HEAD INJURIES IN CHILDREN : ROLE OF X-RAY SKULL, CT SCAN BRAIN AND IN-HOSPITAL OBSERVATION

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ABSTRACT

Skull fractures are unsuspected on clinical grounds hence require X-ray and hospital admission. CT scan of head should be the first line of investigation in cases of head injuries. However, where CT facilities are not available, we still recommend X-ray skull because we found a significant correlation between fracture skull and underlying intracranial lesion. In absence of investigation facilities, careful clinical evaluation of patient is the best predictor of future complications.

MJAFI 1998; 46 : 322-324

KEY WORDS: Cerebral edema; CT scan; Glasgow coma scale; Hospital admission; Paediatric head injury; Skull fracture; X-ray skull.

Introduction

The number of head injuries in children is rising annually and number is by no means insignificant. Twenty five to thirty percent of all patients admitted with head injuries to any large hospital are children [1]. The hospital admission of all cases of head injury is generally unnecessary. History of unconsciousness or presence of a fracture on radiology are definite indications for admission. However, a certain number of these patients will deteriorate because of the development of a post traumatic intracranial mass lesion. Skull X-ray are routinely obtained in all cases of head injuries at admission or as out door patients, in a search for linear skull fracture on the assumption that a skull fracture predisposes the patient to the development of an intracranial mass lesion. It has been well established that head injuries in children differ in several important ways from those seen in the adult population [2-4].

Material and Method

To determine the utility of X-ray skull and its correlation with CT scan, we studied prospectively 100 patients of head injuries admitted to Department of Pediatric Surgery of Sawai Man Singh Medical College, Jaipur. Demographic (age, sex, mode of head injury), historical (state of consciousness at the time of injury and presence of other associated injuries), physical examination (neurological examination including Glasgow coma scale (GCS) and mental status), radiological data (X-ray skull and CT scan), surgical and medical therapies (hyperosmolar agent, phenytoin sodium) and discharge diagnoses were the evaluation criteria.

Results

The 100 pediatric patients of head injury were evaluated for

age, sex, nature of injury, presenting symptoms, GCS and CT scan findings. There were 68 males and 32 females in the age range of 8 months to 11 years. Twenty four percent of injuries occurred in infants below the age of 2 years. There was a striking rise in incidence at the age of 5 years but beyond 5 years the numbers tended to fall. Skull fractures were found in 30 out of 68 males and in 17 out of 32 females. The most common cause of injury was a fall from height of approx. 10 feet (88%) followed by pedestrian/road traffic accidents (Table 1). Seventy percent of falls occurred in early evening when children were playing unattended. The seventy five percent cases occurred in summer holidays and kite flying season. Vomiting and loss of consciousness were the main presenting symptoms followed by convulsions and bleeding from mouth, nose or ear. Evaluation of patients as per Glasgow Coma Scale (GCS) at admission revealed that 70% of patients had minor injury (GCS-15/15) (Table-2). Skull X-ray was carried out in each case and 47% of cases showed linear fractures (26 parietal, 15 frontal and 3 each in temporal and occipital regions). All cases were subjected to CT scan brain, which revealed positive scans in 33 cases, out of which 15 cases were of cerebral edema (Table-3). Twenty one cases who had fracture skull also had contusion/haematoma and cerebral edema on CT scan. The intracranial lesion occurred more frequently in children with a skull fracture (in 21 cases out of 47) than in those without one (in 12 cases out of 53). Only 7 patients were transferred to neurosurgical department where 3 were operated for haematoma and 4 treated conservatively. Two patients died, one because of severe primary diffuse axonal injury and other as a result of associated multiple injuries of chest and abdomen. The minimum hospital stay was 24 hours and longest hospital stay was 3 weeks. Maximum number of patients were hospitalized for 48 hours.

