C33 The Role of Diagnostic Imaging in Child Abuse Cases

Objectives

- Define child abuse
- Describe the significance of diagnostic imaging in child abuse cases
- Outline the role diagnostic imaging workers play
- Provide an overview of basic protocols
- Identify injuries highly specific for abuse

Legal Definition of Child Abuse

- The Federal Child Abuse Prevention and Treatment Act (CAPTA) (42 U.S.C.A. § 5106g), as amended by the CAPTA Reauthorization Act of 2010, defines child abuse and neglect as, at minimum:
  - "Any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation"; or
  - "An act or failure to act which presents an imminent risk of serious harm."
- This definition of child abuse and neglect refers to parents and other caregivers
- A "child" under this definition means a person who is younger than age 18 or who is not an emancipated minor

Importance of Diagnostic Imaging

- As many as 65% of all abuse cases are initially seen in the emergency room
  - Approximately 10% of all children under the age of 5 brought to the emergency room have injuries from non-accidental trauma
- The use of imaging is often critical, particularly in the assessment of young children and infants
  - Injuries from abuse may not be appreciable upon physical examination
- For infants, imaging alone may be enough to determine physical abuse
- Diagnostic imaging can help uncover hidden injuries, past and present

The Role of Radiographers

- Have the ethical responsibility to maintain professionalism and obtain optimal quality images that could be used in a court of law
- Document accurate history pertaining to the illness or injury the patient is presenting with including reported mechanism of injury
- Be aware of facility, local, and state protocols
- Communicate any concerns with supervisor, radiologist and/or referring physician immediately

The Role of Radiologists

- Sound the alarm for abuse if the reported mechanism of injury is inconsistent with the fractures or lesions on imaging
- Communicate immediately and directly with the referring physician
- Understand that other medical conditions may mimic the signs of abuse and investigate those possibilities
  - Conditions such as osteogenic imperfecta, Caffey disease, Rickets, or even an obstetric injury that was missed at time of delivery may present similar to cases of abuse
- May be required to testify in court regarding their findings of abuse

Overview of Radiographic Protocols

- Radiographic skeletal surveys are the initial imaging modality since fractures occur in up to 55% of physically abused children
  - Skeletal surveys are recommended for all children under the age of 2 for suspected abuse
- Basic protocols for child skeletal surveys have been determined by the American College of Radiology (ACR)
- Factors that may affect the actual imaging study performed:
  - Patient age
  - Presenting injury
  - Facility protocols
  - Local/state protocols

ACR Skeletal Survey

- Thorax (AP, lateral, right and left obliques), to include sternum, ribs, thoracic, and upper lumbar spine
- AP abdomen and pelvis, to include thoracolumbar spine
- Lateral Lumbosacral spine
- Skull (AP and lateral), to include cervical spine
- Right and left humerus (AP)
- Right and left ulna & radius (AP)
- Right and left hand (PA)
- Right and left femur (AP)
- Right and left tibia & fibula (AP)
- Right and left foot (AP)

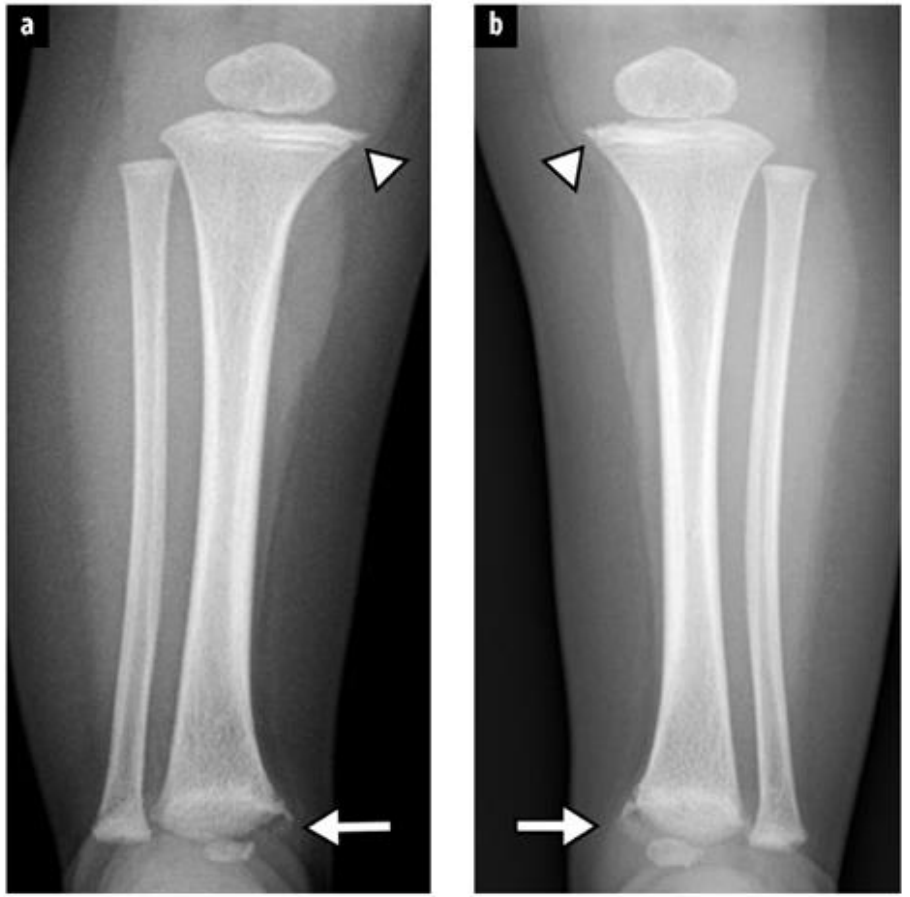
AP: Anterior-Posterior
PA: Posterior- Anterior

