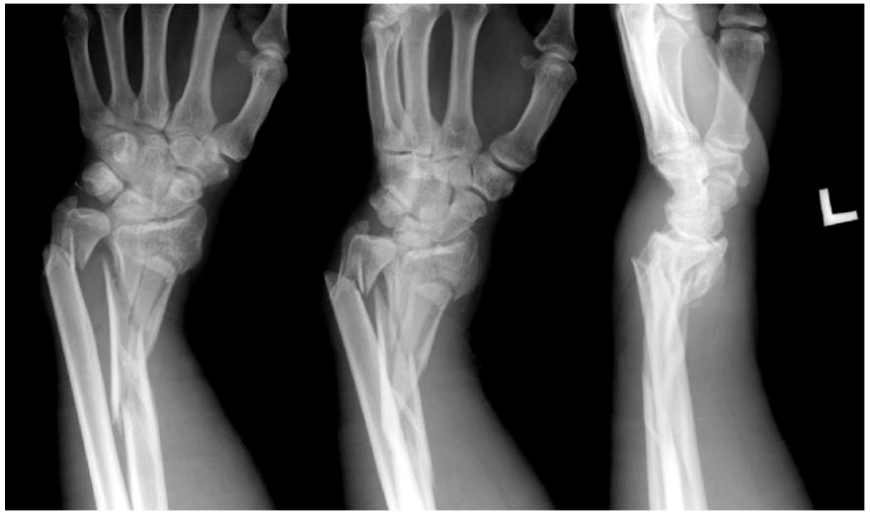


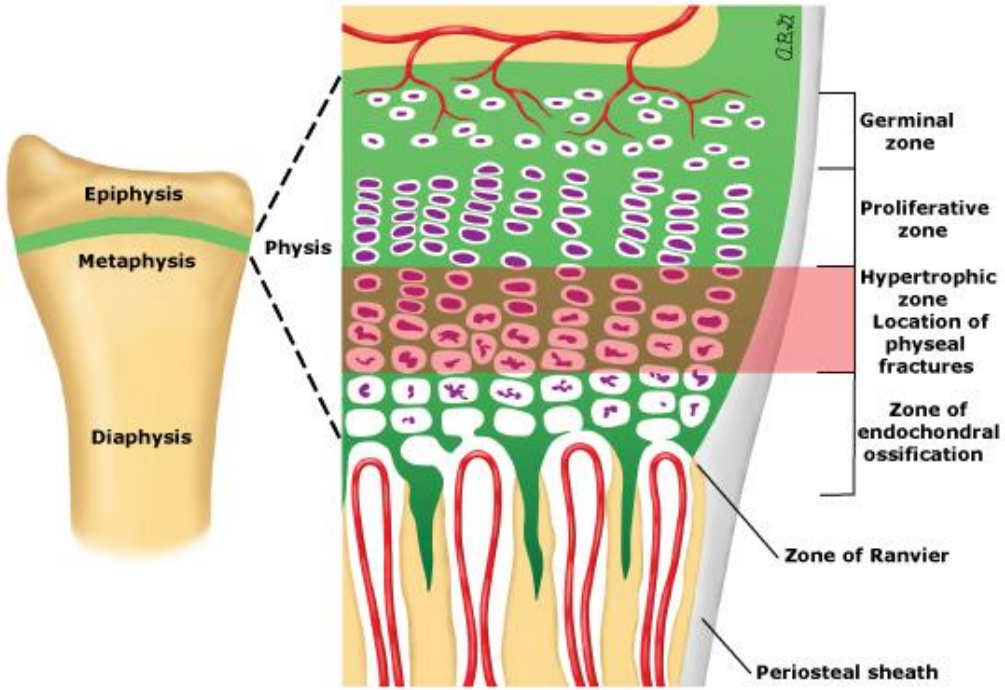
http://www.pmmonline.org/page.aspx?id=848

file:///C:/Users/Flinaro/Downloads/Outcomes_of_Severe_Comminuted_Distal_Radius_Fractu.pdf

