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Pattern of Head Injuries due to Blunt Force

BIREN XALXO[1], SEEMA PEREI[2], DEBENDRANATH MALLA[3], GUNAGOURAV MOHAPATRA[4], RAJLAXMI PAIKRAY[5]

[1]Associate Professor, Department of Forensic Medicine and Toxicology, VIMSAR, Burla, Sambalpur, Odisha, India

[2]Professor &HOD, Department of Forensic Medicine and Toxicology, VIMSAR, Burla, Sambalpur, Odisha, India

[3]Post Graduate Trainee (2nd Year), Department of Forensic Medicine and Toxicology, VIMSAR, Burla, Sambalpur, Odisha, India

[4]Post Graduate Trainee (2nd Year), Department of Forensic Medicine and Toxicology, VIMSAR, Burla, Sambalpur, Odisha, India

[5]Post Graduate Trainee (2nd Year), Department of Forensic Medicine and Toxicology, VIMSAR, Burla, Sambalpur, Odisha, India

Corresponding author
Dr.Biren Xalxo (Associate Professor)
Dept.of FMT,VIMSAR,Burla
P.O-Burla Dist-Sambalpur (Odisha)
PIN-768017
Mob.No.+91-9437246140
Email ID- birenfmt@gmail.com

ABSTRACT

BACKGROUND: Blunt force trauma to the head is one of the leading causes of death in both accidental and homicidal cases.

OBJECTIVES: To analyze and document patterns of head injury caused by blunt force and to correlate these patterns with the different demographic variables.

MATERIALS AND METHODS: A retrospective record based study was conducted on autopsy cases of head injury due to blunt force which were brought to mortuary for autopsy over a period of six months.

RESULTS: In the present study 192 cases of blunt force trauma to head were included of which 85.9% of cases were due to road traffic accident. 38% of incident occurred during 12.01-18 hours of the day. Temporal and parietal bones were the common sites of fracture accounting for 31.2% and 27.6% of cases respectively. Skull fracture was seen in 128 (66.6%) number of subjects. Linear fracture was observed to be the commonest seen in 42.1% of cases followed by comminuted fracture in 34.8% of cases. Sub arachnoid haemorrhage was found in 59.3% of cases followed by subdural haemorrhage in 44.2% of cases. Extradural haemorrhage was seen in only 13% of cases. Majority of cases (22.4%) were observed in 20-29 year age group. Majority of subjects (52.6%) died within 24 hours of incident.

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CONCLUSION: Patterns of blunt force head injuries assists in identifying the mechanism of injury and forming valuable opinion regarding cause and manner of death.

KEY WORDS: Blunt force trauma, Head injury, Skull fracture, Intracranial haemorrhage

INTRODUCTION

Head injuries are serious public health problem and can lead to life threatening complications. Head injury has been defined as "a morbid state, resulting from gross or subtle structural changes in the scalp, skull, and or the contents of the skull, produced by mechanical forces".[7] Injuries to the head are common and important in forensic practice. In hair covered areas, care must always be taken at autopsy to palpate the scalp in any case in which there is a possibility of injury, otherwise abrasions, swelling, bruising and even lacerations may be missed.[3]

Blunt force trauma to head is a common mechanism of injury encountered in clinical, forensic and emergency settings. Head is always vulnerable to external violence. Most of the injuries to the head occur due to road traffic accidents, fall from height, assaults, industrial accidents, combat sports etc. The mechanical forces like shearing strains and biophysical motion that occur during accidents to the head are responsible for patterns of injuries. The nature and severity of head injuries caused by blunt force depend on multiple factors including the force of impact, shape and size of the object and the anatomical region involved. Understanding the pattern of these injuries is not only decisive for accurate diagnosis and effective treatment but also for forensic investigations to determine the cause and manner of injury. The study aims to collect data on pattern of head injury due to blunt force and identifying the common trends and associations with demographic variables, injury mechanisms and outcomes.

MATERIALS AND METHODS

This was a retrospective record based study conducted in a tertiary health care centre over a period of six months from January 2022 to June 2022. The study included all autopsy cases presenting with head injuries due to blunt force trauma confirmed during post-mortem examination.

Inclusion Criteria

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- Cases with a clearly documented history or evidence of blunt force trauma to the head
- Victims of all age groups
- Complete clinical, radiological, or autopsy records available for review

Exclusion Criteria

- Cases involving penetrating or firearm injuries or crush injury to head
- Decomposed bodies or incomplete medical/autopsy records
- Injuries resulting from other mechanisms like burns or sharp force

Data were collected using a pre-designed proforma from hospital records and autopsy reports. Data were compiled and analyzed using microsoft excel sheet and were used to summarize the data. Frequencies and percentages were calculated for categorical variables and the results were presented in tables and charts.

RESULTS

In the present study 192 cases of blunt force trauma to head were included of which 85.9% of cases were due to road traffic accident followed by fall from height in 8.4% of cases (Figure:1). Males(77.6%) outnumbered females(22.4%) significantly. Majority of cases (22.4%) were observed in 20-29 year age group while 19.3% of cases were seen in 30-39 year age group (Table-1). 38% of incident occurred during 12.01-18 hours of the day followed by 26% during 18.01-24 hours. Least number of cases (6.3%) were recorded during 0.01-6.00 hours. Majority of subjects (52.6%) died within 24 hours of incident while 14.6% of subjects survived more than 7 days duration. Skull fracture was seen in 128 (66.6%) number of subjects. Linear fracture was observed to be the commonest seen in 42.1% of cases followed by comminuted fracture in 34.8% of cases (Table-2). Temporal and parietal bones were the common sites of fracture accounting for 31.2% and 27.6% of cases respectively (Table-3). Least common site of fracture was posterior cranial fossa observed only in 3.1% of cases. Sub arachnoid haemorrhage was found in 59.3% of cases followed by subdural haemorrhage in 44.2% of cases. Extradural haemorrhage was seen in only 13% of cases (Table-4).

