SKULL FRACTURES IN HEAD-INJURED PATIENTS ATTENDING THE ACCIDENT AND EMERGENCY DEPARTMENT OF THE TEACHING HOSPITAL AT KADHIMIYAH: A RETROSPECTIVE STUDY OF 100 CONSECUTIVE CASES

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Abstract

Background: A skull fracture (SF) finding in acutely head injured patient represents a neurosurgical emergency that necessitates admission to the hospital as it indicates a significant head trauma and can be accompanied by life threatening complications.

Objective: To study the pattern of SF in 100 head injured patients presented to the Accident and Emergency (A and E) Department at Al-Kadhimiya Teaching Hospital.

Methods: 100 patients having fresh SF were examined during October 2001 to February 2003 inclusive. All patients had plain skull X-ray, CT scanning; MRI study.

Results: The most common causes were fall from height (FFH) (40%), road traffic accidents (RTA) (37%), assaults (13%), collapse of building (4%), diving (1%), missile (1%) and miscellaneous causes (4%). While eighty-six patients had single SF, 14 patients harbored multiple SF, all totaling 118 SF. The pattern of SF was fissure fracture (66.1%), depressed (20.3%), fracture base of skull (8.5%) and diastatic (5.1%). At Glasgow Coma Scale (GCS) scoring, 69% had a score of 13-15, 22% a score of 9-12, and 9% had a score of 3-8. Intracranial haematomas were extradural 14, subdural 3, and 1 intracerebral haematoma.

Conclusions: The majority of SFs are simple fissure patterns affect mainly young age groups who sustain HI; males are more involved than females. Conventional X- ray, spiral CT scan and MRI are essential for determination of the type of SF. Since the majority of accidents have occurred in urban sites, 80%, the authors think that HI may be a phenomenon of urbanization. Moreover, the majority of the causes of SF(s), the authors think, are preventable, like FFH and RTA, by adequate measures such as family supervision, community education, safe house construction and traffic regulation legislation. Although the majority of cases had high GCS scores indicating a mild severity of trauma, however, a proper management and skilled care would contribute to avoidance of life-threatening complications and effect recovery.

Key words: head injury, skull fracture, neuro-imaging, CT scan, MRI venography, family and school supervision.

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Introduction

Trauma is the leading cause of death and disability in people under 45 years of age worldwide. Up to 50% of trauma fatalities are due to HI, but HI represents a much greater proportion of permanent disability[1]. The main causes of HI are road accidents, falls, and assaults[2]. Improved emergency medical services and campaigns for road safety have seen a relative reduction in both the incidence of injury and the number of resulting fatalities[2]. A SF is a well known sequel of HI; HI causing SF from blunt or penetrating mechanisms, is the commonest cause of death and morbidity in all forms of trauma and commonest cause of trauma among those attending the accidents and the emergency department with half of them being aged 14 years or less.

The skull X-ray is still a useful tool in the management of injuries that are associated with SF. E.g., in the context of extradural haematomas (EDH), most EDHs occur at the base of the skull beneath the temporal lobe or over the the lateral surface of the brain. This distribution corresponds not only to the course of the middle

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meningeal artery but also to the most common sites for a skull fracture[3]. Occasionally, EDHs occur over the top (vertex) of the head or in the occipital region. In these cases, the haematoma is usually caused by a laceration of a dural venous sinus and is almost invariably associated with an overlying skull fracture[3].

SFs are classified according to whether the skin overlying the fracture is intact (closed) or disturbed (open or compound), whether there is a single fracture line (fissure or linear), several fractures radiating from a central point (stellate), or fragmentation of the bone (comminuted), and whether the edges of the fracture line had been driven below the level of the surrounding bone (depressed) or not. Simple SFs (linear, stellate, or comminuted non-depressed) require no specific treatment. They are, however, potentially serious and can be fatal if they cross major vascular channels in the skull, such as the groove of the middle meningeal artery or the dural venous sinuses.