Fractures in Pediatric skeleton

Anatomical Peculiarities

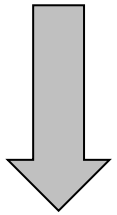
- It's presence is a major difference
- GP is stronger than bone
- Provide perfect remodelling power
- Injury may cause deformity



https://ukemigquickhit.wordpress.com/2012/10/01/salter-harris-fractures/

Fractures in Pediatric skeleton

- **Bone:**
- lower modulus of elasticity



more susceptible to bending forces

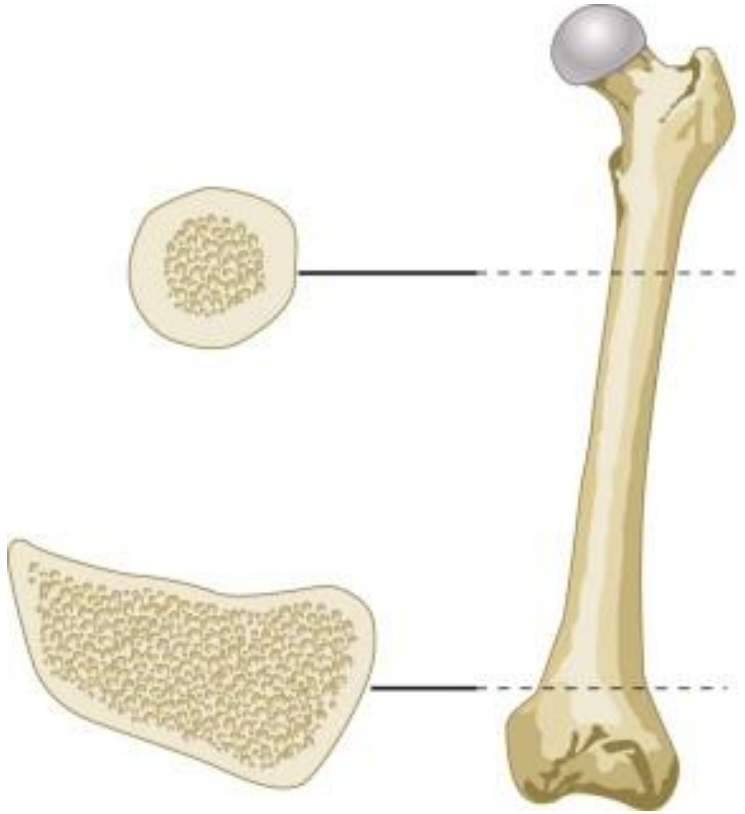
Fractures in Pediatric skeleton

- Increased cancellous bone

  reduces tensile strength

  reduces tendency of fracture to propagate

  Less comminuted fractures



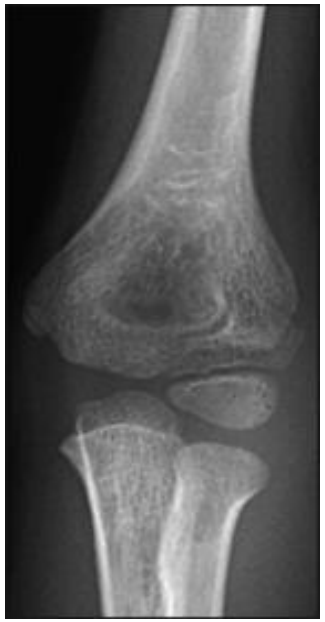
Fractures in Pediatric skeleton

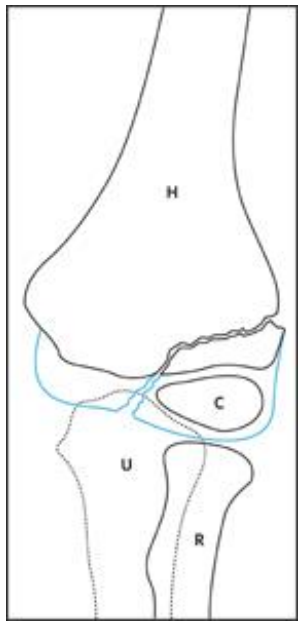
- **Cartilage:**
- Increased cartilage:bone ratio

difficult x-ray evaluation

size of articular fragment

often under-estimated





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- **Periosteum:**
- Metabolically active

- Thickness and strength
  intact periosteal hinge affects
  fracture pattern
  may aid reduction