Specificity of Fractures

- Injuries that are highly specific for the diagnosis of abuse:
  - Classical metaphyseal lesion (to include corner or bucket handle fractures)
  - Rib fractures, especially posterior
  - Scapular fractures
  - Spinous processes fractures
  - Sternal fractures
  - Multiple fractures involving more than 1 skeletal area

Classical Metaphyseal Lesions

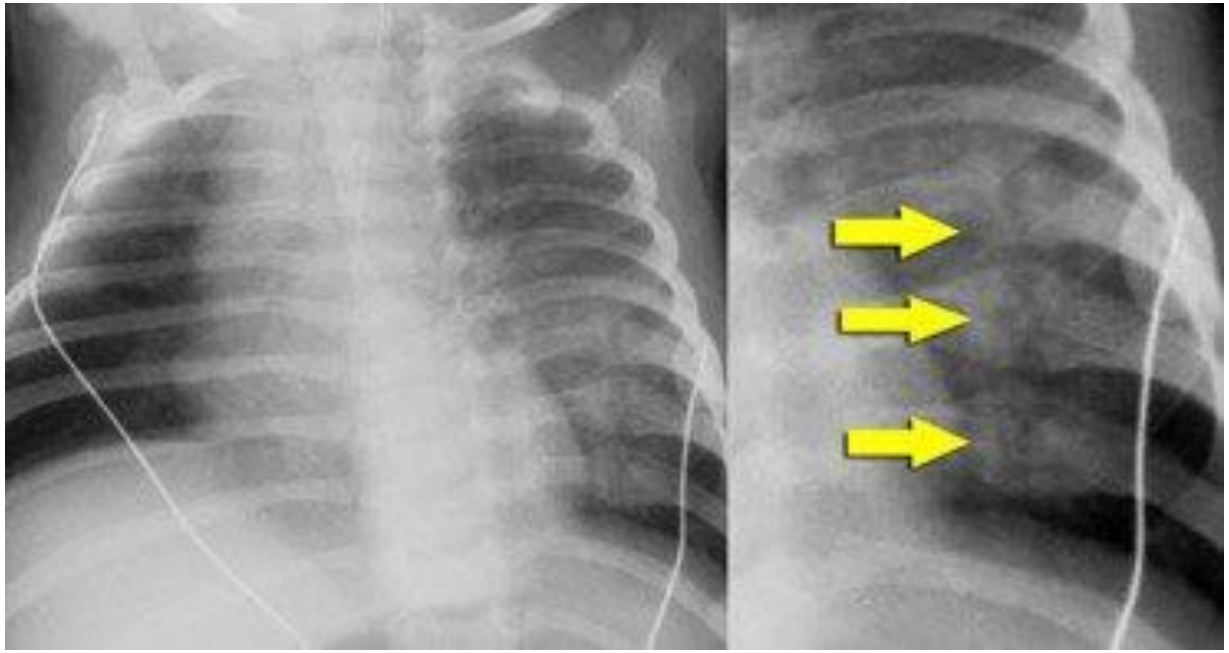
- Transverse fractures through the edge of the metaphysis
  - When healing, cartilage can grow into the metaphysis
- Often result from torsional force applied to a limb or extreme forces experienced with extremities flailing while being shaken



