

BRAIN TRAUMA

BRAIN INJURY AND SHAKING

The mechanism of brain injury in 24 infants with a diagnosis of shaken baby syndrome was investigated at the University of Iowa Hospitals and Clinics, Iowa City, IA. Half of the patients demonstrated signs of external head trauma. Intracranial injuries were indistinguishable in infants with and without evidence of external trauma. The mortality rate was the same in both groups. These findings indicated that shaking by itself is sufficient to cause severe or fatal intracranial injury and child abuse injuries associated with shaking may include direct trauma or only shaking. (Alexander R et al. Incidence of impact trauma with cranial injuries ascribed to shaking. AJDC June 1990; 144:724-726).

COMMENT. From an anatomical standpoint one might expect that shaking would cause damage to the brain in the distribution of the vertebral arteries. Brain stem and occipital hemorrhage or ischemia was not documented in this report however. Apparently, shaking may cause hemorrhage from various sites including the retina and the intracranial bridging veins and the subdural space. The data in this study suggests that shaking alone is sufficient to cause serious intracranial injury or death.

Brain injuries among infants, children, adolescents, and young adults are reviewed from the Department of Epidemiology School of Public Health, UCLA, Los Angeles, CA. (Kraus JF et al. AJDC June 1990; 144:684-691). The distribution of injuries by external cause varied with age. For infants, more than two-thirds of all brain injuries were from falls but only 8% were severe in nature. For preschool children, falls and motor vehicle accidents accounted for 51% and 22%, respectively. For school aged children five to nine years old, injuries were equally divided among motor vehicles, falls, and sports and recreation-related activities (31%, 31%, and 32%, respectively). Among adolescents aged 10-14 years, sports and recreation-related activities accounted for 43% of all brain injuries but only 7% were serious. Among young adults, 55% of injuries involved motor vehicles and one-third were serious.

BRAIN INJURY AND DROWNING

The epidemiology and clinical course of immersion brain injury of childhood drowning cases are reviewed from the University of California, Davis, Sacramento. In 1986 there were 2,122 childhood drownings in the United States. Children 0-4 years of age accounted for 36% of all deaths and most of these occurred in residential pools. Children with a seizure disorder are at increased risk for drowning with rates several times higher than expected. Alcohol use is a contributing factor among adolescents in 40-50% of males. The outcome of drowning is largely determined by events occurring in the first ten

minutes after the incident. Consciousness is lost after two minutes of anoxia, and irreversible brain damage occurs after four to six minutes. Survival is unusual after immersions of longer than five minutes. Prompt resuscitation is vital; almost all subjects who ultimately survive are making a spontaneous respiratory effort within five minutes after extraction from the water and most do so within two minutes. Children who still require CPR in the emergency department have a poor prognosis: 35-60% die, and 60-100% of the survivors are severely brain damaged. Resuscitative measures may achieve somatic survival of the heart and other vital organs but brain function remains severely impaired. The patient in the permanent vegetative state breathes spontaneously and may exhibit random movements but has no purposeful activity or thought. Life expectancy of these children is estimated to average 18 months in institutions and longer in home care. Failure to provide timely resuscitation and lack of knowledge of CPR techniques among pool owners is associated with a poor outcome in drowning and near-drowning incidents. Pentobarbital therapy, at one time thought to be a promising addition to standard therapy for near drowning, has recently been shown to be ineffective. (Wintemute GJ. Childhood drowning and near-drowning in the United States. AJDC June 1990; 144:663-669).

COMMENT. Since the outcome of an immersion event is determined within a few minutes of the onset of the incident, the emphasis is on primary prevention. Mandatory pool fencing and training in cardiopulmonary resuscitation for pool owners should be stressed. Children with epilepsy are often permitted to swim in pools but not in lakes with poor underwater visibility. Strict supervision must be observed since the risks of drowning are several times higher than for the average child.

HYPERGLYCEMIA AND CEREBRAL BLOOD FLOW IN DROWNING

Serial blood glucose levels and cerebral blood flow within 48 hours of admission were correlated with the clinical courses of 20 children with severe near-drowning in the Division of Child Neurology, the Department of Pediatrics, and Section of Neuroradiology, Loma Linda University School of Medicine, Loma Linda, CA. Seven children died, nine were in the persistent vegetative state, and four were normal. Ages ranged from nine month to ten years. Blood glucose levels on admission in the patients who died (511 ± 110 mg%) or who survived in a persistent vegetative state (465 ± 104 mg%) were significantly elevated compared with children who were normal at follow-up (238 ± 170 mg%). The blood glucose values returned to normal by day three of hospitalization. Cerebral blood flow measured by stable xenon computed tomography was significantly decreased in patients who died compared with those who were normal or in a persistent vegetative state. An increase in intracranial pressure was correlated with decreased cerebral blood flow but not with the elevated blood glucose. An elevated initial blood glucose on admission was highly predictive of patients who died or those with vegetative survival. Cerebral blood flow measurements were predictive of eventual