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Association of skull fracture with extradural haematoma in patients with head injury

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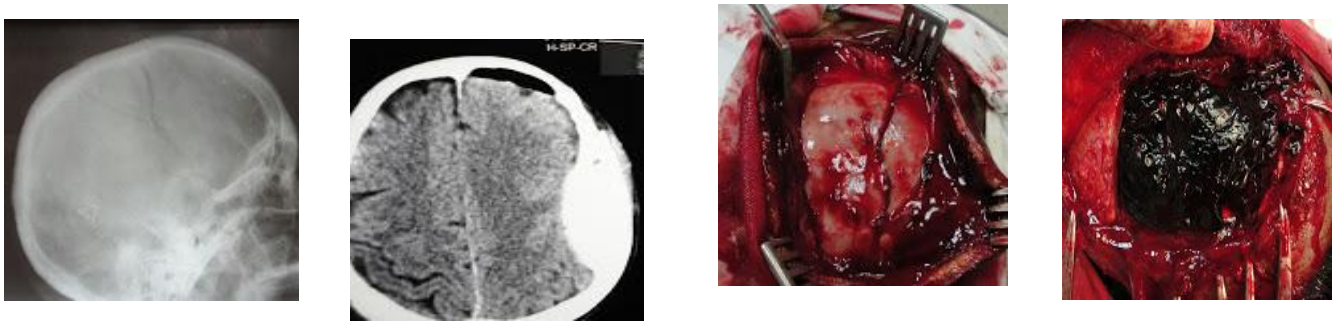
Abstract
Introduction: *Extradural haematoma (EDH) is an emergency condition. Apparently normal looking patients after traumatic head injury can have serious neurological deterioration, and one of the common reason of such deterioration is extradural haematomas (EDH)*
Objective: *Our goal in this study is to assess the association of skull fracture with extradural haematoma in patients with head injury.*
Methodology: *This cross sectional study was carried out at Department of Neurosurgery, Dhaka Medical College Hospital, Dhaka from January 2010 to June 2011 where 80 patients data were evaluated on the basis of their history, clinical examination. The entered data were cross-checked and confirmed.*
Results: *During the study all patients of group I maximum 40% patients belonged to 25 to 34 years age range and most of them were male. Head injury cases were mostly due to RTA which was 65% in group-I and 62.5% in group-II also All patients of group- I, had features of fracture.*
Conclusion: *In conclusion we can say that there is close association between skull fracture with extradural haematoma in patients with head injury. Further study is needed for better outcome near future.*
Keywords: *Head injury, extradural haematomas (EDH), skull fracture.*

Introduction

Head injury is a serious health problem all over the world and is a significant factor for approximately half of all deaths related to trauma. The main cause of head trauma includes road traffic accident, assaults, fall from height, sports injuries and industrial accidents. EDH develops in 1-3% of all major head injuries and most common

in the young male in the second and third decades of life. Head injury is a leading cause of death among adults younger than 45years and in children upto 15 years of age. The mechanical forces in head injured patient result in compression and shearing of neuronal and vascular tissue at the time of impact. A series of pathological events may further lead to brain injury. Young males are more common victims of head injury and one of important causes of death in acute EDH . The estimated incidence of head injuries is 100 per 100,000 and result in 52,000 deaths per year making it of major public health significance. 0.5% patient of head injury got admitted with EDH having indication of surgical management. Scientist observed that EDH if treated early, the prognosis is usually excellent because the damage to the underlying brain is usually limited and outcome is directly related to the neurological status of the patient before surgery. Skull fracture is a break in the continuity of one or more of bones in the skull caused by a head injury. Incidence of skull fracture in patients with extradural hematoma (EDH) has been reported between 63-85%.[1][2][3]



1a **1b** **1c** **1d**

Figure-1a,1b,1c,1d: skull fracture with head injury and EDH in patient

A force severe enough in intensity to fracture the skull may spread to produce brain damage as well Oozing from fractured ends of the skull leads to extradural hematoma in approximately 1/3rd of patients. Now a days Skull X-rays are a valuable tool for assessment of patients with head injury. The patient who has fracture skull should be referred to tertiary neurosurgical centers for further evaluation and management. Our goal in this study is to assess the association of skull fracture with extradural haematoma in patients with head injury.

