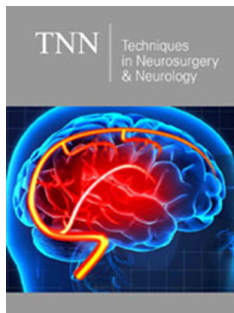


Child Abuse: A Review of Neurosurgical and Medicolegal Considerations

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Abstract

This manuscript's goal is to provide an overview of child physical abuse and neglect, mainly from a neurosurgical point of view, and to describe the magnitude of the problem, as well as the triggers and factors that place children at risk for abuse and neglect. Besides examining the legal and clinical definitions of child abuse and neglect, common clinical outcomes, including the lifelong poor physical and mental health of victims are presented. Mandated reporting laws, and facilitating collaboration among child welfare, judicial, and health care systems are considered. Important tools and resources for addressing child maltreatment in clinical practice are discussed. The ultimate goal of this article is to provide an overview and reference for neurosurgeons, including recognition of common child abuse syndromes, outcome prediction, medicolegal responsibilities and consequences, and prevention efforts.

Opinion

Child abuse is nowadays recognized as a major cause of severe head injury in children and it follows in order of severity only motor vehicle-related injuries as a cause of traumatic mortality in the pediatric population. Child abuse refers to deliberate, inflicted injury, rather than to accidental injury occurring in the setting of neglect or inadequate supervision. It has been estimated that about one fourth of all hospital admissions for head injury in children younger than 2 years of age are the result of deliberate inflicted trauma, and these patients suffer disproportionately severe injuries. It has been hypothesized that many cases of unexplained developmental delay and retardation are directly related to head injuries inflicted in infancy. The cost of acute and chronic care related to child abuse, as well as of the loss of potential from brain damage suffered so early in life and with such high frequency, are enormous and have only recently begun to be considered widely.

As our knowledge regarding the biomechanics of head injury in young children has remarkably increased, it has become evident that neurologically serious head injuries rarely result from common, minor household falls. Familiarity with traumatic mechanisms of injury in children and with the presentation and evaluation and management of non-accidental injury is important for attending neurosurgeons, because a missed diagnosis frequently results in recurrent injury. It is accepted that the correct diagnosis is missed in about one third of children with head injuries caused by abuse who sought out medical attention, and this inappropriate diagnosis resulted in medical complications, recurrent injury and fatality. Besides that, a neurosurgeon's consultation as to the presumptive mechanism of injury which is responsible to cause a specific clinical picture is often given great deal of importance in medicolegal determinations. These decisions affect the patient, siblings, parents, and caretakers in profound and different ways, and a responsible neurosurgeon must be able and exact in order to separate what is known and understood from what is conjecture. The goal of this article is to provide an overview and reference for the readers, including presentation and description of common child abuse syndromes, management of acute injuries, clinical and neurological outcome prediction, medicolegal responsibilities and consequences, and prevention efforts.

The term *shaken baby syndrome* was originally coined by Caffey in 1972 to describe infants with acute subdural and subarachnoid hemorrhages, retinal hemorrhages, and

periosteal new bone formation at the epiphyseal regions of the long bones. The mechanism of the injuries commonly found in abused infants was postulated to result from 'whiplash-shaking' as a form of discipline, and the term *shaken baby syndrome* became widely accepted as both a diagnosis and a mechanistic description. Support for the validity of the term was found in the observation that many infants with the intracranial findings of the syndrome had little if any evidence of blunt impact to the head on the initial physical examination. In addition, infants' relatively large heads, weak neck muscles, and watery brain consistency were thought to render them particularly vulnerable to severe injury from being shaken back and forth by a caretaker.

Controversy about the mechanism of these injuries arose because of the paucity of reliable history typically available to the evaluating physician. More recently, the term *shaken baby syndrome* has been argued because clinical series, autopsies, and biomechanical and radiographic analyses have suggested that many if not most of these infants do, in fact, have evidence of blunt impact to the head and that the deceleration forces generated by shaking alone are insignificant compared with those caused by impact, even when it is again a padded object. The frequent lack of dramatic cutaneous bruising can be explained by the dissipation of angular deceleration forces across a relatively wide and soft surface. It seems likely that although an infant may be shaken, the final thrust involves the head striking a surface, resulting in the high deceleration forces required to cause subdural hemorrhage and frequently severe parenchymal damage.