The two most important risk factors for the development of an intracranial haematoma are an abnormal level of consciousness and the presence of a SF. The statistical risk of developing a traumatic intracranial haematoma in conscious adults in whom no skull fracture exists and in whom there is no history of altered consciousness is approximately 1 in 6000; however, when there is a history of loss of consciousness and SF is present, the risk is increased to 1 in 4[3].

Depressed SFs often require surgery to elevate the depressed bone fragments. If there are no adverse neurologic signs and the fracture is closed, repair may be done electively. Basal SFs involve the floor of the calvarium. Bruising may occur about the eye (raccoon sign) or behind the ear (Battle sign), suggesting a fracture involving either the anterior or middle fossa, respectively. Any associated CSF rhinorrhoea, or otorrhoea should be treated expectantly. Traumatic CSF leaks typically stops within the first 7 to 10 days. Should a leak persist, lumbar CSF drainage can be implemented to seal the leak by lowering CSF volume and intracranial pressure.

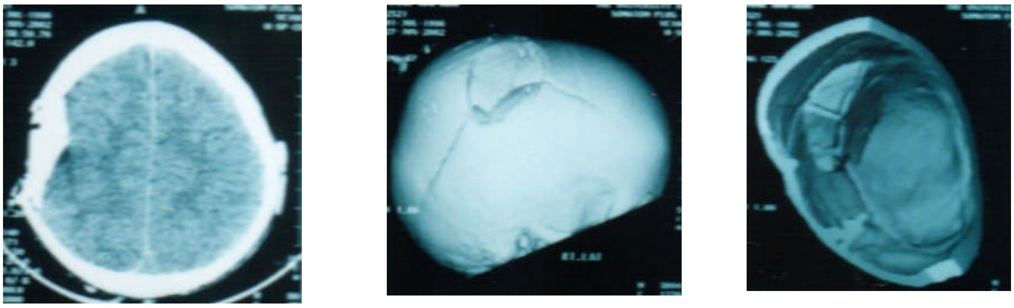
If this therapy fails, surgical exploration and oversewing of the defect with a facial patch graft is indicated. Less than 5% of patients actually require surgical repair. Tyson thinks that an open fissure fracture is not ordinarily an indication for the use of prophylactic antibiotics are no longer used and that their use in patients with who have open depressed fractures is controversial and there is no reason to use them in the majority of cases; however, they should be considered when there is brain tissue within the wound or when a skull x-ray reveals foreign bodies within the cranial cavity[4].

The main aim of this retrospective descriptive study is to verify the patterns (types) of skull fractures in 100 consecutive head-injured patients; also, to analyze some other variables and findings relevant to those events.

Patients and methods

One hundred consecutive head injured patients, attending the A and E Department of the THK having sustained head trauma, over seventeen-month-period from October 2001 through February 2003 inclusive, who had SFs, qualified for this retrospective study. Having received the patients, their clinical condition would have been stabilized; the general and the neurological conditions are assessed. All patients had PSXR films (postero-anterior, lateral projections, and only few of them had Townes views) and spiral CT scanning (Figures 1-4).

When indicated, occipito-mental, ortho-pentographic and a complete set of cervical spine films would have been taken. Few patients had in addition an MRI venography, only when felt necessary in order to solve a clinical confusion regarding the patency of the superior sagittal sinus for the blood flow. The patient and / or his / her relatives, guardians, or witness were asked about the cause of head injury; the clinical severity of the injury was assessed according to GCS; the patients were given the appropriate GCS score[5].



A B C

Figure 1: Pictures of a depressed comminuted compound fracture in the parietal region with spiral computerized scanner. A. Axial section. B. 3-dimensional appearance from outside, and C. An inside view.