Objective

General objective: To evaluate the association of skull fracture with extradural haematoma in patients with head injury.

Specific objectives

- To identify common mode of injury in study groups.
- To estimate GCS level of the patients

Methodology

Study type: This study was a cross sectional analytical study.

Place and period of the study: This study was conducted at Department of Neurosurgery, Dhaka Medical College Hospital, Dhaka from January 2010 to June 2011.

Study population: Patients with head injury with and without evidence of skull fracture in plain X-ray were evaluated during the study.

Sample size: The sample size was determined by the following formula-

$$n = \frac{z^2 pq}{d^2}$$

Where,

n= the desired sample size.

z= the standard normal deviation, usually set at 1.96 at 5% level which corresponds to 95% confidence level.

p= the assumed target proportion to have a particular characteristics, here, p=0.75
q= 1-p=0.25
And
d= expected range of error, level considered as 5%, which is assumed as 0.05.
Putting the values in the above equation the sample size n is estimated as $(1.96)^2$x 0.75x 0.25/ $(0.05)^2$= 288
n= 288 (target sample size)
During the study duration only 80 patients were available to be included.
3.6 Sample Techniques:
Purposive sampling:
Group- I: Adult patients with head injury with evidence of skull fracture on plain X-ray.
Group- II: Adult patients with head injury with no evidence of skull fracture on plain X- ray.

Inclusion criteria

- Adult patients (Age 18-70 years) with head injury.
- Plain X-ray skull with antero-posterior and lateral view.
- CT scan of brain with bone window.

Exclusion criteria

- Patients who were on anticoagulant therapy.
- EDH due to post surgical complication.
- Patient admitted with poor GCS (<9).
- Patients who were not willing to participate in this study.

Data collection

A questionnaire was prepared as per protocol and it was filled with the information from of history, clinical examination and investigations by study group.

Data management

On admission, a detailed history of the illness was taken from the patient or attendant, thorough neurological and general examinations were carried out, and findings of the performed investigations were recorded. On admission GCS were recorded. Relevant associated medical conditions were recorded carefully.

Data Analysis

Data were presented in tabulated form. The entered data were cross-checked and verified. Comparative analysis was done between group I and group II based on presence or absence of EDH in both the study groups were done using Chi-square test with the help of software, SPSS.

Results

In figure-2 demonstrates age distribution between group I and group II where out of all patients of group I maximum 40% patients belonged to 25 to 34 years age range followed by 25% below 25 years 17.5% within 35 to 44 years. Within all patients of group II maximum 35% belonged to 25 to 34 years age group followed by 32.5% below 25 years. Mean (±SD) age of the patients of group I 31.85±12.897 and group II was and respectively 32.0±13.765.The following figure is given below in detail:

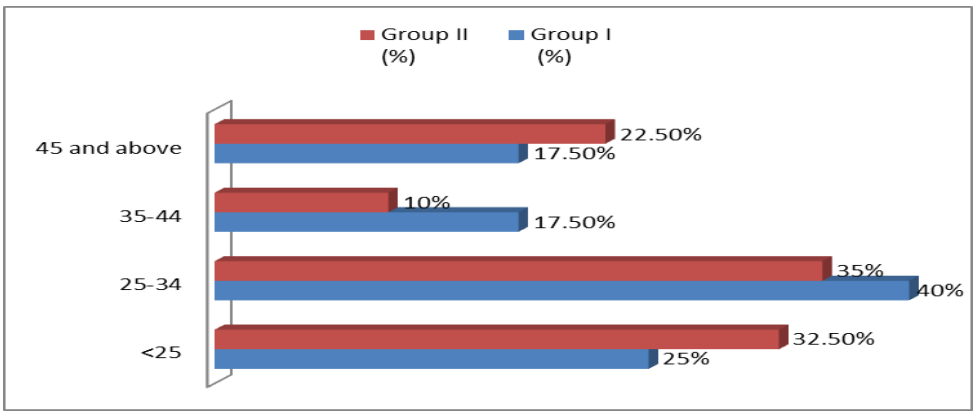


Figure-2: Age distribution between group I and group II
*(Minimum age 18 years, Maximum age 70 years)

