Nonaccidental Trauma in Pediatric Surgery

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KEYWORDS

• Nonaccidental trauma • Child abuse • Abusive head trauma

KEY POINTS

- Children younger than 5 years account for 81.5% of all child abuse with those younger than 1 year being the most vulnerable group.
- Abusive head trauma is the leading cause of fatality in children younger than 2 years old and early detection can be lifesaving.
- Abdominal injuries are uncommon but are the second most common cause of death following nonaccidental trauma (NAT).
- Burns in NAT are commonly caused by immersion or contact with hot objects and are characterized by uniform depth and sharp demarcation or clear outline of the object.
- Careful and consistent screening for nonaccidental trauma is crucial in allowing early detection and prevention of more serious injuries.

INTRODUCTION/EPIDEMIOLOGY

Child abuse/neglect is a significant cause of morbidity and mortality in the pediatric population, with 702,000 confirmed cases in the United States in 2014, including 1580 fatalities. Approximately 17% of the cases were physical abuse or nonaccidental trauma (NAT) and an additional 8.3% suffered sexual abuse.[1] More importantly, the number of admissions and deaths secondary to physical abuse has not decreased since the 1970s despite increased efforts in child protection, not only in the United States but also in other developed countries.[2] In a recent study at a large level 1 pediatric trauma center, patients with NAT had higher injury severity score, rate of intensive care unit stay, and mortality. There was also a delay in the diagnosis of NAT in 20% of the cases.[3] Thus it is critical to recognize and properly evaluate patients with NAT.

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Younger children are at a higher risk of child abuse, as 81.5% of the cases occurred in children younger than 5 years. Children younger than 1 year are the most vulnerable group, representing 24.4% of all cases. Additionally, younger children suffer more significant injuries, as 70% of the child fatalities were in those younger than 3 years.[1] Other risk factors include prior history of abuse in victims as well as perpetrators; medical conditions in victims, such as intellectual disability, or in perpetrators, such as various psychiatric disorders or substance abuse; and other stress factors within the home environment, including financial and relationship issues.[1,4,5] In more than 80% of the cases, biological parents were the perpetrators and nonbiological parents or partners accounted for 12%.[1]

CLINICAL PRESENTATION

Head Trauma

Abusive head trauma (AHT) or shaken baby syndrome is the leading cause of severe brain injury and death in children younger than 2 years.[6,7] AHT is also associated with a significant increase in morbidity compared with nonabusive head trauma (nAHT).[8] Unfortunately, often there is no history of head trauma and only vague clinical symptoms and signs, making the diagnosis difficult. However, early recognition of AHT can be lifesaving.[9] After AHT, children can be asymptomatic or can have lethargy, irritability, decreased appetite, poor sucking or swallowing, nausea, emesis, headache, or seizures. Most minor head injuries are accidental, but significant findings, such as skull fracture or intracranial injuries, especially in a child younger than 1 year, should prompt detailed evaluation looking for other nonaccidental injuries.[6,7]

AHT can result in primary and secondary injuries. Primary injuries are damage directly related to the traumatic rotational and translational forces applied to the child's head. Secondary injuries occur subsequently as complications of primary injuries due to hypoxia and/or ischemia. Secondary injuries occur an estimated 3 times more often in AHT compared with severe nAHT.[10]

Primary injuries include retinal hemorrhages, skull fractures, intracranial hemorrhages, parenchymal injuries, and spinal cord injuries. Retinal hemorrhages are present much more frequently in AHT than nAHT. In one literature review, retinal hemorrhages occurred in 78% of AHT versus only 5% in nAHT. The odds ratio of AHT and retinal hemorrhage was 14.7 with probability of 91%. Characteristically in AHT, hemorrhage is bilateral and involves multiple layers of the retina.[11] Ophthalmology should be consulted for children younger than 1 year with intracranial injuries to fully and accurately document ophthalmologic findings as part of the evaluation for AHT.

Skull fractures are another common finding in AHT but are also frequent in nonintentional trauma. In both AHT and nAHT, linear, parietal fractures are the most common and require careful analysis of the history and overall clinical findings. On the other hand, complicated skull fractures (multiple, bilateral, stellate, crossing suture lines, depressed, or diastatic) strongly suggest AHT, although specificity varies depending on studies.[6,7]

Intracranial hemorrhage (ICH) is common and characteristic of AHT. In low-impact trauma, such as a short vertical fall, ICH is rare.[12] ICH can be divided into subdural, epidural, and subarachnoid hemorrhages. Subdural hemorrhage (SDH) is a result of bleeding bridging veins from shearing and rotational forces and is more common in AHT. Usually, blood is reabsorbed without further issues if only SDH is present.[6] However, in some patients with AHT, hemispheric hypodensity can be seen on imaging in one or both hemispheres. These patients undergo rapid progressive atrophy with elevated intracranial pressures and have mortality rates up to 70%. Survivors are