

Abusive Head Trauma in Infants and Young Children: A Unique Contributor to Developmental Disabilities

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KEYWORDS

- Abusive head trauma • Inflicted neurotrauma
- Shaken baby syndrome • Shaken impact syndrome
- Battered child syndrome • Child abuse
- Developmental disabilities

Child abuse has an unquestionably negative effect on the growth, emotional, social, and cognitive development of children. Psychologic and emotional trauma, violence, abandonment, neglect, and failure to nurture can impact brain development at neuronal, functional, and neurodevelopmental levels. A specific type of abuse characterized by direct physical trauma to the developing brain, abusive head trauma (AHT), occurs predominantly in the youngest and most vulnerable infants. This type of traumatic brain injury (TBI) can result in global, pervasive developmental disabilities that affect a child and family for a lifetime. This article provides a historical, epidemiologic, and clinical perspective on presentation and outcomes of AHT. Because the effects of even mild brain injuries from any cause are recognized to result in a range of neuropsychologic disabilities, AHT contributes to the growing list of causes of developmental disability and is unique in its impact on previously normal children.

HISTORICAL FEATURES

In 1946, pediatric radiologist Caffey¹ recognized radiologic manifestations in children who had suffered long bone fractures in conjunction with chronic subdural hematomas. These children clearly seemed to have suffered from serious trauma to the brain and extremities, but their parents did not provide a history that would account for their injuries. Silverman,² another pioneering pediatric radiologist, published a second

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study of the radiographic findings of unrecognized skeletal trauma in children in 1953. Both authors described the radiologic findings of skeletal and head trauma, and believed these children presented differently than true “accidental” trauma victims. As awareness of serious physical abuse of children was emerging, Kempe and co-workers³ in 1962 described children who had suffered multiple abusive injuries, and coined the term, “the battered child syndrome.” This new diagnosis gave credence to child abuse as a medical problem, not just a social one. It paved the way for medicine to recognize child abuse as a diagnostic issue and a condition that impacted the health of children. Almost a decade later Guthkelch,⁴ a British neurosurgeon, reported in 1971 the relationship of infant subdural hematoma to whiplash-type injuries caused by shaking of an infant. The following year, Caffey⁵ gave his sentinel lecture, the Abraham Jacobi Award Address, “On the theory and practice of shaking infants: It’s potential residual effects of permanent brain damage and mental retardation.” Caffey⁶ then, in 1974, described “The whiplash shaken infant syndrome: manual shaking by the extremities with whiplash-induced intracranial and intraocular bleedings, linked with residual permanent brain damage and mental retardation.” He further expanded on shaking as a mechanism of head trauma and its link to developmental disability. Medical attention began to be focused on a population of brain-injured children, who often suffered permanent neurologic sequelae. Typically, their caregivers denied any trauma or occasionally provided a history of a trivial event, such as a short fall. The discrepancy of injury with history became one of the key elements in the diagnosis of abusive injuries in children. More than 30 years after Guthkelch and Caffey, physicians and the public continue to struggle with the concept that other caregivers can inflict such harm on the vulnerable infants and young children in their care.

Hundreds of articles have since been published supporting many aspects of what has been known for more than a quarter of a century as the “shaken baby syndrome” (SBS). Some researchers and clinicians have questioned the role of impact during shaking, speculating that shaking alone may not generate sufficient forces to cause the brain injury that is observed. Others have discussed whether or not cervical spine damage should result from whiplash forces. There are attempts to quantify precise biomechanical forces that result in such injuries through computer-generated models or biofidelic infant-sized dummies equipped with accelerometers. Some of those approaches have helped to refine the diagnostic process, caution clinicians carefully to analyze injury histories, and to recognize conditions that can seem to be AHT but are medical mimics. Other so-called “controversies” are currently being played out in the legal system. Those issues are beyond the scope of this article. What remains, however, is that injuries observed in AHT can often be differentiated from those that have well-documented noninflicted mechanisms. These abusive injuries vary both in presentation and outcome compared with those that are not inflicted. Terminology has also evolved to reflect the variety of mechanisms through which infants and young children suffer brain injury. The term “shaken baby syndrome” does not reflect the role of impact that may accompany shaking of infants, yet is well recognized by both laypersons and professionals. “Shaken impact syndrome” fails to address the fact that many patients have no sign of impact that can be detected clinically.⁷ Neither term accurately describes injuries to the head that are clearly abusive but do not have features of shaking, such as isolated skull fractures, concussions, and injuries to the brain from direct impact. Inflicted injuries, such as suffocation or squeezing infants to restrict their breathing, results in neurologic trauma and yet are not reflected in any of these terms. SBS describes a triad of subdural hematoma, cerebral edema, and retinal hemorrhages, but has diagnostic limits. Injuries may not fall into the defined triad.⁸ This “syndrome” does not include evidence of additional abusive trauma to other parts

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