In table-1 shows gender distributions of the patients where in group I, 95% were male and 5% were female and in group II, 92.5% were male and 7.5% were female. Male female ratio was 19:1 in group I and 12.33:1 in group II. The following table is given below in detail:

Table-1: Gender distribution in study group (n=80)

Gender	**Group I Frequency (%) n=40**	**Group II Frequency (%) n=40**
Male	38 (95%)	37 (92.5%)
Female	2 (05%)	3 (7.5%)
Total	40 (100%)	40 (100%)
Ratio	19: 1	12.33:1

In figure-3 shows distribution of common mode of injury in study groups. In this study, cases were mostly due to RTA which was 65% in group-I and 62.5% in group-II. The other most common cause were assault which is about 25 and 22.5% in both group respectively. The following figure is given below in detail:

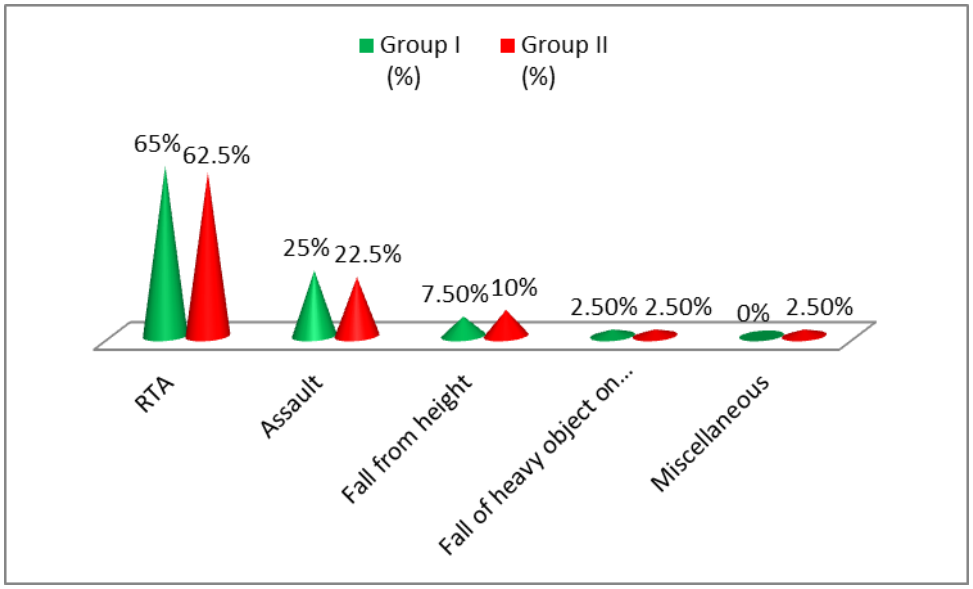


Figure-3: Distribution of common mode of injury in study groups

In table-2 shows distribution of patient according to GCS score on admission. In group-I 65% patients had GCS 9-12 and 35% had 13-15. In group-II 45% had GCS 9-12 and 55% had 13-15. The following btable is given below in detail:

Table-2: Distribution of patient according to GCS level on admission (n=80)

GCS on admission	**Group I Frequency (%), n=40**	**Group II Frequency (%), n=40**
GCS 9-12	26 (65%)	18 (45%)
GCS 13-15	14 (35%)	22 (55%)
Total	40 (100%)	40 (100%)