https://radiologykey.com/trauma-and-its-imitators /

Rib Fractures

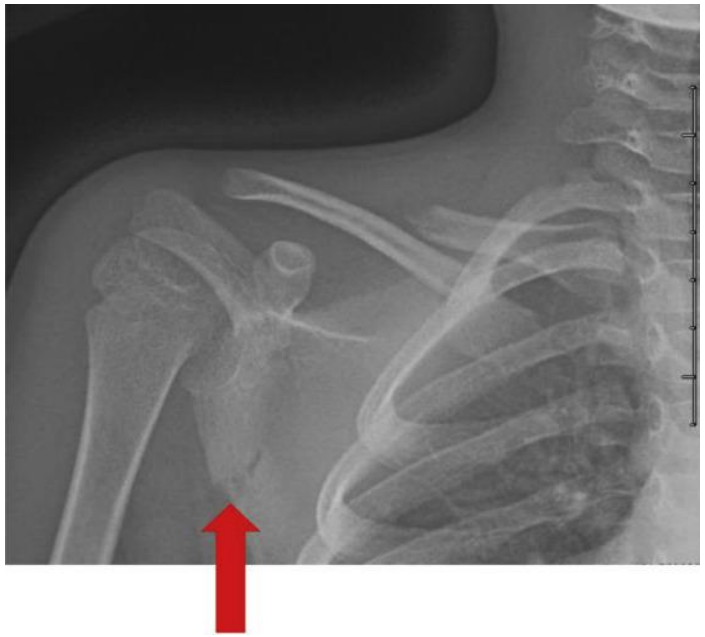
- Rib fractures due to accidental trauma are uncommon in children under the age of 5 because of the plasticity of their bones
- Rib fractures are strong indicators of abuse
  - May be the only physical manifestation
- Oblique images of the ribs should be obtained to increase diagnostic accuracy



https://www.orthobullets.com/pediatrics/4001/pediatric-abuse

Fractures with High Specificity

- Scapular, spinous process, and sternal fractures



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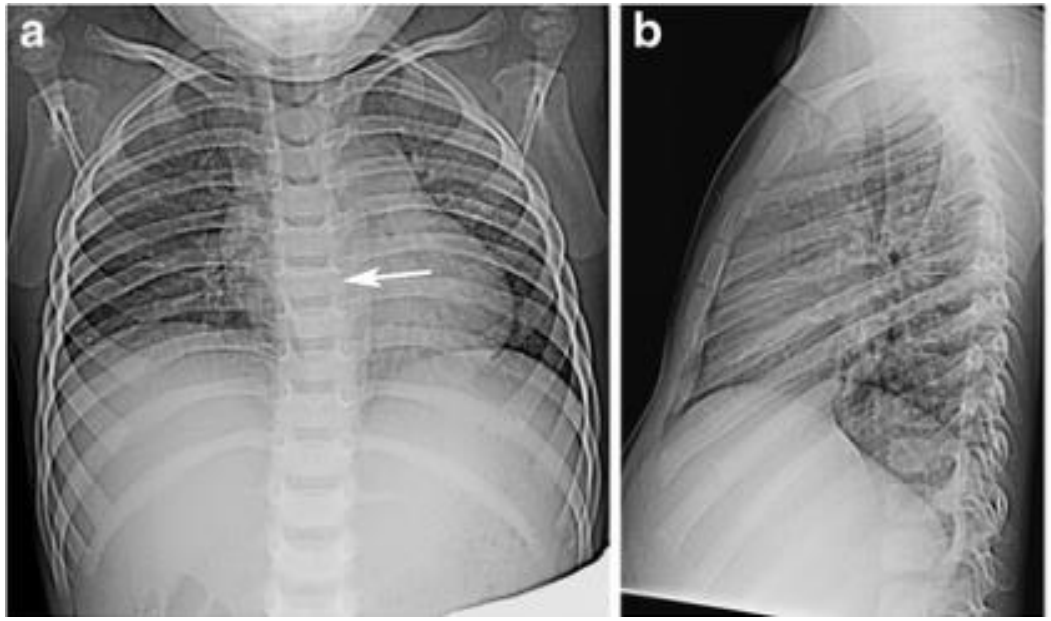