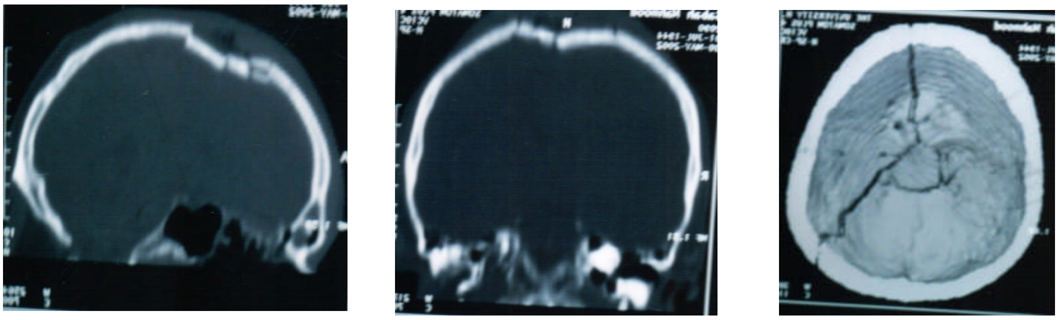


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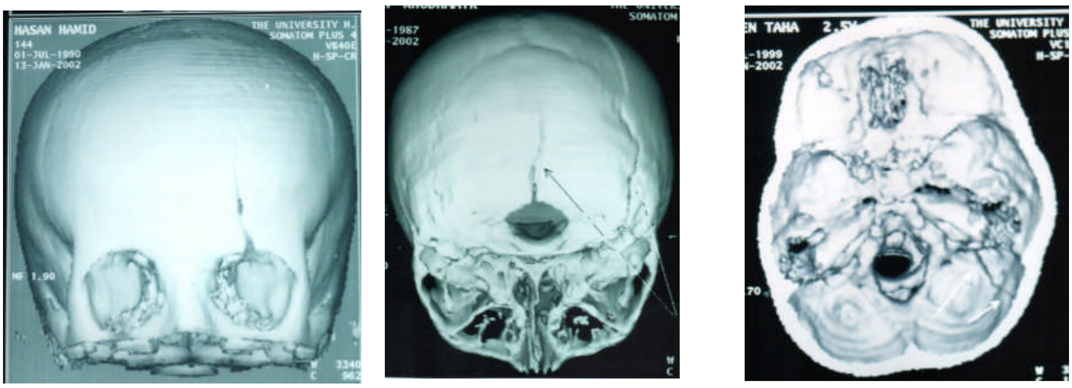
Figure 2: Different views A. Sagittal, B. Coronal and C. An inside views of a depressed comminuted parietal fracture overlying the superior sagittal sinus with risk of occlusion to blood flow; the latter should be verified by magnetic resonance venography or by conventional cerebral angiography (the venous phase).



A B C

Figure 3: Three dimensional picture of the skull showing A. A frontal fissure fracture extending into the superior margin of the left orbit, B. An occipital fissure fracture extending into the posterior lip of the foramen magnum, and C. An inside view of a right occipital fissure fracture extending to the petrous bone.

Figure 4: An axial tomographic scanner view showing pneumocephalus: air bubbles in the III ventricle, basal cisterns, ambient cistern and sylvian fissures.

A simple format was designed for registering and analyzing few other variables such as age, sex, residential area, occupation, pattern and number of fractures, whether the fracture was simple (closed) or compound (open), single or multiple, CSF leak, other associated lesions and whether there was any fatality in the same event; the need for a surgical intervention was also documented. Also, in case of a child, we inquired about family supervision at the time of accident.

Results

Age and gender

The age has ranged between 9 months and 70 years (mean 17.7 ± 16.7) (Table 1); 62 of them are in the paediatric age group, below the age of 14. As far as sex is concerned, 28 are females and 72 are males.

Table1. Distribution of patients by age groups

Age groups	Number of patients
9 months-4 years	19
5 years-9 years	22
10 years-14 years	21
15 years-19 years	9
20 years-24 years	3
25 years-29 years	4
30 years-34 years	5
35 years-39 years	3
40 years-44 years	4
45 years-49 years	3
50 years-54 years	4
55 years-59 years	0
60 years-64 years	1
65 years-69 years	0
70 years	2
Total	100
Mean age in years ± standard deviation	17.7 ± 16.7

Residential areas and occupation

Twenty patients (20%) came from rural areas, while 80 were from urban residential regions (80%) (Table 2).