Fractures in Pediatric skeleton

- **Age related fracture pattern**
- Infants: diaphyseal fractures
- Children: metaphyseal fractures
- Adolescent: epiphyseal injuries

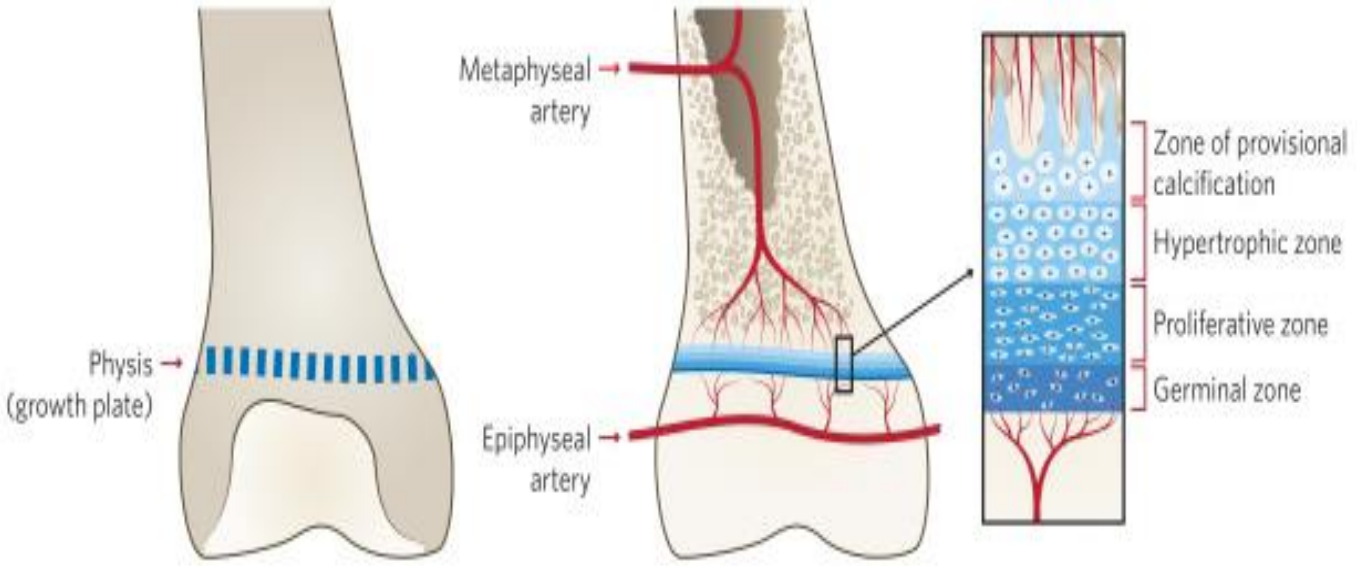
Fractures in Pediatric skeleton

- **Physiology:**
- Better blood supply

  rare incidence of delayed and non-union

Fractures in Pediatric skeleton

Anatomy of the growth plate



https://www.rch.org.au/fracture-education/growth_plate_injuries/Physeal_growth_plate_injuries/

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Physeal injuries

- Account for ~25% of all children's fractures.
- More in boys.
- More in upper limb.
- Most heal well rapidly with good remodeling.
- Growth may be affected