Regardless of the exact mechanism responsible for the injury, the clinical scenario in shaking-impact syndrome is often remarkably similar from case to case. Affected children are nearly always 2 years old or younger, and most are younger than 6 months old. They are brought to medical attention because of irritability, poor feeding, or lethargy in mild cases and because of seizures, apnea, or unresponsiveness in more severe cases. Although these types of injuries occur in families of all sorts, they present most commonly in more fragmented family situations; typically, the infant has multiple caretakers, the parents are young, there are few resources, or other stressful conditions are present. Drugs or alcohol may be involved. Perpetrators were fathers, boyfriends, female babysitters, and mothers, in descending order of frequency.

On physical and examination, a range of neurological abnormalities may be found and the anterior fontanelle may be full, indicative of increased intracranial pressure. Hemorrhagic elements may be located unilaterally or bilaterally and have a remarkable propensity for the posterior interhemispheric space. This may result from impact to the back of the head and bony displacement across the lambdoid sutures, resulting in strains to the underlying venous sinuses and deep draining veins.

In severe cases of shaking-impact syndrome, the brain may lose its normal gray-white matter differentiation and have the appearance of a large unilateral or bilateral supratentorial infarction. This finding may be visible on the initial scan or may develop 1 to

2 days after injury. Children with this radiological appearance are usually unresponsive on admission and have a dismal prognosis for neurologic recovery. The pathophysiology of the so called *black brain* may have a causative relationship to the synergistic effects of hypoxia, mechanical trauma and subdural hemorrhage.

Management of head injuries related to child abuse is related to the underlying pathologic entity. When we are confronted with acute subdural hematomas, there is no way to assure in every case that the underlying mechanism is inflicted versus accidental injury. Whenever they present with mass effect of the underlying brain, emergency evacuation in the standard fashion is the treatment goal. Despite prompt evacuation, lesions to the relevant brain tissue may persist or even deteriorate, resembling that of a widespread infarction. A common clinical scenario is that the pathologic processes leading to the extended parenchymal damage have already begun at the time of patient admission to the hospital, being related to local parenchymal compression, direct mechanical trauma, brain hypoxia or seizure activity related to the event.

Another relatively common finding encountered in this patient population is bilateral, extensive, chronic, intradural fluid collections, composed of degraded blood products or proteinaceous cerebrospinal fluid. The term 'chronic subdural hematoma' often applies to such collections, resembling in many circumstances the consistency of adult chronic subdural hematomas. In these cases, a definite clinical history of profound antecedent head trauma is often missing, and the probability of child abuse should not be excluded. There is increased possibility that we can distinguish blood products of different intensity on MRI, and accordingly of different chronological age, within the collections. This could be indicative of repeated head trauma, possibly correlated with child abuse.

Medicolegal considerations in child abuse

The recognition of child physical abuse as a theoretically preventable entity has led to the development of child abuse legislation. In 1963 the U.S Department of Health, Education, and Welfare's Children's Bureau developed principles and suggested language for states to use in generating child abuse statutes. In 1974 the Federal Child Abuse Prevention and Treatment Act required states to expand reporting laws to include other forms of abuse and provided grants to states meeting the new standards.

Physician testimony is often required in civil and criminal trials. The physician can testify as either a fact witness or an expert witness. This legal distinction is designed to prevent witnesses of fact, who are asked only to report their actions or observations, from expressing personal opinions based on conjecture or bias, which might unfairly influence a jury. A treating physician may be subpoenaed to provide information regarding only the child's treatment or care, thus serving as a fact witness. Whereas fact witnesses are not permitted to offer opinions or conclusions derived from the facts of a case, an expert witness is expected to do just that. An expert witness is an individual who, by training, education and clinical experience, has knowledge in a particular

