

CASE REPORT

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Rib fractures: Accidental or non-accidental

Muhammad Waseem, Evelyn Erickson

ABSTRACT

Introduction: We report an incidental discovery of multiple rib fractures in a wheezing child without a history of an injury or the presence of metabolic bone disease. As a result, the child was evaluated for the presence of non-accidental trauma. **Case Report:** An 11-month-old African-American child was brought to the emergency department by his father with a 2-day history of fever, cough and breathing difficulty. After receiving nebulizer treatments, the child was still wheezing. A chest X-ray was obtained which showed bilateral fractures of the ribs. No history of trauma was provided. Given the radiographic findings, Child Protective Services was contacted and a report of child abuse was made. **Conclusion:** Child abuse is a complex phenomenon. Any skeletal injury in young children can be due to abuse. Rib fractures are uncommon in the pliable chest of a child. When discovered, however, they raise the suspicion of a non-accidental trauma. They are often uncovered during the assessment of children who present to the emergency department for unrelated reasons. The physician's ability to differentiate accidental from non-accidental trauma may depend on

gathered information. This report emphasized the importance to evaluate for non-accidental trauma after the finding of bilateral rib fractures on a chest X-ray. Non-accidental trauma should be considered when there is evidence of injury without a history of trauma.

Keywords: Non-accidental trauma, Rib fractures, Child abuse

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INTRODUCTION

Rib fractures are uncommon in infants and children. Non-accidental trauma is a common cause of morbidity and mortality in young children, but the diagnosis is not always apparent. Most abused children present without a plausible explanation for their injuries. In the absence of a documented history of significant injury or the presence of metabolic bone disease, non-accidental trauma is the most likely presumed diagnosis. We report an incidental discovery of multiple rib fractures in a wheezing child.

CASE REPORT

An 11-month-old African-American, asthmatic child was brought by his father to the emergency department during the winter with a two-day history of fever, cough and breathing difficulty. On arrival, he was noted to be wheezing and was directly brought to the asthma room.

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He had a temperature of 101.2°F, heart rate of 112/min, respiratory rate of 30/min, and an oxygen saturation of 95%. The rest of the physical examination was normal.

The medical history revealed prior episodes of wheezing in a developmentally appropriate child. No history of trauma was given. The patient lived with his father and had not attended school or daycare. There were no other siblings. Physical examination revealed no bruising, swelling, abnormal marks or other signs of trauma. His complete blood count and basic metabolic profile were normal. Subsequent laboratory investigations were as follows: serum phosphate level 5.3 mg/dL (2.7–4.5 mg/dL), serum 25-OH Vitamin D 31 ng/ml (3–67 ng/mL) and serum alkaline phosphatase 139 U/L (30–90 U/L). Normal range is given in parenthesis. A chest X-ray was obtained due to persistent wheezing despite three nebulizer treatments. No infiltrate was noted but bilateral posterior fractures of the 9th and 10th ribs were identified (Figures 1, 2). A subsequent skeletal survey confirmed the presence of bilateral healed fractures of the 9th and 10th ribs. Given the radiographic findings, Child Protective Services was consulted in the emergency department and a report of child abuse was made.

DISCUSSION

Child abuse is a complex phenomenon. Any skeletal injury can be due to abuse. Rib fractures are uncommon in the pliable chest of a child. The presence of bilateral rib fractures in an infant should prompt a thorough medical and social evaluation for child abuse [1]. When discovered, however, they raise the suspicion of non-accidental trauma. These findings may be uncovered during the assessment of children who present to the emergency department for unrelated reasons. Non-accidental trauma is a relatively common occurrence and fractures are the second most common presentation of child abuse [2]. Bilateral rib fractures, particularly in infants, should always raise the suspicion. Many children with non-accidental trauma have healing fractures. Multiple rib fractures are considered a marker of serious injury in children.

