

PATTERN OF FATAL HEAD INJURIES AUTOPSIED AT VYDEHI HOSPITAL BANGALORE: 5 YEARS STUDY

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ABSTRACT: Head injuries are among commonest of regional injuries, it results in gross or subtle structural changes in scalp, skull and or contents of skull produced by mechanical forces, it is the major contributor of deaths due to assault, fall and transportation accidents. The incidence of head injuries is growing with great mechanization in industry and increase in high velocity transport. Correct interpretation of head injuries is of great importance in providing proper treatment in living victim. It is also important for the purpose of accurate reconstruction.¹ In depth studies of fatal head injuries provide valuable data for implementing effective services to reduce the trauma, related mortality and to strengthen legal measures. Data in the current study was collected from the autopsy reports of medico legal cases brought to Vydehi hospital and from police information forms 146 (i) and (ii) of all fatal head injuries from the period of September 2006 to February 2011 and also from the cases of fatal head injuries that were brought for medico legal autopsy at Vydehi Hospital mortuary during the period of March 2011 to August 2011. The study concluded that most common cases were those of RTA, most of the deaths proved to be immediately fatal within period of 1 hour following incidence, cause of death that were given in majority of cases was that of shock and haemorrhage as a consequence of injuries sustained.

KEYWORDS: Fatal Head injuries, mortality, reconstruction.

INTRODUCTION: "Head injury" as defined by the National Advisory Neurological Diseases and stroke council, is a morbid state, resulting from gross and subtle structural changes in the scalp, skull and/ or the contents of the skull produced by mechanical forces. Mechanical forces is restricted to the forces applied externally to the head, thus excluding surgical ablations and internally acting forces such as increased intracranial pressure resulting from edema, hydrocephalus, or mass occupying lesion without antecedent head trauma.

As per History, head trauma did not take long to be realized by human, the head has always been seen by both assailant and defender as a region of particular vulnerability, where an incapacitating blow might most effectively be landed. These is well attested by the creation of protective helmet (iron hat) worn by the warriors far back in the antiquity and now as well, at war and at peace, while at work and in variety of sport- connected activities. Nevertheless, mortality from battlefield injury has been reduced from ancient times to the present day, despite advances in weapons technology.¹

Introduction of helmet in view of protecting head from crashes following motorcycle accidents dates back to 1885 when the first helmet was used. It was crude compared to modern

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helmets which had given little protection. This had led for the introduction of helmet in 1931. Professor C.F. Lombard created helmet which will absorb the crash. The ultimate function of a motorcycle helmet is to protect the skull from a type of punctures and to provide a cushion that will de-accelerate a rider's head during impact. This will lead to a decrease in force that is placed on the skull of a rider.²

Head injuries are basically classified into two types depending on the involvement of dura mater. Closed head injury where the dura mater is intact, and open head injury where dura mater is torn. However based on gross anatomical involvement of structures head injuries are classified into, scalp injuries, facial injuries, skull injuries, injury to Meninges and injury to the brain.³

A couple of important dicta should always be remembered in relation to craniocerebral injury, which would prevent any unnecessary theorizing among doctors as well as lawyers because, 'Any type of craniocerebral injury can be caused to any kind of blow or any sort of head.' 'No form of craniocerebral injury is too trivial to be ignored or so serious as to be despaired of.'⁴ The current study was aimed to study pattern of fatal head injuries in relation to age, sex, survival period and in relation to cause of head injury.

MATERIALS and METHODOLOGY: Data was collected from the autopsy reports and from police information forms 146 (i) and (ii) of all fatal head injuries from the period of September 2006 to February 2011 and also from the cases of fatal head injuries that were brought for medico legal autopsy at Vydehi Hospital mortuary during the period of March 2011 to August 2011.

A proforma was prepared accordingly to collect the data based on the deceased's particulars, with complete external and internal examination both in prospective and retrospective studies of those involved in fatal head injuries cases. The particulars of deceased in the form of age, sex, nature of injury, treatment if given along with cause of death were studied based on autopsy reports, forms 146 (i) and (ii)- police request for medico legal autopsy, information from relatives (if available).

This was a type of descriptive study. The criteria used for selection of cases for this study were as follows:

INCLUSION CRITERIA:

- All the medico legal autopsy reports of fatal head injuries at Vydehi Hospital, Bangalore during the year September 2006 to February 2011.
- All the medico legal autopsies of fatal head injuries at Vydehi Hospital, Bangalore during the year March 2011 to August 2011.