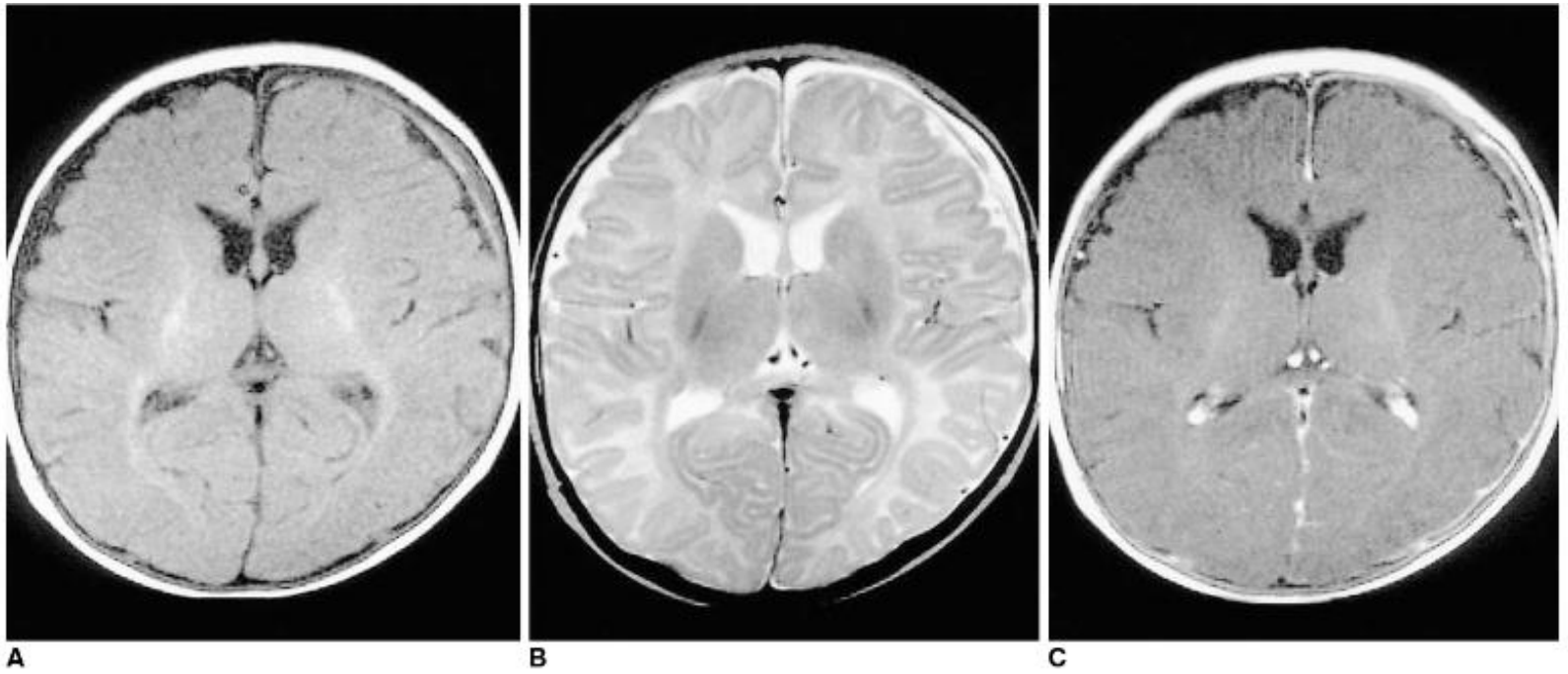
https://link.springer.com/article/10.1007/s00247-013-2726-x

https://www.sciencedirect.com/science/article/abs/pii/S0022346818305475

Shaken Baby Syndrome

- Shaken baby syndrome occurs when an infant is violently shaken, resulting in severe intercranial trauma
- Many shaken infants often have previous trauma to their body, indicating that this is not an isolated incident
- Any infant that is suspected of abuse should have a skeletal survey performed
  - This imaging must be repeated roughly 2-3 weeks after the initial survey was performed to follow the healing process of the injury
- If an infant is found to have any neurological findings, they should have a CT performed to determine if surgical corrections are necessary
- The majority of patients should receive an MRI to understand the full extent of injury and further determine the prognosis

Shaken Baby Syndrome



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Conclusion

- Death, serious physical or emotional harm, sexual abuse, and exploitation of children by a parent or caregiver is a global public health concern
- The fatality rate for child maltreatment is 2.2 per 1,000 children annually, making homicide the second leading cause of death in children younger than age one
- Careful correlation of observed radiologic findings with the reported mechanism of injury and clinical status is essential in evaluating any case of suspected abuse
  - If such correlation is not performed, important signs of maltreatment may be overlooked, and the child may be returned to an abusive environment
  - Delay in diagnosis may result in the child sustaining additional injuries or potentially devastating consequences

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