Fractures in Pediatric skeleton

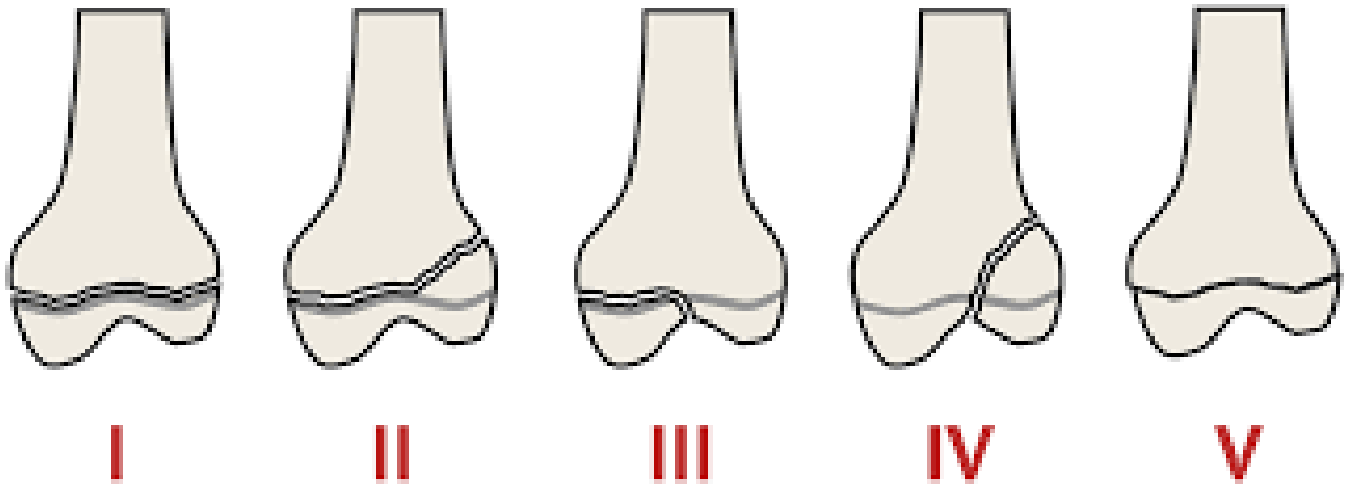
- Less than 1% cause physeal bridging affecting growth.
  - Small bridges (<10%) may lyse spontaneously.
  - Central bridges more likely to lyse.
  - Peripheral bridges more likely to cause deformity

  - Avoid injury to physis during fixation.
  - Monitor growth over a long period.
  - Image suspected physeal bar (CT, MRI)

Fractures in Pediatric skeleton

Classification:

Salter harris



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Prognostic factors

- the treatment.
- the severity of injury
- the patient’s age
- the physis injured

Fractures in Pediatric skeleton

The power of remodeling

Factors affecting remodeling potential of ALL Pediatric #

- **Years of remaining growth** – most important factor
- **Position in the bone** – the nearer to physis the better
- **Plane of motion** –

  greatest in sagittal, the frontal, and least for transverse plane
- **Physeal status** – if damaged, less potential for correction
- **Growth potential of adjacent physis**

  e.g. proximal humerus better than distal humerus

  & distal radius better than proximal radius

Fractures in Pediatric skeleton

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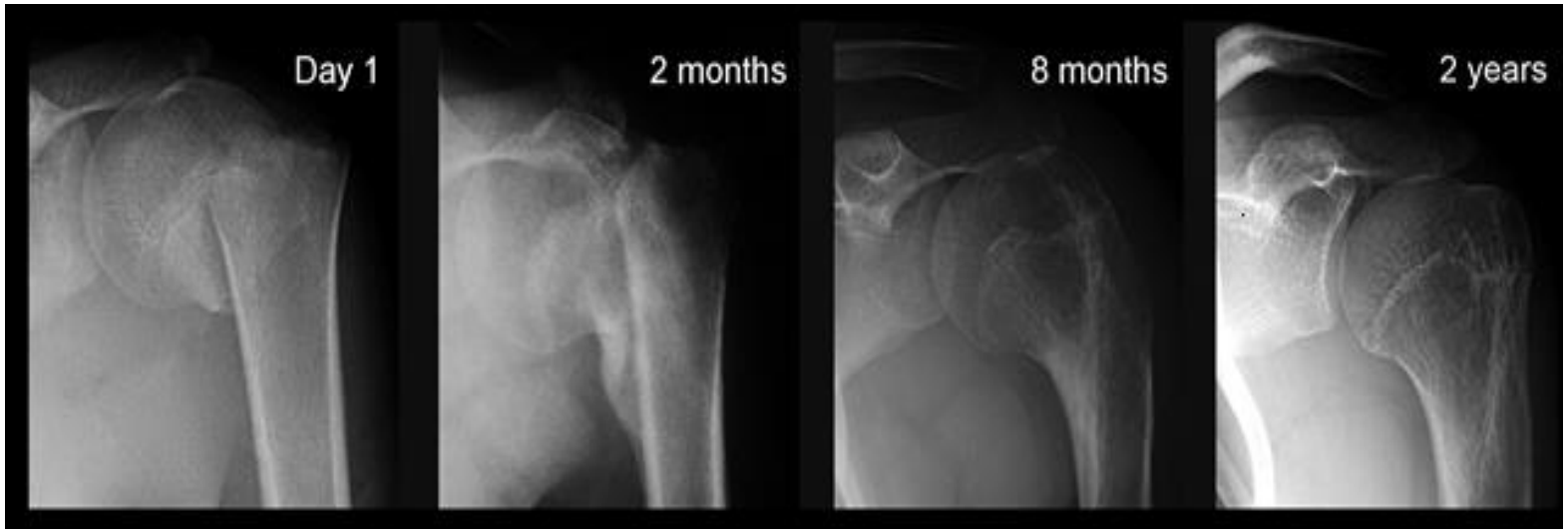
  e.g. proximal humerus better than distal humerus