Table 2. Distribution of patients by residency area

Residency	Number	%
Rural	20	20
Urban	80	80
Total	100	100

The students, preschool children, self-employed, and civil servants have accounted for most of the patients: 34%, 25%, 19% and 6% respectively. However, other occupations are also represented (Table 3).

Table 3. Distribution of patients by occupation

Job	Number	%
Preschool children	25	25
Student	34	34
Self-employed	19	19
Civil Servant	6	6
House wife	4	4
Farmer	4	4
Worker	4	4
Retired	2	2
Driver	2	2
Total	100	100%

Causes of HI

As it is shown in tables 4 and 5, FFH have stood for the majority of causes (40%) among the study patients, followed by RTA (37%), whom vehicular users (54%) exceeded pedestrians (46%); 13 patients (13%) had been assaulted on their heads; only 4% patients suffered injuries by collapse of their houses in the winter time; they were mainly from rural areas. Other various causes were also responsible for HI.

Table 4. Distribution of patients by causes of head injury

Cause	Number	%
Fall from height (1-4 meters) (2 due to electrocution)	40	40
Road traffic accident	37	37
Assault	13	13
Collapse of Building	4	4
Diving	1	1
Penetrating missile (bullet)	1	1
Miscellaneous (fall of an object,…)	4	4
Total	100	100%

Table 5. Distribution of patients by details of road users involved in road traffic accidents

Details		Number	%
Vehicular users	Driver	2	54%
	Front Seat Passenger	5	
	Back Seat Passenger	13	
Pedestrians		17	46%
Total		37	100%

Symptoms and signs

1. Consciousness

The majority of patients (59%), gave no history of loss of consciousness. The rest have shown various time intervals for regaining their consciousness following the trauma (Table 6).

Table 6. Distribution of patients by alteration in the level of consciousness (LOC)

Any alteration in LOC	Duration	Number	%
History of loss of consciousness	Few minutes - < 1 hour	15	15%
	1 hour – 6 hours	11	11%
	7 hours – 1 day	7	7%
	2 days – 1 week	5	5%
	> 1 week (4 weeks)	3	3%
Absence of loss of consciousness		59	59%
Total			100%

2. GCS score

Considering GCS score (Table 7), most of patients 69 (69%) had GCS score of (13-15), 22 (22%) had a score of (9-12), and only 9 (9%) had GCS from (3-8); the latter group was severely injured.

Table 7. Distribution of patients by GCS score on admission

GCS score	Number of patients	%
13-15	69	69%
9-12	22	22%
3-8	9	9%
Total	100	100%

3. Other symptoms and signs

While 89 patients have suffered post-traumatic headache, 16 vomiting, 11 epistaxis, 10 bloody otorrhoea, 16 had peri-orbital haematoma, 15 lateralising signs and 8 showed cranial nerve palsies. Extra-cranial injuries were also present (Table 8). Two patients had very early post-traumatic seizure.

Table 8. Distribution of patients by other associated symptoms and signs

Symptom and sign		Number	%
Headache		89	89%
Vomiting		16	16%
Haematemesis		5	5%
Peri-orbital haematoma		5 Lt., 6 Rt., & 5 Lt. & Rt.	16%
Lateralizing signs		15	15%
Cranial nerve palsies (II, III,VI) (transient) (one patient had bilateral VI nerve palsy which is quite uncommon)		II nerve 1, III nerve 2, VI nerve 5	8%
CSF rhinorrhoea		15	15%
Epistaxis		1	1%
Bloody otorrhoea		10	10%
CSF otorrhoea		2	2%
Cerebral tissue otorrhoea		1	1%
Any extra-cranial Injuries:	Soft tissue bruises (limbs and trunk)	35	38%
	Fracture maxillae 1	1	
	Fracture mandible1	1	
	Fracture clavicle1	1	
Early epilepsy (by time of presentation to A and E department)		2	2%

II nerve = optic nerve, III nerve = occulomotor nerve, VI nerve = abducens nerve.

