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Evaluation of Pediatric Head Injuries

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Abstract

Background Trauma is a leading cause of death in children older than one year in the world; with head trauma representing 80% or more of the injuries. Most head injuries in children occurs secondary to motor vehicle accidents, falls, assaults, recreational activities, and child abuse.

Objectives To evaluate head trauma in pediatrics age group regarding age, sex, presenting symptoms and signs and the line of management; to know the role of CT scan in assessment of pediatrics head trauma, and t determine the extent of pediatric head trauma in Baghdad city.

Methods Fifty neurosurgical pediatrics cases with head trauma between the age of one year to fourteen years whom presented to the neurosurgical ward in Al-Imamain Al-kadhimain Medical City. Questioner for gender, age, mechanism of injury, presented signs and symptoms, consciousness, CT scan findings, and the line of management.

Results The study showed that males have the higher incidence with 72%. Head injury due to road traffic accident accounting for 44%. The loss of consciousness was documented in 60% of the cases. All patients subjected to CT scan imaging modality for assessing head injury as the ideal way. The presence of hematoma was seen in 68% of the cases. Associated injuries were seen in 60% of cases. Vomiting as an important symptom in pediatrics head trauma encountered in 52% of the patients. The developments of fits are very important sequel encountered in 16%. The close monitoring and follow up being the most common line of management accounting for 88%.

Conclusion Pediatrics head trauma is a common problem with males have higher incidence than females. The most common mechanism of injury was road traffic accident. CT scan is a very vital and important diagnostic tool in evaluating patient with head trauma.

Key words Pediatrics, head trauma.

List of abbreviation: HT = head trauma, ICH = intracranial hemorrhage, PGCS = Pediatric Glasgow Coma Scale, CT scan = computerized tomography scan, CSF = cerebrospinal fluid, RTA = road traffic accident.

Introduction

Trauma is a leading cause of death in children older than one year in the world, with head trauma (HT) representing 80% or more of the injuries. Patients with HT may experience one or a combination of primary injuries, including scalp injury, skull fracture, basilar skull fracture, concussion, contusion, intracranial hemorrhage (ICH), subarachnoid hemorrhage, epidural hematoma, subdural hematoma, intra-ventricular hemorrhage, penetrating injuries, and diffuse axonal injury [(1)]. The secondary injury is represented by systemic and intracranial events that occur in response to the primary injury and further contribute to neuronal damage and cell death [(2)].

The distribution of HT is relatively stable throughout childhood. An increase in the incidence of HT was identified in two age groups. At approximately age 15 years, a dramatic increase occurs, mainly in males, related to their involvement in sports and driving activities. Infants younger than 1 year

also have an elevated incidence of HT, which is attributed to falls and child abuse [3]. The overall outcome for children with head injuries is better than that for adults with the same injury scores [4-6].

Outcome assessment based on the Pediatric Glasgow Coma Scale (PGCS) can be used as an early predictor, but this scale has limitations regarding long-term outcome. Mechanism of injury appears to be a significant predictor of clinical and functional outcomes at discharge for equivalently injured patients [7].

Seizures are more commonly observed with contusions (more so with subdural hematoma than with epidural hematoma), depressed skull fracture, and severe head injury (PGCS score, 3-5).

Other complications include leptomeningeal cyst, meningitis, cranial nerve injury, post traumatic syndrome and transient cortical blindness [8]. Computed tomography (CT) of the head remains the most useful imaging study for patients with severe HT or unstable multiple organ injury [9,10].

Indications for CT scanning in a patient with a head injury include posttraumatic seizures, progressive headache, an unreliable history or examination because of possible alcohol or drug ingestion, loss of consciousness for longer than 5 minutes, physical signs of basilar skull fracture, repeated vomiting or vomiting for more than 8 hours after injury, and instability after multiple trauma [11].

Methods

A cross-sectional study of 50 cases of closed pediatric HT between the ages of 1 year to 14 years whom present to the neurosurgical ward, Al-Imamain Al-Kadhmain Medical City from 1st of December 2012 to the 1st of May 2013. Questioner about the sex, age, mechanism of the injury, presented signs and symptoms, consciousness level, CT scan findings, and the line of the management.

Vomiting consider seriously in such patient, because it can be an important sign of raised intracranial pressure. Observation for any watery nasal or ear discharge can give clue to dural laceration with resultant cerebrospinal fluid (CSF) leak. Periorbital swelling and discoloration or post auricular bruises can indicate basilar skull fracture. Focal neurological can indicate hemispheric or brain stem compromised.

