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# Pediatric Abusive Head Trauma

## (Formerly known as Shaken Baby Syndrome)

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**Definition:** Abusive head trauma includes any non-accidental injury to the head, including the soft tissue, skull, and skull contents. The mechanisms of injury can include shaking, impact, crush, or any combination of those. It is the leading cause of death and disability from brain injury in children under age one (1) and is the most dangerous and deadly form of child physical abuse.

1. A board-certified or board-eligible child abuse pediatrician (and medical examiner for fatality reports) should be involved in the diagnosis of every case of suspected abusive head trauma. Some medical mimics need to be evaluated and considered. Please involve a child abuse pediatrics program in the evaluation of the case as early as possible if they are not involved already.
2. Subdural hemorrhage is a common finding in abusive head trauma, and is caused by tearing and bleeding of bridging veins inside a child's skull during a violent shaking event and/or impact. In some instances the subdural hemorrhage needs to be drained by neurosurgery, however, more often it is a thin collection of blood on the outside of the brain, inside the skull.
3. During a violent shaking or impact event, the brain tissue is stretched and distorted, causing injury to the brain cells. The injury (not the subdural hemorrhage) most often causes disability and death in victims.
4. There are anatomical differences in babies and young children that make them more prone to brain injury from a violent shaking and/or impact event.
5. Babies and young children have a large head in comparison to body size with weak neck muscles. This makes it extremely difficult for an infant or young child to resist the violent forces causing the head to whip back and forth.
6. The myelin (a protective fatty protein coating on the brain cells) is not yet developed in infants and young children, increasing the vulnerability of the individual brain cells to injury.
7. In the absence of myelin, a baby or young child has increased water content of the brain. The consistency of a baby's brain is similar to unset gelatin. Consequently, the softer brain is more prone to injury during a violent event. The brain firms up by around age three (3) to age four (4).
8. Babies and young children have more space between the brain and the inside of the skull, allowing for more movement and momentum during an acceleration/deceleration (shaking or slam/impact) event.
9. The inside of the skull in infants and young children is smoother, with fewer nooks and crannies to hold the brain in place.

10. Associated injuries can include retinal hemorrhages, which is bleeding in the back of the eye. However, retinal hemorrhages do not have to be present to make a diagnosis of abusive head trauma. Thirty (30) to ninety (90) percent of cases (depending on the study) involve retinal hemorrhages. Retinal hemorrhages are very specific for abusive head trauma when there are too many to count, in multiple layers of the retina, or extending to the periphery of the retina.
11. Other associated injuries can include fracture of any bone in the body, bruising, or internal abdominal injury—but often the child has only the head injury. These infants and young children can appear completely normal/unharmed from the outside; thus, it is imperative for infants with suspected abuse to be evaluated by an appropriate medical provider as soon as possible.
12. Routine handling of an infant, including bouncing them on a knee or tossing them in the air to play airplane is not sufficiently violent to cause the injuries seen in abusive head trauma.
13. Common presenting signs and symptoms include vomiting, decreased level of consciousness or seeming spaced out, irritability, lethargy/decreased activity, poor feeding, breathing abnormalities (including stopping breathing), and full cardiac arrest and/or death.
14. It is critical to obtain a detailed history for how the baby or child has been behaving for at least seventy-two (72) hours prior to presentation—preferably for seven (7) days prior to presentation. It is important to determine when the child was last completely well appearing, alert, feeding normally, etc.
15. Law enforcement should be involved as early as possible in the investigation.
16. Bruising in non-mobile babies is not normal. Those who don't cruise rarely bruise. Cruising is the developmental milestone in which a child pulls to stand and takes steps while holding on to furniture or other objects for support. Bruising is the single most commonly overlooked sign of child physical abuse.
17. Remember the TEN-4-FACEs clinical decision rule. Any bruising of the **T**orso, **E**ars, or **N**eck of a child four (4) years old or younger, any bruising anywhere in an infant who is not yet cruising, and any injury (including bruising) to the **F**renulum, **A**ngle of the jaw, **C**heeks (soft portion), **E**yelids, or **S**ubconjunctiva (white part of the eyeball), or any **P**atterned injury is highly concerning for physical abuse and needs to be fully medically evaluated and investigated.
18. Child maltreatment can and does occur in nice families. The absence of risk factors does not equate the absence of risk. Research tells us we are more likely to miss the diagnosis of abusive head trauma in white children, well-educated parents, intact families (meaning parents living together in the home), families we perceive to be similar to our own, and very young infants (because their symptoms can be non-specific.)