Pediatric Head Trauma: Abuse or Not?

Your pager sounds at 3 AM. You’re called to admit a 4-month-old infant who sustained a temporal skull fracture. As the overnight pediatric hospitalist at a community hospital, you’re asked to admit this child to observation. The fall was unwitnessed and the floor is hardwood. He vomited twice afterward. Head computed tomography scan reveals no additional intracranial injury apart from the skull fracture. A skeletal survey reveals no additional injuries. On examination, you see bruising of the area. The child is sleepy but neurologically intact. The emergency department has called local child protective services, and you wonder what you will tell them when they ask your opinion, especially when the family has no explanation for what happened.

Every pediatric hospitalist has faced a scenario like this many times. Making the correct diagnosis is critical, because children with missed inflicted head trauma are at high risk for sustaining more trauma, and head trauma represents the most common cause of death in abused children.1 Although the literature concerning child abuse has evolved, establishing the diagnosis still requires astute clinical judgment along with evidence-based practice. Unfortunately, no definitive test for abusive head trauma currently exists.

The known subjection of children to abuse dates back to ancient times with King Nimrod slaying every first-born child upon being informed a boy would be born that would declare war on the king.2 Killing “deformed” children was common in ancient Greece. During the Industrial Revolution, child abuse became a recognized entity. The writing of Charles Dickens exemplifies the hardship of children in a growing industrial society. In 1962, Kempe and colleagues3 coined the term “The Battered Child Syndrome” to describe the clinical condition of physical abuse, unrecognized trauma, and the lack of resources available to aid these children. Since then, the literature on child abuse has exponentially expanded.

In the August 2012 issue of Pediatrics, Piteau et al4 report a systematic review to provide clinicians with clinical and radiologic characteristics to distinguish abusive versus nonabusive head trauma. They used a comprehensive analysis to select 24 relevant studies of hospitalized patients (from almost 600 candidate studies) and meticulously assessed them for quality, classifying 21 as high quality and 3 as low quality. High-quality studies were defined as (1) abuse confirmed at case conference or civil, family, or criminal court proceedings or admitted by perpetrator or (2) abuse confirmed by stated criteria within the study that included a multidisciplinary assessment.

Piteau et al included 19 clinical and radiologic variables in their meta-analysis. This analysis revealed the following clinical features as suggestive of abusive head trauma: lack of adequate history to explain the injury, presence of retinal

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hemorrhages, presence of metaphyseal fractures, seizures within 24 hours, presence of rib fractures, presence of subdural hematomas, presence of cerebral ischemia, and presence of long-bone fracture(s). When low-quality studies were excluded, these markers remained significantly associated with abusive trauma. Conversely, epidural hemorrhage(s), scalp swelling, and isolated skull fracture(s) were associated with nonabusive head trauma. Diffuse axonal injury, subarachnoid hemorrhage, and vomiting were not significantly associated with abusive head trauma or nonabusive head trauma. Piteau et al found that the mean reported age per study of abused children (range: 2.1 in 1 study to 22 months in 1 study) was lower than the mean age of nonabused children (5.64–43 months). Although Piteau et al recognized the challenges in performing their review—mostly surrounding lack of consistent definitions or how the cause of trauma was established—their review provides clinicians with a useful guideline in approaching a patient such as the one described above.

A similar study using different methodology was undertaken by Maguire et al in 2009. Although Maguire et al used a different definition of head trauma, included different articles, and analyzed different variables, these authors likewise found that apnea, retinal hemorrhage, rib fractures, long-bone fractures, skull fractures with intracranial injury, and seizures were associated with abusive head trauma. Maguire et al did not include historical data such as lack of plausible explanatory history for the injury. Taken together, the analyses of Piteau et al and Maguire et al suggest that the pattern of clinical presentation and radiologic findings can be strongly suggestive of either abusive or nonabusive head trauma.

The data from the articles cited above suggested to you nonabusive trauma, but initially you are not able to obtain a detailed history. You confirm that there are no retinal hemorrhages. Upon further discussion with the family, however, they admit that the child was left unattended when they stepped out for a minute. They returned to find the child lying on the floor next to the bed. You inform child protective services that this child’s pattern of injury does not suggest abuse.

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