All patient managed with first aid measures (airway, respiration and circulation), those whom need surgical intervention managed urgently in the emergency theater, and others with no surgical findings admitted to the neurosurgical word and close observation ensured. Antiepileptic and antibiotics were given for those with high risk for seizures and infection respectively.

By using the SPSS (Statistical Package for the Social Sciences) the categorical data formulated as frequency and percentage. Chi-square test describes the association of these data. The lower level of accepted statistical significant difference is bellow or equal to 0.05.

Results

A total of 50 pediatric head trauma were enrolled in this study. They were 72% male and 28% female. The age range was between 1-14 years, mean age 4.4 years.

The mechanism of the of most head injury in this study were due to road traffic accident accounting for 44% while fall from height was 42% and trauma or fall of a heavy object were 14%. The loss of consciousness in this study was documented from the history in 60% of the cases while those with no history loss of consciousness were 40% (Table1).

The presence of hematoma was seen in 68% of the cases as seen in table (2). The presence or the development of associated signs like Raccoon eyes which is found in 32% of the cases and battle sign which is found in 16% of the cases which may point to the presence of basilar skull fracture.

Basilar skull fracture may cause CSF to leak from the nose (CSF rhinorrhea) alone or with blood, which is seen in 12% (6 cases). Basilar skull fracture may cause CSF to leak from the

ear with hemotympanum or bleeding from the ear which is encountered in 8% (4 cases). In this study 52% of the patients had vomiting all were projectile in type (Table 3).

Table 1. Descriptive statistics of the presenting state of consciousness

Consciousness	Frequency	%	Valid %	Cumulative %
Loss	30	60.0	60.0	60.0
No	20	40.0	40.0	100.0
Total	50	100.0	100.0	

Table 2. Descriptive statistics of the C-T scan findings

CT scan finding	CT fracture		Total
	Yes	No	
Hematoma	20	14	34
No hematoma	12	4	16
Total	32	18	50

Table 3. Associated symptoms and signs

Symptoms or sign	Frequency / out of 50	%	Valid %	Cumulative %
Vomiting	26	52.0	52.0	52.0
Raccoon eye	16	32.0	32.0	84.0
Battle sign	8	16.0	16.0	100.0
Rhinorrhea	6	12.0	12.0	100.0
Otorrhea	4	8.0	8.0	100.0
Extracranial injuries	8	16.0	16.0	100.0
Focal neurological sign	2	4.0	4.0	100.0
fit	8	16.0	16.0	100

In this study CT scan showed that 64% (32 cases) had skull fracture while 36 % (18) had no skull fracture. Forty eight percent of the cases in this study had linear fracture while 16% had depressed fracture (Table 4).

Table 4. Descriptive statistics of the type of the skull fracture

Skull fracture	Frequency	%	Valid %	Cumulative %
Linear	24	48.0	48.0	48.0
Normal	18	36.0	36.0	84.0
Depressed	8	16.0	16.0	100.0
Total	50	100.0	100.0	

The presence of hematoma was seen in 68% of the cases. The most common site of hematoma encountered is the subgaleal (extra cranial) which was seen in 40% of the cases either alone mostly or in association with other intracranial hematoma the second most

common hematoma was the subdural type which is seen in 16% of the cases either alone or with extradural hematoma and then the intracerebral hematoma in 12% either alone or with subgaleal hematoma and then is the extradural hematoma either alone or in with subdural hematoma accounting for 8% of the cases (Table 5).

Table 5. Descriptive statistics of the site of hematoma

Site	Frequency	%	Valid %	Cumulative %
Normal	16	32.0	32.0	32.0
Subgaleal	16	32.0	32.0	64.0
Subdural	6	12.0	12.0	76.0
ICH	4	8.0	8.0	84.0
Extradural and Subdural	2	4.0	4.0	88.0
Extradural	2	4.0	4.0	92.0
Subgaleal and Extradural	2	4.0	4.0	96.0
Total	50	100.0	100.0	100.0

The close monitoring and follow up being the most common accounting for 88% ,while surgical option was done in only 8% of the cases (4cases) three of them had depressed fracture and the other had a big extradural hematoma. Two patients died (Table 6).

Table 6. Descriptive statistics of the line of management and outcome

line of management and outcome	Frequency	%	Valid %	Cumulative %
Follow up	44	88.0	88.0	88.0
Surgery	4	8.0	8.0	96.0
Dead	2	4.0	4.0	100.0
Total	50	100.0	100.0	

Discussion

Pediatric head trauma is a common problem and is commonly seen in the neurosurgical ward of hospitals.

