Management of minor closed head injury in children and adolescents

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Abstract In order to develop a systematic, evidence-based approach to minor closed head injury (CHI) in the pediatric patient, case records were reviewed of all 2,533 children and adolescents admitted to Cooper Hospital/University Medical Center for minor CHI during the years 1986 to 1992. A survey was taken during a 6-month period of 734 consecutive pediatric patients discharged from the Emergency Department for minimal CHI (out of a total of 10,276 children during the entire 7 years of the study). Categories of minor CHI derived from studies in adults were used to group data. For each category of minor CHI, the frequency of various complications such as skull fracture, intracranial lesions, and need for neurosurgical intervention was determined. Also reviewed were survival and neurological outcome 6 months following injury. Children with moderate CHI had a 37% incidence of intracranial lesions on computed tomography (CT) scan and 9% of them required intracranial surgery. The incidences of intracranial lesions and surgical intervention in the mild CHI group were 12% and 2.6%, respectively. Children with Glasgow Coma Scale scores of 13 belonged in the moderate rather than the mild CHI group, as evidenced by their higher risk. Skull fracture was not highly correlated with intracranial pathology or the need for surgery. Age had no significant impact on the incidence of lesions, rate of surgery, or outcome. Both intracranial lesions and surgery were extremely rare in the minimal CHI group. We propose three categories of minor CHI based upon relative severity (minimal, mild, and moderate) and offer a simple management scheme for each category. Based on our experience with this approach, we estimate that 80% of children with minor CHI can safely be discharged from the Emergency Department. Cranial CT scanning will be required in only 7% of cases, but when indicated, will be extremely valuable in guiding further care.

Key words Head injury • Children • Pediatrics • Minor head injury

Introduction

Every year, approximately 150,000 children suffer closed head injury (CHI) and require hospital attention [41]. Over 80% of these injuries are minor, but the care of children with even minor head injury is not necessarily simple. The history is often difficult to obtain, as is cooperation for physical examination and diagnostic testing. Children are more likely than adults to suffer skull fractures [14] and dramatic post-traumatic symptoms such as intractable vomiting and seizures [13, 21]. It is, therefore, no surprise to note that proportionately more children are admitted to the hospital than are adults [20, 26]. The greatest concern among those caring for children with apparently minor CHI is the risk of undetected mass lesions, which can cause devastating neurological injury [1, 49]. Other acute events such as brain swelling [11, 43], hydrocephalus, dural venous sinus thrombosis, and blindness can complicate even the mildest pediatric head trauma.

Unfortunately, there are few guidelines for the care of minor pediatric CHI that are based on evidence rather than on judgement or authority. It is, therefore, not surprising that one survey of pediatricians found little agreement on how to manage minor CHI [6]. Encouraged by our ability to develop evidence-based guidelines for early management of minor CHI in adults [47, 48], we embarked on a similar study of children and adolescents.
During the 7-year period from January 1986 to December 1992, the emergency facilities at Cooper Hospital/University Medical Center evaluated approximately 25,000 patients with CHI. Almost 13,000 were 19 years of age or less. Hospital admission was routine for all children with mild or moderate CHI and all those whose minimal CHI was complicated by risk factors. All patients admitted to the hospital were entered into a trauma registry; significant clinical and radiologic features were recorded. We reviewed all pediatric patients admitted with moderate or mild CHI, as well as those with minimal CHI admitted for risk factors. All children with mild and moderate CHI underwent cranial computed tomographic (CT) scanning, as did many with minimal CHI in whom risk factors were present.

Data were collected regarding GCS, findings on CT scan, clinical course, including neurosurgical procedures, and Glasgow Outcome Scale (GOS) score 6 months following injury [18]. Cooper Hospital collected standardized data as part of the National Pediatric Trauma Registry [52]. We were unable to follow all of the 10,276 children who presented with minimal CHI and no complications during the entire 7-year period. However, a detailed review was made of 734 pediatric cases discharged from the Emergency Department following evaluation for minimal CHI during a 6-month period in 1991. Families were contacted by phone and mail 48 h after the Emergency Department visit to determine short-term outcome.

Results

The number of patients and the age distribution of each severity group are summarized in Tables 3 and 4. Short-term follow-up data were obtained for 572 (77.9%) of the 734 surveyed children with minimal CHI and no complications. Six-month GOS scores were obtained for 165 (80.5%) of the 206 patients with moderate CHI and 507 (82.3%) of the children whose injuries were in the mild category. There were no pediatric patients in a persistent vegetative state at 6 months after injury.

Moderate CHI

Table 5 analyzes the intracranial complications by GCS and Table 6 lists the various lesions found on CT scan. It should be noted that 64% of skull fractures were associated with intracranial lesions but that only 31% of children with intracranial abnormalities also had skull fractures. There were 3 deaths (1.5%), 1 each with admission GCS scores of 9, 11, and 13. Two were secondary to delayed deterioration from cerebral lesions, the third from associated extracerebral injuries. Six-month outcomes of moderate CHI are summarized in Table 7.

Mild CHI

Of the 695 children in this category, 582 (83.7%) had a GCS score of 15 on admission; the remaining 113 scored 14. Table 8 lists intracranial complications by GCS. The incidence of individual lesions in given in Table 9. As in the moderate CHI group, only 39% of the children harboring intracranial lesions had an associated skull fracture. Complications were not observed in any child whose admission CT scan was normal. Three children with mild CHI died...