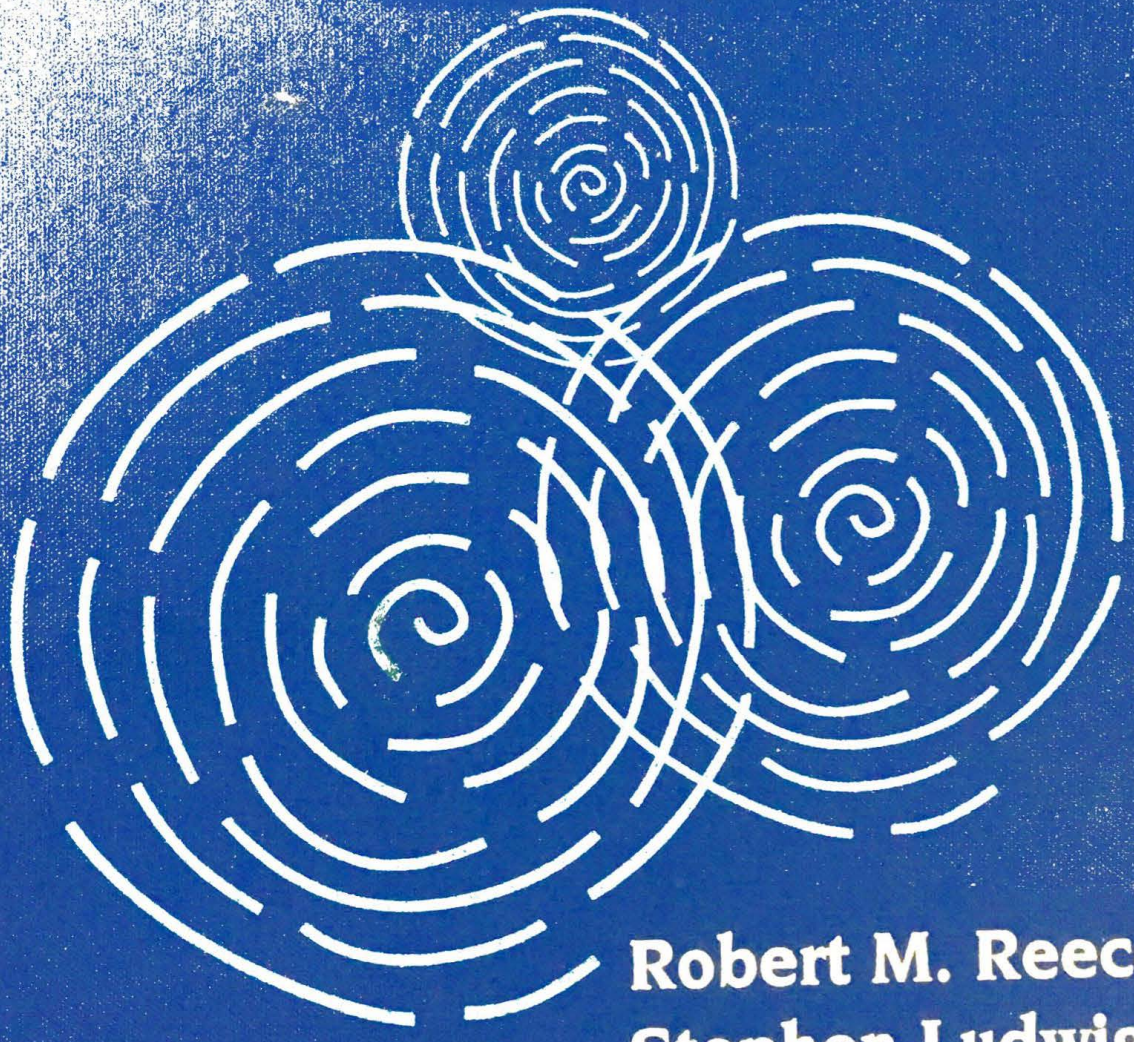
CHILD ABUSE

Medical Diagnosis and Management

Second Edition



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age 18 months admitted to a hospital in London with SDH. Although only 28 cases were reviewed ("[17] were Caucasian, 10 were non-Caucasian and one was of mixed race") the authors claimed to discern a "race-dependent pattern of SDH pathophysiology," and a racial predilection among nonwhites for subdural hemorrhage after trivial falls. In addition to this highly suspect finding, these authors did not differentiate between motor vehicle accident victims, known assault victims, and victims of alleged falls with respect to severity of injury outcome. Retinal hemorrhages were highly associated with inflicted head trauma, but the authors' data must be regarded as otherwise uninterpretable.

Recognizing the exception posed by encumbered falls, if free falls of the type encountered within the home were potentially lethal, it is unlikely the human race would have survived. Based on our clinical experience with documented accidental trauma, it is appropriate to compare the forces necessary to produce fatal cerebral injury with those that would be sustained in a motor vehicle accident or fall from an upper-story window. When a parent or other caretaker indicates that severe head trauma has resulted from a fall in the home, or occurred without his or her knowledge, the story must be presumed to be false. Although not all abusive head trauma leads to permanent neurologic injury or death, when an infant or young child presents in such a state, the probability of abuse is extremely high.