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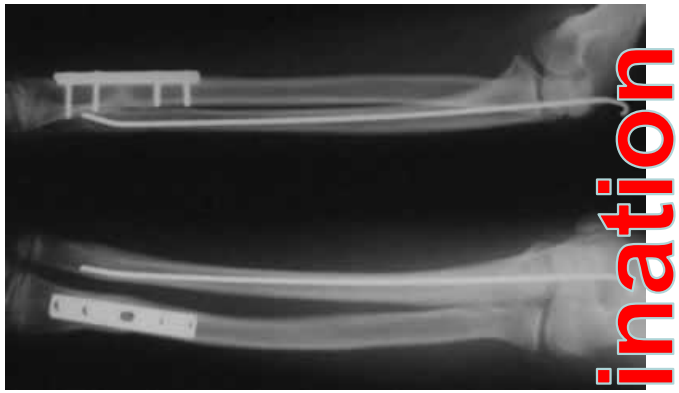
Indications for operative fixation

- Open fractures
- Displaced intra articular fractures
  (Salter-Harris III-IV)
- fractures with vascular injury
- ? Compartment syndrome
- Fractures not reduced by closed reduction
  (soft tissue interposition)
  or reduction lost with follow up
- Unstable diaphyseal fractures

Fractures in Pediatric skeleton

Methods of fixation



Combination from all

- Casting - still the commonest
- K-wires
  - most commonly used
  - Metaphyseal fractures
- Intramedullary wires, elastic nails
  - Very useful
  - Diaphyseal fractures
- Screws
- Plates – multiple trauma
- IMN - adolescents
- Ex-fix

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Complications

- Ma-lunion is not usually a problem
  (except cubitus varus)
- Non-union is hardly seen
  (except in the lateral condyle)
- Growth disturbance – SH III. IV, V & too many times of manipulation
- Vascular – volkmann’s ischemia
- Infection - rare

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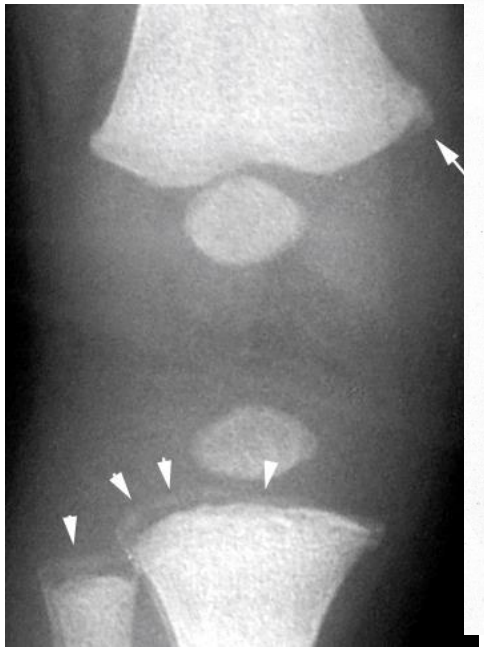
Child abuse



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Take-home messages

- The child is not a small adult
- High capability of rapid healing
- Remodeling for deformities is high if :

  - In the plane of motion
  - long growth remaining

Fractures in Pediatric skeleton

Take-home messages

- Respect physeal injuries
  - Avoid multiple reduction attempts
  - Follow closely if nonoperative
  - Anatomic reduction for articular fracture
  - Smooth K-wires when crossing the physis
  - Screws parallel to physis
  - **Be aware of possible child abuse**