EXCLUSION CRITERIA:

- Decomposed cases with fatal head injuries, where the interpretation of injuries is not possible due to extensive decomposition.
- Unknown cases where, the history and details are not available.
- Intracranial hemorrhages, infarctions, lesions as a result of natural diseases.
- Extensive burns involving head, where there is difficulty in interpretation of injuries.

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OBSERVATIONS and RESULTS: A study was done for a period of five years about the head injury pattern in Vydehi Institute Of Medical Sciences and Research Centre Bangalore and data was collected in 184 cases about various objectives like knowing the relationship in terms of age, sex, nature of injuries, survival period and cause of death, it also includes the site of skull fracture and intracranial haemorrhage and brain injuries. The study was done as retrospective for four and half years and prospective for six months based on the autopsy reports and police information's from form 146 (i) & (ii).

Age of incidence among the individuals is broadly grouped into ten years range.

Youngest case	8 months old
Oldest case	83years old
Highest incidence of 79 cases	age group of 21 to 30 years

On considering sex profile among deaths due to head injuries.

Male	162 cases
Female	22 deaths

Survival period	No. of cases
One hour	132 cases
More than twenty four hours	42 cases

INCIDENT NOTICED:

Road traffic accidents	122 cases
Fall from height or fall of objects	45 cases
Assault	17 cases

In road traffic accidents when data was analyzed among the type of road users. The incidents indicate four wheeler occupants were well protected compared to other type of road users.

Type of road users	Cases
Two wheeler	68 cases
Pedestrians	47 cases
Four wheeler	3 cases
Others	4 cases

On autopsying 184 cases, 164 cases showed one or the other external injuries at particular regions of the body.

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External injuries	No. of cases
Lacerations	55 cases
Laceration + abrasions	31 cases
Abrasions	15 cases
Crush injuries	13 cases
Scars	12 cases
Laceration + contusion + abrasion	4 cases
Laceration+ contusion	3 cases

Scalp extravasation of blood (contusion) involvement depends on the site of impact and on the side of the body on which the individual falls. Most cases of RTA the point of impact were opposite to the wound or injury noticed, but majority of cases were those of crush injury but the point of impact could not be made out. In cases of fall from height most common site of impact was head followed by legs and back, temporal region laceration was common. The subsequent extravasation in scalp and skull fracture was corresponding to external injuries in majority of cases.

Scalp extravasation	No. of cases
Diffuse	74 cases
Temporal region	19 cases
Parieto temporal region	10 cases

On considering the fracture of skull vault, out of 184 cases 169 cases showed skull vault fracture.

Fracture of skull vault	No. of cases
Linear/ Fissure fracture	70 cases
Comminuted fracture	51 cases
Linear/ Fissure + Comminuted fracture	22 cases
Depressed + Comminuted fracture	8 cases
Diastic + Depressed fracture	2 cases
Linear + Hinge fracture	1 case

Skull vault bone involvement	No. of cases
Temporal bone/s	19 cases
Frontal bone	18 cases
Temporal + Parietal bone/s	14 cases
Occipital bone	9 cases
Frontal + Facial bones	2 cases

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Involvement of skull base in the form of fractures seen in 126 cases.

Cranial fossa involvement	No. of cases
All	35 cases
middle cranial fossa	26 cases
anterior cranial + middle cranial fossa	26 cases
anterior cranial fossa	19 cases
posterior cranial fossa	14 cases
middle cranial+ posterior cranial fossa	3 cases
anterior cranial + posterior cranial fossa	2 cases

Total of 153 cases showed meningeal haemorrhages.

Meningeal haemorrhages	No. of cases
Sub dural haemorrhage(SDH)+ Sub arachnoid haemorrhage(SAH)	115 cases
Sub dural haemorrhage	13 cases
Extra dural haemorrhage(EDH)+ SDH+ SAH	9 cases
EDH + SDH	3 cases
EDH + SAH	2 cases
Intra ventricular haemorrhage (IVH)	1 case
SDH+ SAH + IVH	1 case

Type of brain injury

Contusions	40 cases
Oedema	32 cases
Laceration	25 cases
Extruded out	13 cases
Infection	1 case
Infection+ oedema	1 case

When the site of brain injured were analyzed in total of 114 cases.

whole brain	39 cases
frontal area	24 cases
base of brain	11 cases
temporal area	5 cases
parietal area	4 cases
occipital area	2 cases

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When causes of death were analyzed;

- It was noted that in 54 cases, it was attributed due to → shock and haemorrhage as a consequence of head injury
- In 45 cases as due to → shock as a result of injury
- In 31 cases as due to → coma as a result of head injury
- In 27 cases as due to → head injury
- In 19 cases other causes were mentioned like → respiratory failure or infection
- In 8 cases death was attributed as → instantaneous due to crush injury sustained to the head.