Shaking/Impact Lesions

Serious or lethal head injury may result from shaking, impact, or a combination of shaking and impact (30,48,109). External injuries may be minimal or absent (11), and the history given by the caretaker must be carefully recorded because the story is likely to change if inconsistencies are discovered. In the most difficult clinical circumstances, a previously healthy, afebrile infant may present to the hospital with the rapid onset of unexplained coma, cerebral edema, no external evidence of injury, and no evidence of subdural or retinal hemorrhages. The differential diagnosis must include infection, metabolic disease, drug intoxication, or, rarely, carbon monoxide poisoning. When studies for these disorders prove negative, the diagnosis should focus on near-asphyxiation, blunt head trauma, or shaking without its other usual manifestations of subdural hemorrhage and retinal hemorrhages.

The autopsy in such a case may reveal only cerebral edema, with no evidence of subgaleal hemorrhage, skull fracture, or cerebral contusions. Absence of any scalp, cranial, or localized cerebral injury supports a diagnosis of asphyxiation. Small contusional tears or lacerations within the subcortical white matter of the brain indicate deceleration injury, such as might be caused by violent shaking, or by striking the head against a firm padded surface. Striking an infant's head against a surface or striking the head with a hand or other object will usually produce subgaleal hemorrhage, even in the absence of external bruising. Each contusion or subgaleal hemorrhage represents a separate impact site. Careful documentation of these hemorrhages is important, as they may represent the only anatomic markers of inflicted trauma. Infants with skull fractures and significant brain injury who survive more than a few minutes will usually show swelling overlying the fracture site due to hemorrhage and edema within soft tissues. At times, however, soft-tissue swelling may be absent, particularly in the occipital region.

Shaken baby syndrome (SBS) is the result of a violent shaking force, with or without impact, that causes a whiplash action of the relatively unstable infant's head on its neck. It usually produces a triad of injuries that includes cerebral edema, subdural hemorrhage, and retinal hemorrhages. No other medical condition fully mimics all of its features (48). Fatal shaking events are usually characterized clinically by almost immediate loss of consciousness, often preceded by seizures or apnea. Irritability, lethargy, inability to feed, and vomiting are common components of less severe shaking episodes. It is the type of shak-

ing that an independent lay observer would recognize as likely to cause serious harm: rapid acceleration–deceleration of the head in an angular/rotational manner on an unstable neck. Shaking a baby who has allegedly stopped breathing to start it breathing again, or shaking a baby that has aspirated food or some foreign object does not cause the SBS. There is absolutely no medical evidence that infant immunizations cause SDH or other signs of SBS. However, an infant who is irritable or cries at length after an immunization injection is susceptible to being shaken and otherwise abused by a caretaker.

The shaking may produce slight to moderate hemorrhage in the cervical paraspinous muscles, but this is not a constant feature. Epidural or subdural hemorrhage in the cervical canal also is a variable feature; spinal cord injury is unusual. Shaken babies may show other evidence of injury, such as rib fractures or bruises of the chest, arms, or legs where the infant has been grabbed, and associated fractures of a clavicle, humerus, femur, or tibia. It has been our experience that in the unusual case in which such symptoms progress over a period of a few hours to unresponsiveness and coma rather than to recovery, there is likely to be evidence of multiple shaking episodes on CT scan, MRI, or autopsy.

A variation of SBS is the "tin-ear" syndrome, in which the infant is struck on the side of the head, producing contusion of the ear and rotational acceleration of the head that produces ipsilateral cerebral edema and subdural hemorrhage, and hemorrhagic retinopathy (76).

Duhaime et al. (49) have claimed that shaking alone is unlikely to produce the injuries observed in SBS, and that an impact component is probably necessary. Their conclusions were based on the findings in 13 autopsies, a biomechanical model using specially constructed dolls, and comparison of their data with that obtained from studies involving subhuman primates. Although there can be no doubt that shaking with impact generates far more force than shaking alone (49,86), there is considerable evidence based on confessions (87), witnessed events, and the absence of blunt trauma to the head in many SBS autopsies that shaking alone is sufficient to cause death (2,22,63). Those who support the necessity of impact, on all occasions, dismiss confessions as being unreliable, and point to the possibility of impact on a soft surface not producing injury to the scalp. This academic dispute should not be construed, however, to indicate that there is any disagreement that the diagnostic triad of SBS represents serious inflicted injury.

SBS is more common in younger infants. It may, however, be seen at any age if there is great enough disparity between the size of the victim and the size of the perpetrator. A documented shaking fatality involving an adult victim is particularly illustrative (138,142). For several years, Israeli security agents used violent shaking as one of many techniques to interrogate Palestinian detainees. During one such episode that involved a rather small man (44 kg) being shaken by two large agents, the victim suddenly began to froth at the mouth and lapsed into unconsciousness. On arrival at hospital, CT scan showed cerebral edema and subdural hemorrhage, and the patient died within hours. At autopsy, in addition to the intracranial findings, there were extensive retinal hemorrhages, diffuse axonal injury on microscopic examination of the brain, and bruises of the upper chest. There was no evidence of impact either by history or at autopsy. One of us (R.H.K.) subsequently had the opportunity to interview more than one dozen Palestinians who were subjected to the same form of interrogation. They reported symptoms ranging from dizziness, to severe and persistent headache, nausea, vomiting, confusion, and disorientation. In September 1999, on petition from attorneys representing Palestinian detainees, the Israeli High Court of Justice prohibited the security services from further use of shaking as an interrogation technique.

Ultimately in any particular case, it is irrelevant from a medicolegal standpoint whether shaking or impact produces the fatal force; each is a form of abusive head trauma. In this