Family and supervision

This is given in table 9; most of children below the age of 14 years, 36 (58.1%), lack family supervision at time of accident.

Table 9. Family supervision for patients in paediatric age group (9 months-14 years)

Family supervision	Number	%
Yes	26	41.9
No	36	58.1
Total	62	100

Radiological findings

All patients have PSXR and CT scanning, few had MRI and other relevant studies, as mentioned above; the summary of findings is shown in tables 10-14.

While eighty-six patients had single SF, 14 patients harbored multiple SF (10 with 2 SF and 4 with 3 SF), all totaling 118 SF; in 2 patients, the same SF crossed the midline and continued to the other side. The pattern of SF was as follow: fissure fracture 78 (66.1%), depressed 24 (20.3%), fracture base of skull 10 (8.5%), 4 of which involved the ethmoid and sphenoid PNS and diastatic 6 (5.1%) (Table 10 and Figures 1-3).

Table 10. Pattern of fracture

Pattern	Number	%
Fissure (linear and curvilinear) fracture of vault of skull	78	66.1
Depressed (most are comminuted) fracture	24	20.3
Fracture base of skull	10	8.5
Diastatic (lambdoid and sagittal sutures) fracture	6	5.1
Total	118	100%

Table 11 shows that the majority of vault fractures are as follow: frontal 36, parietal 26, temporal 21 and occipital 13. Few SF involved more one site and 2 crossed the midline to involve the other side.

Table 11. Distribution of fractures according to their site and side

Site	Side and number			Total
	Left	Right	Midline	
Frontal	16	20	-	36
Temporal (few extended into petrous and / or mastoid bones)	10	11	-	21
Parietal (one crossing midline)	7	19	-	26
Frontoparietal	0	4	-	4
Temporoparietal	0	2	-	2
Occipital (2 involved posterior lip of foramen	3	10	-	13
magnum)	2	4	-	6
Anterior cranial fossa (2 extended into edge of orbit)	1	1	-	2
Ethmoid	-	-	2	2
Sphenoid (midline)	1	2	3	6
Diastatic fracture				
Total (%)	40 (33.9%)	73 (61.9%)	5 (4.2%)	118 (100%)

There were 55 patients with scalp laceration(s) overlying their SF (compound or open SF), however, 45 patients were free of scalp laceration (simple or closed SF) (Table 12).

Table 12. Communication of fracture with external environment

Pattern of fracture	Number of fractures		Total
	Compound	Simple	
Fissure and diastatic vault fractures	35	49	84
Depressed fracture	16	8	24
Basal (paranasal sinuses) fracture	4	-	4
Anterior cranial fossa	-	6	6
Total number of fractures (%)	55 (46.6%)	63 (53.4%)	118 (100%)
Total number of patients (%)	55 (55%)	45 (45%)	100 (100%)

However, only patients with large (significant) haematomas needed to have surgical intervention in the form of appropriate craniotomy / craniostomy to remove the haematoma; all, except one, were in good clinical condition. Unfortunately, one patient who was an elderly with severe fracture and multiple wounds, deteriorated shortly after admission and died before surgical exploration. Those who were not operated upon were firmly reassured, clinical monitoring continued, and so their improvement; they were discharged home in few days time.

The indications for surgical intervention were one or more of the followings: Ventricular compression, Midline shift, Effacement of basal cisterns, Intracranial haematomas of significant size, and Lateralizing signs.

As far as intracranial haematomas are concerned (Table 13), there were 16 patients with EDH , 8 SDH, 3 had combined EDH and SDH, 1 ICH and one with a supra- and infra-tentorial haematoma at the same time.

