

X-ray quiz: a 2-month-old baby with a painful ecchymotic upper extremity

KH Lee, CN Chao, CH Chen, HJ Huang, MJ Tsai

Case

This 2-month-old female baby without previous systemic disease was brought to the emergency department (ED) because she was found to have a painful, swelling and ecchymotic right upper limb for 1 day. According to her mother's statement, she didn't have a trauma history recently. Extremities X-ray was performed and showed as Figure 1. Orthopaedics was consulted and close reduction with Velpeau sling immobilisation was performed at the ED.

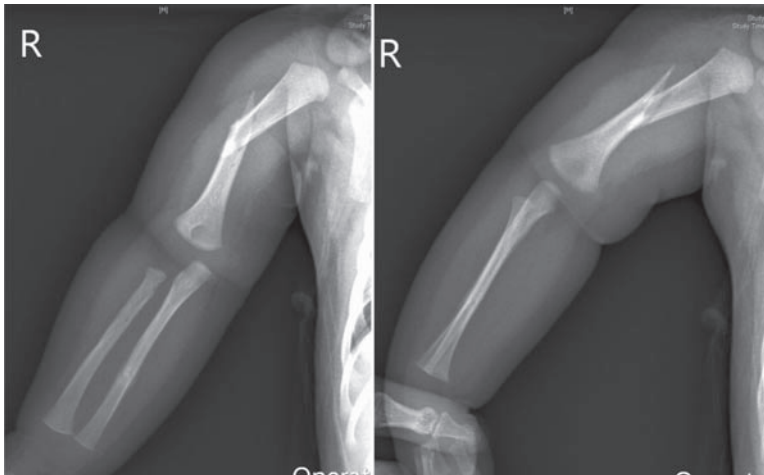


Figure 1.

Correspondence to:
Tsai Ming Jen, MD
Ditmanson Medical Foundation Chiayi Christian Hospital,
Department of Emergency Medicine, Chiayi, Taiwan
Email: tshi33@gmail.com

Lee Kuan Hsien, MD
Huang Hsin Ju, MD

Questions

1. What are the findings in right upper extremity X-rays (Figure 1)?
2. Which type of injury the baby suffered from should be considered?
3. How should this patient be managed?

Ditmanson Medical Foundation Chiayi Christian Hospital,
Department of Pediatrics; and National Chung Cheng University,
Institute of Molecular Biology, Chiayi, Taiwan
Chao Chun Nun, MD

Ditmanson Medical Foundation Chiayi Christian Hospital,
Department of Orthopedic Surgery, Chiayi; and National Taiwan
University, School of Medicine, Taipei, Taiwan
Chen Chun Ho, MD

Chia Nan University of Pharmacy and Science, Department of Sports
Management, Tainan, Taiwan
Tsai Ming Jen, MD

Answers

1. Right humeral shaft fracture and old ulna shaft fracture with callus formation.
2. Child physical abuse.
3. Skeletal survey, admission and consultation of child protective and social welfare services.

Discussion

Child abuse is an inescapable social and medical problem that remains a major cause of paediatric morbidity and mortality. In the United States, over 650,000 children suffer child maltreatment leading to over 1500 child deaths annually.¹ It is estimated that around 2% to 10% of children visiting the ED for trauma are victims of child maltreatment.² Therefore, emergency physicians should have the sensitivity to identify non-accidental injuries and potentially prevent further child abuse.

Physical abuse, the most easily identified type of maltreatment, is the 2nd common form of child maltreatment after child neglect.¹ The most common manifestation of physical abuse is skin bruising.¹⁻⁴ A decision tool, "TEN-4" bruising clinical decision rule, which provides an easy manner to identify bruises that are of concern for abuse are bruising on the Torso, Ear, or Neck for a child ≤ 4 years of age and bruising in any region for an infant < 4 months of age.^{1,5}

Fracture is the second commonest manifestation of child physical abuse.¹⁻⁴ It was estimated that 12% to 20% of fractures in infants and toddlers was caused by physical abuse.⁶ Certain situations that physician should consider a fracture was caused by physical abuse rather than unintentional injury include:¹⁻⁴

1. Multiple fractures
2. Fractures in various stages of healing
3. Infant and toddler with ribs fractures
4. Femoral or humeral fractures in nonambulatory children

5. Unusual parts of fracture, including scapula, classic metaphyseal lesions of the long bone, spinous process, sternum, vertebrae, digit and complex skull fractures
6. A vague or contradictory history of trauma or without a known medical condition that predisposes to bone fragility
7. Delay in presenting, and the presence of other coexisting injuries to the skin, internal organs, or central nervous system.