In this study the age of the patients presented with closed head trauma was between 1 to 14 year with the mean age is 4.42, while in a same study conducted in the USA by the American pediatric association the mean age was 8.9 years an older mean age than our study [(12)].

The sex distribution in our study shows that the males have the higher incidence with 72% (36 cases out of 50) while in females it was 28% (14 out of 50) as the boys are more playful than girls and have more outside activities that make them more prone to RTA. The same study in the US showed also a higher male incidence with 64% and the females were 36% [(12)].

The mechanism of the of most head injury in this study were due to road traffic accident accounting for 44% while fall from height was 42% and trauma or fall of a heavy object were 14% as these percentages are relatively equal to study published in pediatrics in review 2012[13] .

The loss of consciousness in this study was documented from the history in 60% of the cases while those with no history loss of consciousness were 40% (Table1), for a period lasted from 5 minutes to about 2 days, which shows a higher incidence of loss of consciousness than a study in the USA was made by the Traumatic Brain Injury Study

Group of the Pediatric Emergency Care Applied Research Network [14].

All patients in this study had undergone C-T scan, the ideal imaging modality for assessing head injury which can detect both intracranial injury and skull fracture reliably. In this study C-T scan showed that 64% (32 cases) had skull fracture while 36 % (18) had no skull fracture. Forty eight percent of the cases in this study had linear fracture while 16% had depressed fracture (Table 4).

In comparison to study made in the USA, fractures were encountered in CT scan in 52% of the cases 39% were had linear fracture and 13% had depressed fracture [15].

The presence of hematoma was seen in 68% of the cases while in another study in the USA the percent was 65% [15] which is close to it.

The most common site of hematoma encountered is the subgaleal (extra cranial) which was seen in 40% of the cases either alone mostly or in association with other intracranial hematoma the second most common hematoma was the subdural type which is seen in 16% of the cases either alone or with extradural hematoma and then the intracerebral hematoma in 12% either alone or with subgaleal hematoma and then is the extradural hematoma either alone or in with subdural hematoma accounting for 8% of the cases (Table 5).

In this study patients who had another injury elsewhere in their body were about 16% which varied from single fracture to multiple fractures to abdominal visceral injury most of them are due to RTA (Table 3), and this agreed with a study done in Nationwide Children's Hospital in Columbus, Ohio and Rainbow Babies and Children's Hospital in Cleveland, Ohio [2].

The presence or the development of associated signs like Raccoon eyes which is found in 32% of the cases and battle sign which is found in 16% of the cases which may pointed to the presence of basilar skull fracture (Table 3), these result agreed with a study published by Ringl et al [10].

In addition basilar skull fracture may cause CSF to leak from the nose (CSF rhinorrhea) alone or with blood, which is seen in 12% (6 cases).

Basilar skull fracture may cause CSF to leak from the ear with hemotympanum or bleeding from the ear which is encountered in 8% (4 cases), this is comparable to the result of Ringl et al [10].

Vomiting is an important symptom in pediatric head trauma as it may reflect an increase in the ICP. In this study 52% of the patients had vomiting all were projectile in type varied in frequency from once time only to more than ten time over a period of three days, and this more or less equal to the study done by Traumatic Brain Injury Study Group of the Pediatric Emergency Care Applied Research Network [14].

The development of the fit is a very important encountered in patients with head trauma and the onset of the attack is very important too as the more early the fit is the less likely that the patient will develop epilepsy in the future. In our study 84% of the patients (42 cases), did not develop fit while only 16% (8 cases) developed fit , two of them were immediately after the trauma and two of them within the first 24 hours and the remaining four were after the first 24 hours. Six of the patient who developed fit had depressed fracture as this may cause direct damage to the brain tissue. Most of the fit were of the tonic clonic type, this comparable to Atabaki et al [15].

The subsequent development of focal neurological deficit was only seen in two cases (4%), one of them was having cerebellar ataxia and the second had right upper arm weakness, and these results are more or less equal to the result of Schunk and Schutzman [12].

The line of management decided for each case was directed toward treating the possible brain injury and the extent of the head injury. The close monitoring and follow up being the most common accounting for 88%, while surgical option was done in only 8% of the cases (4 cases) three of them had depressed fracture and the other had a big extradural hematoma.

Two patients died, one after about 12 hours of the presentation, and the second after about two days for unknown reasons and they were referred to the forensic medicine to know the cause , this agree with study of Haider et al [7].

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Conflict of Interest

The author declares no conflict of interest.

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