DISCUSSION: This study was done for a period of five years in the eastern part of Bangalore about fatal head injuries and had shown increased incidence of RTA cases, which constituted 122 cases (66%) out of total 184 cases, which can be compared to the study done on pattern of fatal head injuries in Aligarh U.P which had also shown maximum of RTA cases -18cases (45%) out of total 43cases.⁵

Most of the fatalities in our study had occurred within one hour 132 cases (72%) out of total 184 cases. This was in contrast to other studies like one done at Chandigarh where majority of deaths in 63 cases (17.17%) had resulted in 1-6 hours of occurrence.⁶ Study done in Jaipur (Rajasthan) had assessed the duration of survival ranging with 12 hours difference and had concluded that 0-12 hours survival was seen in 29 cases (36.70%) and survival for 12-24 hours was in 21 cases (26.59%)⁷

Among the injuries to face and the head, laceration was the most common type of injury accounting for 55 cases (34%), followed by abrasion in combination with laceration in 31 cases (19%), abrasion alone were noticed in 15 cases (9%), in this study. Similar results were drawn in a study that was done in Government Medical College Chandigarh, where scalp laceration was noticed as common injury in 104 cases (28.34%) followed by scalp abrasion in 56 cases (15.26%).⁶

In the present study on considering skull fractures of the vault, it had shown that the linear/ fissure fracture were the commonest accounting for 70 cases (41%) followed by comminuted fracture in 51 cases (30%). This can be compared with a study done in Jaipur where they concluded linear fracture in 34 cases (43.04%) was common followed by basilar fracture 14 cases (17.73%) and then comminuted fracture 06 cases (07.61%).⁷

On considering the anatomical location of the skull vault fracture in the present study showed involvement of all bones in majority of cases, that was in 21 cases (16%) followed by involvement of temporal bone in 19 cases (15%), which was then followed by frontal bone in 18 cases (14%). These data were in contrast to Chandigarh based study which had showed parietotemporal bones in 64 cases (19.81%) being common followed by parietal bones in 19 cases (5.88%).⁶

In this study on considering site of skull base fracture, majority of cases involved all fossa in 35 cases (28%) followed by middle cranial fossa 26 cases (21%) and then combination of anterior cranial fossa and middle cranial fossa in 26 cases (21%). This study was in contrast to

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the study done in northeast Delhi, which had shown that posterior cranial fossa involvement in 12 cases (40%) being common followed by anterior cranial fossa involvement in 6 cases (20%).⁸

The common meningeal haemorrhage in the current study was combination of subdural and subarachnoid haemorrhage in 115 cases (75%), followed by subdural haemorrhage alone in 13 cases (8%), extra dural haemorrhage in 2% of cases. This was in contrast with Chandigarh based study where the subdural haemorrhage (62%) is commonest followed by subarachnoid haemorrhage (23%) followed by extra dural haemorrhage in 16%.⁶

This study had observed the brain contusion in 40 cases (30%) which was common followed by cerebral oedema 32 cases (28%) and then brain laceration in 25 cases (22%), 13 cases (11%) also showed complete expulsion of brain matter. The present study had also showed the diffuse involvement of whole brain commonly in 39 cases (34%) followed by frontal lobe involvement in 24 cases (21%). This study was similar to Aligarh based study that had showed that contusion 41 cases (56.1%) is common followed by cerebral oedema in 24 cases (32.8%).⁵

When the cause of death were analyzed in this study, it was found that in many cases it was concluded as – ‘shock and haemorrhage as a result of head injury sustained’ in 55 cases (29%), followed by ‘shock as a result of injury sustained’ in 45 cases (25%), as due to – ‘coma as a result of head injury’ in 31 cases, as due to – head injury in 27 cases, as due to other causes which were mentioned like- respiratory failure or infection in 19 cases and in 8 cases death was attributed as –instantaneous due to crush injury sustained to the head. There were no similar or contrasting studies to comment on this issue. There was no uniformity of findings with regard to conclusion of cause of death. In some cases only the anatomical cause of death was mentioned, while in some other cases mode of death was included along with the cause of death. Until we have uniform standards for concluding cause of death, comparison of such data may not be possible.