About 80% of all fractures from child abuse occur in children under 18 months of age, and one-quarter of fractures in children before 1 year of age are due to child abuse. The percentage of fractures caused by abuse decreases after the child is able to walk.² In all cases of suspected abuse younger than 2 years of age, a complete skeletal survey (Table 1) recommended by the American College of Radiology is mandatory to detect the additional fractures.^{2,7} Further imaging study like echography, computed tomography or magnetic resonance imaging may be needed to detect internal organs injuries.

In addition to medical assessment and treatment, consultation with child protective services, social

Table 1. Skeletal survey for child abuse

Appendicular skeleton
Bilateral humeri (AP)
Bilateral forearms (AP)
Bilateral hands (PA)
Bilateral femurs (AP)
Bilateral lower legs (AP)
Bilateral feet (AP)
Axial skeleton
Thorax (AP, lateral, bilateral obliques)
Pelvis (AP)
Lumbosacral spine (lateral)
Cervical spine (lateral)
Skull (frontal and lateral)

AP=anteroposterior view; PA=posteroanterior view

welfare services, and legal counsel is necessary to investigate the possibility of child abuse, to evaluate the family dynamics, and to provide social and legal protection for the child¹. Hospitalisation is required to provide a protected environment in which we can take steps to diagnose and substantiate the abuse. Appropriate disposition should be arranged once abuse was diagnosed.

In our patient, she was admitted and performed complete skeletal survey and laboratory testing. No evidence of additional or pathologic fracture was found. Abdominal echography was performed and excluded the internal organ injury. Brain echography and ophthalmic fundus examination revealed no evidence of intracranial haemorrhage or retinal haemorrhage. Social worker was consulted and reported this case to the social welfare department. The assessment of family dynamics and the need of residential placement was initiated.

In conclusion, child abuse is a ubiquitous medical and social issue which is still a major cause of disability and death among children. Fractures are the 2nd most common presentation of child physical abuse after skin bruising. Emergency physician should have the sensitivity to perceive the possibility of child abuse.

References

1. Christian CW; Committee on Child Abuse and Neglect, American Academy of Pediatrics. The evaluation of suspected child physical abuse. *Pediatrics* 2015;135(5): e1337-54.
2. Flaherty EG, Perez-Rossello JM, Levine MA, Hennrikus WL; American Academy of Pediatrics Committee on Child Abuse and Neglect; Section on Radiology, American Academy of Pediatrics; Section on Endocrinology, American Academy of Pediatrics; Section on Orthopaedics, American Academy of Pediatrics; Society for Pediatric Radiology. Evaluating children with fractures for child physical abuse. *Pediatrics* 2014;133(2):e477-89.
3. Baldwin KD, Scherl SA. Orthopaedic aspects of child abuse. *Instr Course Lect* 2013;62:399-403.
4. Kocher MS, Kasser JR. Orthopaedic aspects of child abuse. *J Am Acad Orthop Surg* 2000;8(1):10-20.
5. Pierce MC, Kaczor K, Aldridge S, O'Flynn J, Lorenz DJ. Bruising characteristics discriminating physical child abuse from accidental trauma. *Pediatrics* 2010; 125(1):67-74.
6. Leventhal JM, Martin KD, Asnes AG. Incidence of fractures attributable to abuse in young hospitalized children: results from analysis of a United States database. *Pediatrics* 2008;122(3):599-604.
7. American College of Radiology. ACR-SPR Practice Parameter for Skeletal Surveys in Children. 2014. [cited 21 Aug 2015]. Available from: http://www.acr.org/-/media/ACR/Documents/PCTS/guidelines/Skeletal_Surveys.pdf.