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The Shaken Baby Syndrome

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Although the term "Shaken Baby Syndrome" has become well entrenched in the western literature on child abuse, it has not been reported in our country. This is more likely due to lack of awareness than absence of this form of baby bashing in our society. Hence, we report this case to highlight its salient features. The syndrome is characterized by a constellation of neuro-

logical findings with minimal or absent external marks of injury in the presence of fundal hemorrhages and CT evidence of subarchnoid and subdural hematomas in absence of any bleeding disorder(1). History of shaking is characteristically absent as the perpetrator inflicts the injury unknowingly out of anger or even during rough play. The term shaken baby syndrome was coined by Caffey to describe a group of infants with this typical picture where a nursemaid admitted to roughly shaking the babies by the arm or trunk(1). The mechanism of injury was assumed to be whiplash type motion of the head resulting in tearing of the bridging veins.

Case Report

An 9-month-old male infant apparently healthy till the evening of the day of admission was brought with complains of vomiting, lethargy, irritability and seizures. There was no history of fever, otorrhea, rash, bleeding from any site or injury. However, on questioning later, the father

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admitted to on and off throwing the baby up in the air and catching him as the child enjoyed this form of play. The infant was left alone with a maid when the parents were at work. It was a loving harmonious well-to-do nuclear family.

Examination revealed a semiconscious afebrile infant with bradycardia (heart rate 64 per minute, regular) and respiratory rate 36 per minute, regular without distress. Blood pressure was 120/90 and 126/90 mm Hg in upper and lower limbs, respectively; the values being more than 95th percentile. Child was pale, nonicteric and did not have bleeding spots, external evidence of injury or neurocutaneous markers. Anterior fontanelle was normal and pupils equal, central and reacting to light. Tone was increased in all four limbs and deep tendon reflexes were bilaterally brisk. There were no signs of meningeal irritation, focal neurological deficits or gross sensory loss. Both carotids were normal. Fundus showed bilateral preretinal hemorrhages. All other systems were normal. On investigation, hemogram was normal except for hemoglobin of 7 g/dl, Random blood sugar was 200 mg/dl coagulation profile, renal and hepatic functions, chest X-ray babygram and ultrasound of abdomen were normal. CSF examination was withheld due to raised intracranial tension, CT scan showed bifrontal subdural hemorrhages. He was treated with decongestive measures, mannitol furosemide, dexamethasone and phenobarbitone. With the above line of management, blood pressure came down to 100/70 mm of Hg, heart rate remained 90-120 per minute and sensorium improved. Neuroimaging was repeated to rule out vascular abnormality or malformation and venous thrombosis. MRI done 20 days later at another institution revealed chronic subdural hematoma

with extension into posterior interhemispheric region (*Fig. 1*). A diagnosis of shaken baby syndrome was strongly suspected on the basis of absence of external marks of injury and presence of fundal and intracranial hemorrhage without any coagulation disorder or vascular malformations. History of whiplash was not available at that time.

Discussion

This case highlights the vulnerability of the infantile head brain and eyes to habitual manual whiplash stresses by shaking. Though child abuse was improbable in this child's home setting, affectionate playing by throwing the child up could have at an unguarded moment led to the injury. The term shaken baby syndrome has been postulated to result from the effects of nonimpact acceleration deceleration forces causing tearing of the bridging veins resulting in subdural hematoma and death(1). The relatively large size of infant's head, weakness of the neck musculature, softness of the skull, relatively large subarachnoid space and high water content of the brain are postulated to contribute to the susceptibility of shaking injuries in infants. Infants are rarely subjected to a single manual shake, more often they are shaken in paroxysms which may be repeated frequently.

The crucial factor in whiplash injuries to the head is the effect of the easily deformable brain moving with a time lag after rotating displacement of its much less deformable mature container—the skull. Attachment to the outer surface of the brain and inner surfaces of the skull are thus subjected to powerful tensile and shearing forces. The infantile brain is unmyelinated and softer than older myelinated brains. This permits excessive stretching

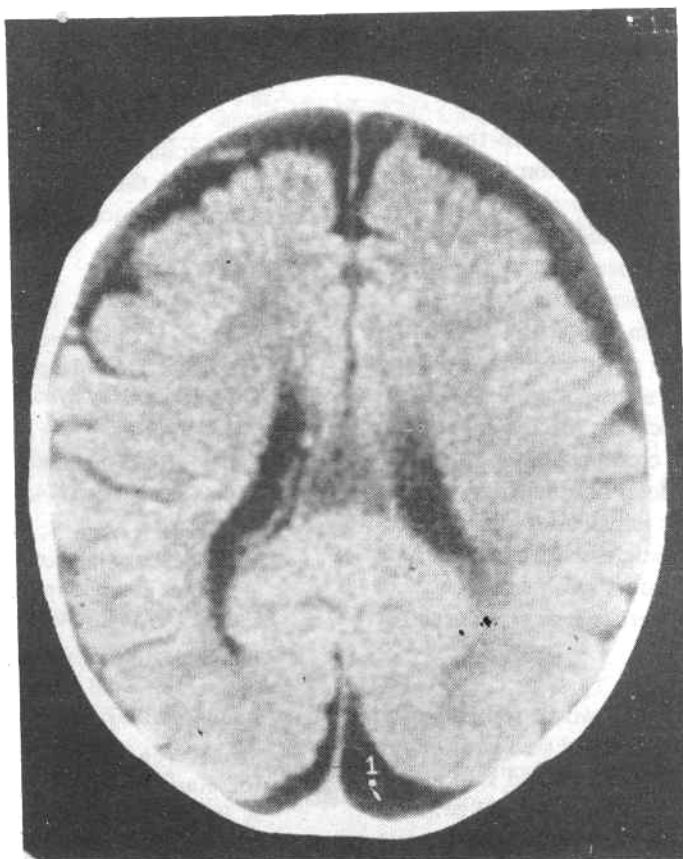


Fig. 1. MRI showing chronic sub-dural hematoma extending into posterior interhemispheric region.

of both brain and vessels. The greater volume of CSF in infantile ventricle and the subarachnoid spaces shift further and faster during whiplash shaking stresses and thus increase their stretching effects on the more resistant brain parenchyma and attachment of blood vessels.

According to Caffey whiplash shaken infant syndrome during early infancy could be one of the primary causes of permanent brain damage and mental retardation or even crib deaths(2). Studies have estab-

lished a direct linkage between admitted manual whiplash shaken infant syndrome and mental retardation, the incidence being as high as 77%. However, Duhaime *et al.*(1) and Alexander *et al.*(3) have shown that the shaken baby syndrome in its more severe form is not usually caused by shaking alone. Although shaking may infect be a part of the process it is more likely that such infants suffer blunt impact. The most common scenario may be a child who is shaken and then thrown into or against a crib or other surface striking the back of

the head thus undergoing a large brief deceleration.

MRI is most valuable when there is a high clinical index of suspicion of abuse despite the presence of a normal or equivocal CT study and when additional funduscopic or neurologic evidence suggest that there may have been intracranial abuse(4). CT is superior to MRI in the acute setting because it is easy to perform in an unstable child, can pick up acute subarachnoid hemorrhage and is cheaper. MRI is superior in the subacute or chronic phase, when CT may often miss deep parenchymal injuries and scar tissue or may lead to misinterpretation of a chronic subdural hematoma secondary to trauma as prominence of the extra-axial cerebrospinal spaces or atrophy(4,5).

In conclusion, it is worth remembering Caffey's quote(2): "Guard well your baby's precious head, Shake, jerk and slap it never, Lest you bruise his brain and twist his mind, Or whiplash him dead, forever".

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