field that goes beyond what a layperson would know. After hearing the credentials of the witness, the judge determines whether the witness qualifies as an expert, allowing him or her to offer opinions and conclusions. Based on this broad definition, most neurosurgeons would be considered experts with respect to head injuries and their causes. Unfortunately, the concept of 'expert' as it applies to this sort of case poses some practical problems. First, the court's definition of an expert differs from that of the medical community, legally allowing for expert testimony from medical scientists who have advanced degrees but no true expertise on the subject in question. Second, an expert witness should be thought of as someone who can educate the judge and jury; the facts and opinions of the expert should assist them in determining the guilt or innocence of the defendant. Although many clinicians in various specialties, including neurosurgery, have some familiarity with inflicted head injuries, it is often tempting to infuse facts with opinions in an area in which considerable uncertainty exists. Reviews of the problem of irresponsible expert witness testimony outlines the qualities of a responsible expert, who should be a nonpartisan scholar with publications in the field in question and an active clinician for whom legal activities constitute only a minor part of professional activities.

Physician involvement in a court proceeding is usually heralded by a served subpoena. In cases of child abuse, the state, or the prosecuting attorney, is most likely to request the participation of the patient's physician. The physician should find out the setting of the hearing (civil versus criminal proceeding) and the extent of his or her expected participation (fact versus expert witness). The medical records should be available to the physician when discussing the case with attorneys. If the physician is called as an expert witness in a trial, the judge first hears the physician's qualifications and determines whether the physician meets the criteria of an expert. The direct examination of the witness, which is done by the attorney requesting the physician's presence, follows. The purpose of the direct examination is to present all the information pertinent to the case. When testifying in court, it is important that the physician understand the question, avoid guessing or speculating, not go beyond his or her area of expertise, be honest and concise, and avoid offering information not requested. Fortunately, the majority of reported cases of child abuse do not require court involvement, and only a minority of abuse cases are severe enough to warrant criminal prosecution.

There has been little focus on the long-term effects of physical abuse. This is partly due the relatively recent professional recognition of child abuse. Studies centered on the effects of physical abuse on subsequent delinquent and adult criminal and violent behavior. They concluded that although the majority of the abused children did not become delinquents or adult criminals,

being abused as a child increased the risk for juvenile delinquency, adult criminal behavior, and violent criminal behavior.

There are no studies that specifically address the long-term social outcome of infants and toddlers who were victims of inflicted head trauma. This is primarily due to the relatively recent recognition of abusive head injury as a medical diagnosis. As the recognition of abused children improves and the management of these patients advances, an increasing number of older children and adults will become available for study.

The significance of restriction of child abuse seems to be universally accepted, yet it is premature to consider the primary prevention of abuse an attainable goal. The factors related to the cause of child abuse are varied and complex. Poverty, social violence, inadequate pediatric health care, family isolation, domestic violence, unrealistic parental expectations, all contribute to abuse and neglect. Much of what we currently consider prevention is actually reactive: high-risk families are identified and monitored; counseling and psychotherapy are provided when available; and when the danger is too great, children are placed in foster care, and the criminal justice system assists in an effort to modify behavior.

Much of the recent effort in prevention has focused on identifying child, parent, and caretaker factors that increase the risk of abuse. Efforts to target high-risk caretakers for specific interventions, including education in parenting skills, stress management, and appropriate choices in surrogate child care, might best direct prevention resources toward those most likely to benefit.

Prevention of all forms of abuse and neglect would require the elimination of poverty and violence from society, the development of comprehensive support systems for new parents and nuclear families, and improved education of the children and young adults who represent the next generation of parents. Comprehensive health care reform is needed to provide adequate medical insurance to millions of children who are currently uninsured. Many school districts have incorporated child abuse prevention into education curricula.

Research into prevention has not kept pace with progress in the diagnosis, pathophysiology, and management of inflicted head injury, and more work is needed to study the efficacy of specific interventions. As in many medical and social problems, in child abuse, prevention is the ultimate goal on both an individual and a public health level. It is incumbent on neurosurgeons who treat children to recognize abuse when it occurs and to participate in public and professional education whenever possible, so that these potentially devastating injuries might be prevented.

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