E14 The Challenge of Diagnosing Child Abuse (CA): The Perks of a Multidisciplinary Approach

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Learning Overview: After attending this presentation, attendees will understand fracture patterns, which are highly suggestive of physical CA.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing the importance of a careful, multidisciplinary evaluation in cases of fractures from suspected CA.

CA represents a diagnostic challenge due to its complex presentation. Although the consequences of failing to diagnose CA may be life-threatening, a wrong diagnosis may have devastating sequelae too.[1] Imaging plays a major role since there are fracture patterns, which are highly suggestive of physical abuse.[2,3] According to Kleinman, injuries with high specificity for abuse include Classic Metaphyseal Lesions (CMLs), rib fractures, especially posteromedial, scapular fractures, spinous process fractures, and sternal fractures.[4]

However, no fracture in itself is pathognomonic for child abuse.[5] Therefore, it is important to take into consideration other factors that can increase the likelihood of abuse. The most significant are: the age and the developmental stage (ambulatory or not) of the child, the consistency of clinical history provided by caregivers, the presence of multiple fractures in different states of healing, coexistence of other injuries suspicious for abuse (bruises, contusions or internal injuries), and the characteristics of the family.[4]

The goal of this presentation is to report findings of a retrospective analysis of CA cases in which the abuse was associated with one or more bone-fractures. This study reviewed all cases managed from January 2012 to December 2017 by the multidisciplinary unit ("Bambi") dedicated to the evaluation of suspected abused children at the Ospedale Regina Margherita of Turin, Italy. The operators of the "Bambi" unit examined 1,042 cases of suspected CA. In 39/1,042 cases, there were one or more fractures, and in 25/39 cases, suspected abuse was confirmed. Among these 25 children, 16 were male and 9 female, the mean age was 18 months, and 20/25 were non-ambulatory. In 6 cases, high-specificity fractures were diagnosed (2 CML, 3 rib-fractures, and 1 in which CML and rib-fractures coexisted). In all of these 6 cases, the children were non-ambulatory. Bruises, abrasions, lacerations, and findings of abusive head trauma were respectively described in 9, 4, 2, and 5 cases. In 10/25 cases, the child's kin modified the initial version regarding how the fracture occurred. Among the cases with high-specificity fractures, 2 children suffered a fall from less than 1 meter high, and in 2 cases, from more than 1 meter high. In 2 other cases, these data were not available.

According to literature, physical abuse is more likely to be the cause of a fracture in children who are not yet walking. In compliance with that, this study revealed that 20/25 children were not yet ambulatory, with a mean age of 18 months. Moreover, all 6 children who were diagnosed with fracture highly specific for abuse were non-ambulatory.[4]

Other than the specificity of the fracture and the age and developmental stage of the child, the history provided by the caregivers can make a fracture suspicious for child abuse. In 10/25 cases, the caregivers changed the initial history provided or gave discordant explanations. Among the 6 cases with high specificity fractures, the history related to 4 of these was inconsistent with the energy needed to cause the fractures. The kin provided either no detail of the dynamic of the event in 2 cases, or in 2 other cases, related a history of a low-energy event (fall from less than 1 meter).[4] In the study sample, males were more likely to suffer from CA than females, but in literature, no significant gender differences were observed in terms of prevalence of CA.[6] The literature states that CA occurs in all socio-economic groups and across all racial and ethnic groups.[4] In the present report, 20/25 children came from families of low (*n*=16) or average (*n*=4) socio-economic status.

In the present review, only 6/25 cases of CA had highly specific fractures, but in the other cases, the "Bambi" staff diagnosed CA on the basis of other relevant findings. This presentation should serve as a stimulus to heighten the importance of the combination of radiological, clinical, investigative, and social findings in order to achieve a reliable CA diagnosis with a multidisciplinary approach.

Reference(s):

1. Amaka C. Offiah, Rick R. van Rijn, Jeanette M. Perez-Rossello, and Paul K. Kleinman. Skeletal Imaging of Child Abuse (Non-Accidental Injury). *Pediatr. Radiol* 39, no. 5 (May 2009): 461–470. http://doi.org/ 10.1007/s00247-009-1157-1.
2. Michael Paddock, Alan Sprigg, and Amaka C. Offiah. Imaging and Reporting Considerations for Suspected Physical Abuse (Non-Accidental Injury) in Infants and Young Children. Part 1: Initial Considerations and Appendicular Skeleton," *Clin. Radiol* 72, no. 3 (March 2017): 179–188. http://doi.org/ 10.1016/j.crad.2016.11.016.
3. Michael Paddock, Alan Sprigg, and Amaka C. Offiah. Imaging and Reporting Considerations for Suspected Physical Abuse (Non-Accidental Injury) in Infants and Young Children. Part 2: Axial Skeleton and Differential Diagnoses. *Clin. Radiol* 72, no. 3 (March 2017): 189–201. https://doi.org/ 10.1016/j.crad.2016.11.015.
4. Emalee G. Flaherty, Jeanette M. Perez-Rossello, Micheal A. Levine, William L. Hennrikus, and 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, and Society for Pediatric Radiology, Evaluating Children With Fractures for Child Physical Abuse. *Pediatrics* 133, no. 2 (February 2014): e477–89. http://doi.org/ 10.1542/peds.2013-3793.
5. Rick R. van Rijn and Tessa Sieswerda-Hoogendoorn. Educational Paper. *Eur. J. Pediatr* 171, no. 2 (February 2012): 215–224. http://doi.org/ 10.1007/s00431-011-1499-1.
6. Sabine A. Maguire, Alison M. Kemp, Rebecca C. Lumb, and Daniel M. Farewell. Estimating the Probability of Abusive Head Trauma: A Pooled Analysis. *Pediatrics* 128, no. 3 (September 2011): e550–64. http://doi.org/ 10.1542/peds.2010-2949.

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