In table-3 shows distribution of fracture in X-ray, CT scan and per-operative findings where All patients of group- I, had features of fracture on plain X-ray, as well as CT scan and 29 patients had fracture per operatively. In group-II, fracture in plain X-ray was absent, but two patients had features of fracture on CT scan. Four patients showed skull fracture per- operatively out of 13 patients underwent surgery. The following table is given below in detail:

Table-3: Distribution of fracture in X-ray, CT scan and per-operative findings

Fracture	Plain X-ray		CT scan		Per-operative	
	Group-I n=40	Group-II n=40	Group-I n=40	Group-II n=40	Group-I n=29	Group-II n=13
Present	40	0	40	2	29	4
Absent	0	40	0	38	0	9

Discussion

Head injury has been described as the prominent reason of death in individuals under the age of 30 years in the western world following trauma. Approximately 8% of all deaths in the United States can be attributed to injuries while nearly 50% of these deaths are from brain injury. The causes of head injury depend on the age group and the geographical location, though the commonest cause usually is motor vehicular accidents.[4]

The most frequent cause of injury were a fall in the 0 year to 9 years age groups and road traffic accident in 10 years to 24 years age group. Nearly 81% of the EDH was due to road traffic accident and 17% due to assault. In traumatic EDH patients skull fracture was present in 75% of the study patients.[5]

In this study, patient's age ranged from 18 years to 70 years and the highest number of patients was in most active periods of life, in third decade 25 to 34 years of age 40% in group-I and 35% in group-II. One study found the maximum incidence was between the ages of 11 to 65 years. This is because, the working people avail themselves of traffic more than others and victimized to RTA. [6]

During study, out of 80 patients 75 (93.75%) patients were male and 5 (6.25%) patients were female of which 95% were male in group I and 92.5% in group II. The ratio between male and female 15:1. One study showed that sufferers of EDH, male and female ratio 4:1.[7] Another study told that the male female ratio was 11.75:1. Male are more prone to this due to more exposure. However females were less affected, working females were more commonly affected. The gender distribution reflects of this part of the world where women are less exposed to traffic as they remain mostly confined to domestic work.

In group I, 65% had history of RTA, 25% had history of assault, and 7.5% had history of fall from height. In group II, 62.5% had history of RTA, 22.5% had history of assault, and 10% had history of fall from height. One study reported that the commonest mode of injury was RTA (50.0%) followed by fall from height (50.0%).[9]Another study found that 50.0% were victims of motor vehicle accidents followed by falls, which account for 30.0% and the remainder was accounted for by acts of violence and sports-related injury 20.0%.[10] In one study falls (47.0%) were the commonest cause of head injury in-group 1 of while RTA (69.0%) was the commonest cause in group II.[11] Another report found that RTA is the major cause of head injury in Bangladesh in 'Surgical Outcome of Extradural Haematoma Associated with Parenchymal Injury'. They found that in group A, 72.5% had history of RTA, 17.3% had history of fall from height, and 10.0% had history of assault. In group B, 43.5% had history of RTA, 34.8% had history of assault, and 21.7% had history of fall from height.[12]In another study, causes of head injury mostly due to RTA 64.7%, assault 19.6% and fall from height was 11.6%. [8] From current study it can be said that the rate of RTA is more in our country.

In this study, all patients in group- I, fracture was seen on CT scan. In group-II, two patients had fracture on CT scan. Linear fractures invisible on routine axial computed tomography: a pitfall at radiological screening for minor head injury. Linear fractures (0 .99%) that were invisible on bone window axial CT but detected on skull radiography, which all ran parallel to the scan slice. Evaluation of head injury by only axial CT may miss such fractures. [13]

Limitations

- Small sample size and short study period.

Recommendations

- Patients with mild head injury with fracture skull should be referred to tertiary centers for further evaluation and detection of EDH.
- Patients with mild head injury without fracture skull should be observed in local centers if any deterioration occurs then they should be referred to a tertiary center.

Conclusion

From our findings we can conclude that there is close association between skull fracture with extradural haematoma in patients with head injury. Further study is needed for better outcome near future.

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