Often, a chest X-ray is obtained in a wheezing child with fever to rule out pneumonia. This child had an asthma exacerbation due to an upper respiratory infection and received care for his asthma. If the chest radiograph is not carefully reviewed, rib fractures may be overlooked; this is especially true in a busy emergency department. The diagnosis of rib fractures is often made by obtaining plain X-ray of the chest, as in our patient. A dedicated rib series may better define the fracture including the age and location. As one might expect, location of rib fractures may provide information regarding the mechanism of injury. The posterior fractures occur due to the mechanical stress at the costovertebral junction as the child is grabbed and shaken. A detailed history of how the injury occurred is, therefore, essential. When non-accidental trauma is being considered, it is imperative to evaluate the child

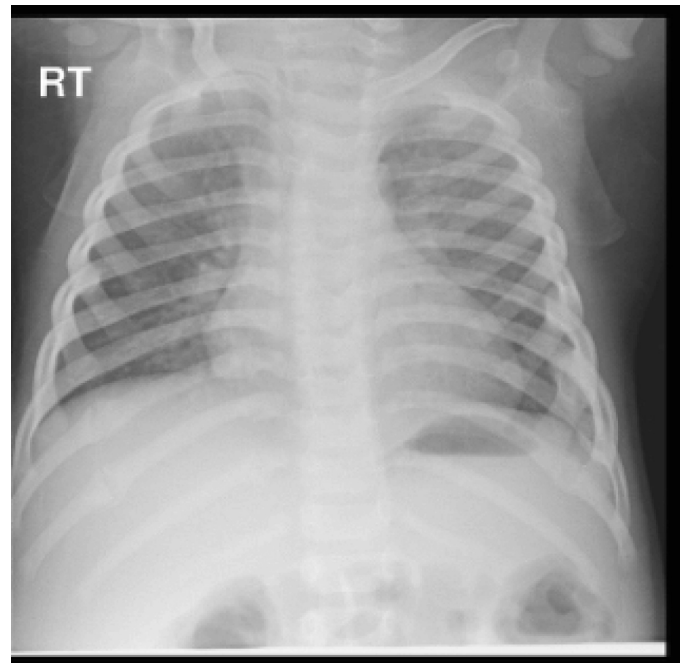


Figure 1: Chest X-ray of an 11-month-old infant showing bilateral rib fractures.



Figure 2: X-ray showing bilateral posterior fractures of the 9th and 10th ribs in an 11-month-old infant.

for other fractures; a complete skeletal survey may uncover additional injuries. It is uncommon to detect these fractures in the acute phase as they are better seen when callus formation is advanced. A follow-up chest X-ray may, therefore, provide useful information in children with suspected non-accidental injury and may improve detection [3, 4].

The physician's ability to differentiate accidental from non-accidental trauma may depend on gathered information. It is difficult to ascertain the cause of rib fractures when no plausible history to explain the injury is offered. Often, the trauma is only recalled after the fracture is identified. Generally, most rib fractures in non-accidental trauma are the consequence of thoracic compression [3]. Posterior rib fractures are considered to have a strong association with non-accidental trauma. Overall, a rib fracture had a positive predictive value of 95% for the diagnosis of non-accidental trauma [3]. The compliance of the rib cage may allow significant injury to occur with little apparent external signs of trauma [3]. Because of the delay in clinical presentation in such cases, healing fractures with callus are more prevalent than acute fractures [3]. Posterior rib fractures, in particular, have a well-known association with non-accidental injury [3].

Table 1 gives other causes of rib fractures in children [3, 5]. Rib fractures may be associated with birth trauma. If birth related injuries are not identified initially, they may later be attributed to non-accidental trauma [3]. Rib fractures may occur with cardiopulmonary resuscitation but the possibility of non-accidental injury should be considered [3]. In the presence of unexplained fractures, causes of bone fragility such as osteogenesis imperfecta and rickets must also be considered [3, 5–7]. The patients with rickets, laboratory evaluation usually reveals low to low-normal serum calcium, low serum phosphorus, and an elevated alkaline phosphatase level. The physical signs of rickets include growth retardation, metaphyseal flaring, prominence of the costochondral junctions (rachitic rosary) and frontal bossing [8]. Our patient did not have any physical findings consistent with the diagnosis of rickets. There was also no history of trauma or cardio pulmonary resuscitation.

Table 1: Important Causes of Rib Fractures in Children

Trauma
• Accidental (rare)
• Non-Accidental
Metabolic Bone Diseases
• Osteogenesis Imperfecta
• Rickets

CONCLUSION

This case report provides an approach in the evaluation of child with evidence of injury but no history

of trauma. In the absence of a history of a significant accidental trauma, evaluation of non-accidental trauma should be performed. Determining whether a fracture is due to accidental or non-accidental trauma can be challenging, but the future safety of the child, depends on a timely diagnosis and intervention.

Author Contributions

Muhammad Waseem – Conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Evelyn Erickson – Acquisition of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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