Table 13. Computerized tomography scanning finding: intracranial haematomas

Nature of lesion	Site	Side	Number	Note	Total
Extradural haematoma (EDH)	Frontal	Left	5	2 small	16
	Frontoparietal	Right	1	-	
	Frontotemporal	Right	1	-	
	Parietal	Left	3	All small	
	Temporal	Right	4	1 small	
		Right	1	Small	
Bilateral EDH	Temporal		1	Small	
Subdural haematoma (SDH)	Frontal	Right	2	1 small	8
	Parietal	Left	3	1 small	
		Right	3	1 small	
Combined EDH and SDH	Temporal	Right	2	-	3
	Parietal	Left	1	-	
Intracerebral haematoma	Frontal	Right	1	Small	1
Both supra- and infratentorial haematoma	Occipital	Right	1	Small	1

Small haematoma = no operation was needed.

Table 14 shows other CT scan findings such as cerebral haemorrhagic contusions (10), pneumocephalus (6), cerebral oedema (5), SAH (5) and the intracranial bullet 1. Few patients with a parietal depressed SF had MRI venography to test for the patency of superior sagittal sinus.

Table 14. Computerized tomography scanning finding: miscellaneous findings

Nature of lesion	Site	Side	Number	Total	Note
Haemorrhagic cerebral contusion	Frontal	Left	2	10	-
		Right	2		
	Parietal	Left	1		-
		Right	2		
	Temporal	Left	1		
		Right	1		-
		Bilateral	1		
Cerebral oedema				5	Diffuse
Subarachnoid haemorrhage				5	Diffuse
Intraventricular haemorrhage				1	Diffuse
Pneumocephalus	Intraparenchymal air			1	Diffuse
	Intraventricular air			1	Diffuse
	Subarachnoid air			6	Diffuse
	More than one compartment			1	Diffuse
Scalp soft tissue air				1	At inlet of bullet
Foreign body	Occipital	Left	1	1	Intracranial bullet

Discussion

In a personal communication with the Section of Biostatistics, Department of Planning, Ministry of Health, Baghdad, it seems that in Iraq, like many other countries, several thousands of patients are admitted to hospitals each year, having sustained a direct violence to the head.

In this study it is found that the males constituted the majority of patients as there were 72 male patients (72%), there were 28 females (28%); this result is similar to other studies who found males to be involved more than females in SFs[6-10]. This may be related to the fact that males are more exposed to dangers of work and RTA than females; Annegers et al think that among the groups at high risk of head trauma are those who have had head trauma previously[9].

HI (among which SFs occur) affects mainly young age groups (Table 1); the mean age in our study of 31.8 years is almost similar to Al-Rawi's study who found that 76.8 % of the patients were below age of 30; this is because the young are among the most active group in the community; this makes them more vulnerable to accidents than others[9]; other researchers had found similar results[11-14].

Another factor which applies to younger children is the relatively larger head size compared to the body than in adults. Also children are more vulnerable to head trauma as a result of carelessness, lack of judgment, and battering[12].

However, in societies where the aging population is marked, head injuries do constitute a health and social problem that deserves specific consideration(s) as reported by Ohno et al from Japan[15].

According to the residency (Table 3), most of the study patients come from urban areas (80%) rather than from rural areas (20%); again, the former group will be exposed to the hazards of fall off higher buildings, more road traffics, and accidents at work due to the pattern of life in the industrialized society; the author think that

HI may accompany the phenomenon of urbanization.

FFH as a major cause of HI (Table 4), shown in this study, is almost similar to other studies[8,16]; although most had happened at domestic (residential) sites and addressing the importance of family supervision as a preventive factor, unfortunately, few occurred at school when students climbed up schools' fences; these events address the importance of school supervision as well. However, many other studies address RTA as a predominating cause[7,9]. This difference is probably due to the study size and design and to local community circumstances. It is interesting to mention that none of our RTA patients was injured in a bicycle or motorcycle accident. This is due to the fact that such sport is not prevalent in Iraq; moreover, modern design-attractive bicycles and motorcycles are relatively expensive and that the majority of families cannot afford to buy them.