Discussion

Head injuries in children are common but they are almost always benign in their course. Most injuries occurred in children living in traditional old houses of Jaipur city having low parapet which is responsible for

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TABLE 1

Mode of injury

Nature of injury	No. of cases
Falls from height (average 10')	80
Falls at ground level	8
Road traffic accidents	8
Fall of object over the head	2
Blow by a stone	1
Others	1

TABLE 2

Distribution of patients according to GCS at the time of admission

GCS	No. of cases	Outcome
3/15	3	1 patient died and 2 transferred to NSU*
4/15	2	1 patient died
5/15	0	—
6/15	5	1 patient transferred to NSU*
7/15	1	—
8/15	0	—
9/15	1	—
10/15	2	1 patient transferred to NSU*
11/15	1	1 patient transferred to NSU*
12/15	7	2 patients transferred to NSU*
13/15	5	Good recovery
14/15	3	Good recovery
15/15	70	Good recovery

NSU* - Neuro Surgical unit

TABLE 3

Distribution of CT scan findings**Total no of cases = 100, CT scan positive = 33**

CT findings	No of cases	Outcome
Central edema	15	3 cases transferred to NSU*
Frontal contusion or haematoma	8	3 cases transferred to NSU*
Fronto-parietal extradural haematoma	3	—
Temporo-parietal subdural haematoma	4	1 case transferred to NSU*
Small occipital haematoma	1	—
Mild hydrocephalus with intraventricular haemorrhage	2	—

NSU* - Neuro surgical unit

high percentage of fall while playing or flying kite.

Inflicted injuries account for nearly 25% of children for head injuries in developed countries [4]. These injuries are more severe, which perhaps explains the high incidence of skull fracture and intracranial haematoma reported in their literature. We have not encountered the problem of a "battered child" which has acquired a sinister proportion in the developed countries. In our set up and in the present series, the commonest cause of head injury was due to a fall (88%)

from a window, balcony or unguarded roof of a house or due to tumble down the stairway. Similar mode of injury was reported in different series from this country [1,5].

The commonest presentation was a history of transient loss of consciousness with vomiting and drowsiness. At times the child was brought in a convulsive or post convulsive state which was controlled by IV phenytoin sodium and at times IV diazepam. However, lateralising signs were not present at the time of admission in any of the case.

The usefulness of skull X rays in the initial evaluation of patients with head injury was always controversial. Eyes and Evans in a review of over 500 patients who underwent skull X-ray concluded that there was no correlation between radiographic findings and need for hospital admission [6]. similar conclusions were reached by Balasubramaniam et al in a review of over 2000 patients [7]. However, other authors are equally convinced that emergency X-ray skull films are a useful adjunct in the management of the head injured patients. Jennett has stated that when complications occur after apparently mild injury, there is usually a skull fracture [8]. Therefore, it becomes important to identify these fractures and admit the patient when a fracture is present. Galbraith [9] noted that skull fractures are often unsuspected on clinical grounds, but are associated with a greatly increased risk of intracranial haematoma and he reasoned that X-ray skull films are helpful in identifying this group of patients. In our series of 100 patients, skull fracture was present in 47% of the patients with 21% having underlying brain lesion. Galbraith and Smith have also reported the high incidence of fracture skull with associated underlying intracranial haematoma. It is important to note that the series reported by Galbraith and Smith included mostly cases of road traffic accident which are always serious and fatal [10].

The most significant observation in children is a high incidence of cerebral edema which at times is acute and fulminant. Out of 100 cases, the CT scan findings were positive in 33 cases. Fifteen patients were found to be having cerebral edema alone, leading to death in one patient. The correlation between detection of skull fracture on X-ray and CT scan were significant, since 45% of patients having skull fractures were found to have either intracranial mass lesion or cerebral edema. Feuerman [11] reported that in a group GCS 15/15 patients, skull radiograph was done in 201 cases and out of which 59 patients had head CT scans. Seventy two patients (31%) were found to have skull fractures. Positive CT findings were there in 20

of the 59 patients (34%), which were similar to our findings.

We conclude from our small series that when a patient is identified as having a fracture, there are greater chances of having an intracranial haematoma than in those without one. Patients with GCS 15/15 and with a normal mental status are at extremely low risk of developing complications, hence can be discharged to home after overnight observation. Patients with GCS less than 14 should always be admitted to the hospital and thoroughly investigated, to minimise their risk of deterioration from significant intracranial lesions. In absence of investigation facilities, clinical evaluation (mental status) was the best predictor of subsequent deterioration. Primary brain injury was rare from simple falls from low height. We also recommend that each and every patient must be evaluated and managed on an individual basis and no fixed algorithms should be used.

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