DISCUSSION

In the present study we analyzed the pattern of head injury resulting from blunt force trauma with focus on gender distribution, time of incident, duration of survival, types and

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distribution of injuries etc. A total of 192 cases of blunt force trauma to head were included of which majority of cases (85.9%) were due to road traffic accident which is in line with some of the researchers.[1,2,10] This might be due to most people travel daily on roads without adequate safety measures especially in developing countries like India. Males (77.6%) outnumbered females (22.4%) significantly which is consistent with most of the researchers.[1,2,4,5,6,8,9,10] Majority of cases (22.4%) were observed in 20-29 year age group while 19.3% of cases were seen in 30-39 year age group which are in alignment with other researchers.[1,2,4] This can be attributed to the fact that males, especially in younger and middle age groups tend to drive more frequently with reckless driving or aggressive overtaking. Young males also do have risk taking tendencies which directly contributes to accident likelihood. 38% of incident occurred during 12.01-18 hours of the day followed by 26% during 18.01-24 hours which is in parallel with some of the researchers.[4,9] Majority of incident occurred during afternoon and evening/night hours of the day which might be due to peak traffic volume, decreased alertness especially post lunch dip, poor visibility etc. during this period. Majority of subjects (52.6%) died within 24 hours of incident which is consistent with other authors.[1,2,4] This may be due to primary brain injury, intracranial haemorrhages and lack of timely medical care.

Linear fracture was observed to be the commonest which was found in 42.1% of cases which is comparable with other reserachers.[2,6,10] Linear fractures occur when a broad, low to moderate force is applied over a wide area of the skull which are frequently found in road traffic accidents, fall from height, assaults etc. Temporal and parietal bones were the common sites of fracture accounting for 31.2% and 27.6% of cases respectively which aligns with the thinness of these regions and their vulnerability to direct impact. Similar patterns were also observed by one author.[9] Intracranial haemorrhages were also prevalent with subarachnoid haemorrhage being the most frequently encountered accounting for 59.3% of cases followed by subdural haemorrhage in 44.2% of cases which is similar to other researchers.[1,2,5,6,8] Both types of haemorrhages are commonly seen in road traffic accidents and have got similar mechanisms as shear stresses and rotational movements of the brain.

CONCLUSION

Blunt force trauma to the head is a frequent and critical finding in cases of accidental, homicidal and suicidal deaths. The present study emphasizes the injury to the scalp, skull and intracranial haemorrhages like subdural and subarachnoid haemorrhages which are the most common injuries observed. The pattern of these injuries often correlate with the nature of

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impacting object, number of impacts and the anatomical region involved. Recognizing these injury patterns is crucial for forensic experts in reconstructing the events leading to death, determining the manner of injury and providing valuable medico-legal opinions. This knowledge not only aids in criminal justice delivery but also contributes to public health and safety by identifying avertible causes of fatal head injuries.

Conflict of interest: Nil

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Figure: 1 Distribution of head injury cases as per external cause

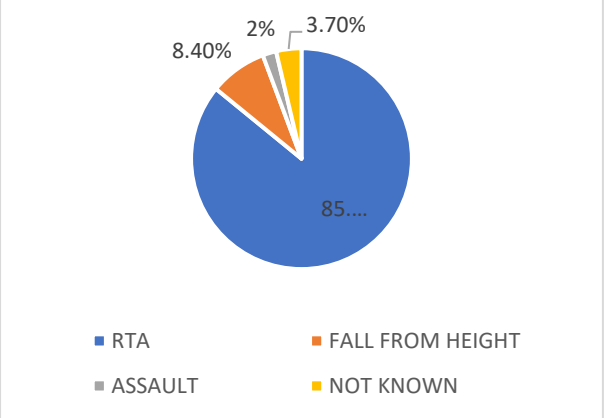

Table 1: Age and sex wise distribution

Age Group (In Years)	Male	Female	Total Case	Percentage(%)
0 – 9	1	2	3	1.6
10 – 19	11	3	14	7.3
20 – 29	36	7	43	22.4
30 – 39	32	5	37	19.3
40 – 49	28	6	34	17.7
50 – 59	23	12	35	18.2
60 & above	18	08	26	13.5
Total	149	43	192	100

Table 2: Distribution according to type of skull fractures

Type of Skull Fracture	Numbers of Cases	Percentage (%)

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Linear Fracture	81	42.1
Basilar Fracture	38	19.7
Comminuted Fracture	67	34.8
Depressed Fracture	10	5.2
No Fracture	64	33.3

Table 3: Site of skull fractures

Site of Fracture	Numbers of Cases	Percentage (%)
Frontal bone	30	15.6
Temporal bone	60	31.2
Parietal bone	53	27.6
Occipital bone	26	13.5
Anterior Cranial Fossa	15	7.8
Middle Cranial Fossa	25	13.0
Posterior Cranial Fossa	6	3.1

Table 4: Type of Intracranial Haemorrhages

Intracranial Haemorrhage	Numbers of Cases	Percentage (%)
Extradural	25	13
Subdural	85	44.2
Subarachnoid	114	59.3
Intracerebral	84	43.7
Brain stem	25	13