An interesting point to mention is that in the senior author's experience, in Iraq, though not reported, the phenomenon of child abuse is very unusual in our society; therefore, none of the patients in this study was hurt by such accident modality; unfortunately, these needless injuries may occur in other societies[17-18].

In the context of HI, from a biomechanical point of view, many variables interact in deciding the pattern, extent and distribution of primary injury sustained by the cranial bones, soft tissues covering and contents of intracranial cavity. One of these variables, is the force of the injurious agent; this force is in itself the product of many elements, namely the change of angular momentum, the time interval (duration of contact between the injurious agent and the head), weight and size of the agent used.

Concerning disturbance of consciousness, which is a sign of brain dysfunction, is a common sequel of HI (Table 6) and usually correlates well with the severity of the injury. Since this descriptive study of SF deals with patients seen at the A and E Department, there has been no mention of the post-traumatic amnesia experienced by the patients; the duration of amnesia usually lasts more that of loss of consciousness.

GCS scores seen on table 7, indicate the mild profile of HI in this study. Many other studies have shown similar results[7,16,19], however, this is also verified by the study design reported by other authors.

Many symptoms and signs are mentioned in table 8 which commonly occur in HI, except the uncommon bilateral VI nerve palsy, most of which are managed conservatively or with appropriate symptomatic drug therapy, although few of them may cause anxiety to the patient and / or his / or her family who need reassurance. For example, post-traumatic headache, not due to surgically correctable cause, responds, usually, to reassurance and simple analgesia, such as Paracetamol with or without Codeine Phosphate; the latter may be given by oral or intramuscular route. However, when it becomes persistent, then it deserves further investigation(s) and may need other appropriate treatment modality[20].

Similarly, interestingly, Hugenholtz et all addressing the problem of vomiting in HI, have concluded that post-traumatic emesis is more common: (1) following minor head injuries than following more severe head injuries (P less than 0.05); (2) in children over 2 years old; (P less than 0.001); (3) in children injured within an hour of a meal or snack (p less than 0.001)[21]. The presence of a skull fracture or the site of the impact does not influence the incidence or duration of post-traumatic emesis. Retching and vomiting generally subside within 3 h in children injured within an hour of a meal or snack. When vomiting appears in children injured more than an hour after a meal or a snack, it may be quite protracted (mean = 7.5 h).

Children over 2 years of age with post-traumatic emesis who are neurologically stable following a mild head injury that occurred within an hour of a meal or snack can be expected to improve quickly. Their counterparts injured more than an hour after a meal or snack are likely to remain distressed much longer and are best admitted to hospital[21]. Sharma et al mention that one third of paediatric HI were brought to hospital with vomiting, however, the incidence of vomiting in this study is 16%; this is probably due to the inclusion of older age groups[16].

The incidence of post-traumatic seizure by the time the HI-patients presented to the A and E Department, is quite low, (2%), and is similar to other studies[22]. This is probably due to the mild profile of HI in this study.

Tables 9 shows the lack of family supervision to 36 (58.1%) of the children below the age of 14, a problem that has been addressed by many authors (6-7), although many accidents have taken place outside residential areas, such as on the roads while going to or coming back from school, the authors think that it is the duty of the family to provide a state of child watch in order to avoid such unfortunate events. Moreover, although this study does not report the occurrence of accident at schools, however, Hammarstrom et al have reported HI occurring at school sites[23]; therefore, it is advisable to extend children supervision to school premises.

According to the pattern, site and side of the fractures (Tables 10 and 11), there were fissure fractures (78, 66.1%) outnumber other types of SF; this is probably due to the more diffuse distribution of the biomechanical energy input rather than to the localized injury site that results in the depressed and comminuted SF. Most of the patients who had the fissure SF were children. Older patients had mainly the depressed comminuted SF probably due to the inter-personal violence (assault).

The majority of SFs in this study has involved the frontal, parietal and temporal bones, probably because these sites are most prominent (apparent) and not protected. Those SF on the right side are more than those on the left (73, 61.9% versus 40, 33.9%); this is probably due to the fact that most people are right-handed and that they tend to protect themselves by turning to the right in order to use their right-sided limbs for defense.

Concerning communication between the SF and external environment, although 55 (55%) patients have compound injuries, however, there is a marginal increase of closed SF over compound SF (Table 12). The compound nature of the injury puts deeper tissue at risk of contracting microbial infection.

In our study, seizure has not occurred in our patients; however, other studies showed low percent of occurrence of seizure; this is, probably, because of smaller size of our patient population.

Regarding the association of most common intracranial haematomas with the presence of SFs, and since this study involves patients selected for having SFs, evidently, all intracranial haematomas were associated with one or more SFs. Kaye analyzing a consecutive series of 200 cases of EDH, mentions that a fracture overlies the haematoma in nearly all (95%) adults and most (75%) children and that 66% of EDH are in the temporal region, 11% in the frontal region and 7% in the parietal region. However, in this study the frontal and parietal EDH are of near frequency and each outnumbers the temporal ones[24]. This is probably due to the small size of this study. He, also, mentions that over 80% of acute SDH are associated with SFs and that intracerebral haematoma is frequently associated with SDH[24]. In this study, however, not all haematomas needed surgical evacuation, as many of them were managed conservatively because of their small size and the lack of mass effects (Table 13).

Apart from SFs and intracranial haematomas, and as far as other CT scan findings are concerned, e.g., pneumocephalus, intracranial contusion, SAH, and other lesions (Table 14), their presence is similar to the huge studies mentioned in the neurosurgical literature, though the incidence of various lesions may differ, some substantially. For example, while this study reports a low incidence of intracranial pneumocephalus, Steudel et al found pneumocephalus in 40 out of 49 (82%) of head injury patients within 6 hours of the accident. They think that while injuries associated with a pneumatocele or a single intracranial air bubble have a good prognosis, as do frontobasal lesions, injuries associated with multiple air bubbles have a bad prognosis[25]. Some of such findings may represent a serious threat to the patient and should prompt the neurosurgeon to adopt active appropriate clinical measures that may include surgical intervention[25].

The MRI study, venography, that has been done for few patients with a depressed parietal compound fracture, showed an established blood flow through the superior sagittal sinus; this finding, and the improvement in the condition of the patient during subsequent neurological observation, obviated the need for surgery, an intervention that was not without risk to the patients.

In spite of the descriptive profile of this study, however, many researchers think that with a greater number of patients now surviving HI, the emphasis of medical research must turn to ways in which to limit the extent of neuronal damage, and promote the functional recovery of neurons. It is these factors that will determine the ultimate quality of life of patients who survive[2].

Conclusions and Recommendations

1. SF affects mainly young age groups who sustain HI; males are more involved than females.
2. Most of SFs are the fissure (linear) type.
3. Conventional PSXR and modern neuroradiological technology, like spiral CT scan and MRI are essential for determination of the type of SF and also if there is any associated structural lesion(s). In certain situations, the MR venography of the dural sinuses, or the conventional cerebral angiography, will demonstrate the patency of the latter, and saved the patient a possible surgical intervention.
4. The majority of the causes of SFs, we think, are preventable, like FFH and RTA, by adequate measures such as children supervision at residential and school premises, traffic regulation legislation and community education campaigns. Therefore, in this context, safety measures to protect citizens should be addressed by a multidisciplinary team approach.
5. Although the majority of cases had high GCS scores (mild trauma), however, a proper management and skilled care would contribute to avoidance of complications that may threaten life and effective recovery.
6. Since HI can be a consequence of urban life, it is the duty of health workers, community figures and city construction planners and designers to consider possible solutions or measures to avoid and deal with this problem.

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