CONCLUSION: In the present study of- ‘A five year autopsy study of pattern of fatal head injuries at Vydehi Hospital, Bangalore’ had helped in drawing following conclusions.

1. The incidence was common among the age group of 21 to 30 years with 79 cases (43%) and youngest age of occurrence being 8 months old and oldest being at 83 years.
2. Male predominance was seen with 162 cases 88% and female incidence in remaining 22 cases (12%).
3. 72% deaths had been noticed within one hour following the incident of head injuries and 23% had survived for more than 24 hours.
4. Most common type of external injury noticed was laceration in 34% of cases, followed by combination of abrasion and laceration in 19% of cases, crush injuries were seen in 8% of cases, contusion alone were seen in 3% of cases, scar marks were seen in 7% of cases.
5. Extravasation of blood in the scalp region was found diffusely in 45% of cases, temporal region in 12% of cases, whereas in parietal region, occipital region, combination of fronto parietal region and combination of parieto temporal region were 6% of cases each.
6. Linear or fissure fracture was the most common type of fracture of skull vault seen in 41% of cases, while as 30% showed communitated fracture, 13% showed combination of linear and communitated fracture, 5% of cases showed combination of communitated and depressed

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- fracture, 1% of cases showed diastic fracture. Combination of hinge and linear fracture were seen in 1% of cases.
7. On considering the most common site of fractures in the skull vault - all bones getting fractured were seen in 16% of cases. Temporal bone fracture was next commonly seen in 15% of cases, 14% showed frontal bone fracture, in 11% cases combination of parietal and temporal bone fracture were seen. 7% of cases showed involvement of frontal, parietal and occipital bones fractures.
 8. All three cranial fossae fractures of base of skull were seen in 28% of cases, 21% of cases showed involvement of MCF alone; and 21% of cases showed combination of ACF and MCF, 15% of cases showed involvement of ACF alone, 11% showed PCF fractures alone.
 9. 75% of cases showed meningeal haemorrhage in the form of SAH and SDH, 8% of cases showed SDH alone, 6% of cases showed combination of EDH, SDH and SAH, 5% cases showed SAH, 1% of cases showed EDH, 1% of cases showed IVH.
 10. Among the brain injuries - contusion was seen in 35% of cases, 28% of cases showed oedema of brain, 22% of cases showed laceration; brain matter was expelled out in 11% of cases. 1% of cases there was infection and in 1% of cases there was combination of contusion and laceration.
 11. When the site of brain injury was analyzed - 34% of cases showed diffuse involvement of brain, 21% of cases showed involvement of frontal lobe alone, 10% showed base of brain involvement, 6% showed parieto temporal lobes, 4% showed parietal lobe alone and 4% showed temporal lobe alone.
 12. When the cause of deaths were analyzed, it was found that in many cases it was concluded as – 'shock and haemorrhage as a result of head injury sustained' in 55 cases (29%), followed by 'shock as a result of injury sustained' in 45 cases (25%), as due to – 'coma as a result of head injury' in 31 cases, as due to – head injury in 27 cases (15%) as due to other causes which were mentioned like- respiratory failure or infection in 19 cases (10%) and in 8 cases (4%) death was attributed as – Instantaneous due to crush injury sustained to the head.

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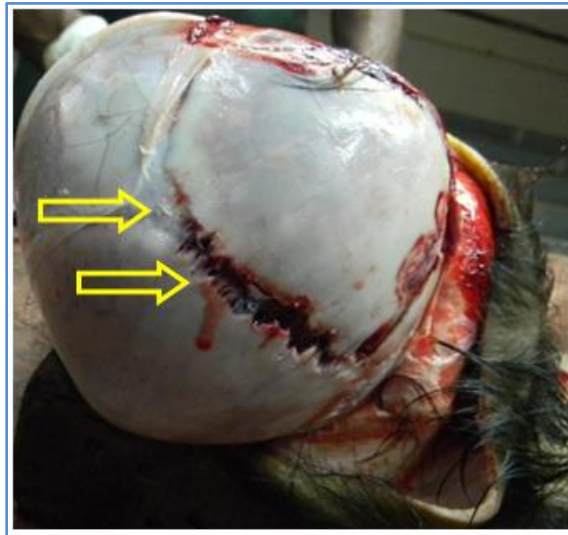
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Photograph 1: Shows diffuse blood extravasation present in frontal, parietal and temporal region of scalp



Photograph 2: Shows linear/fissure fracture in the parietal area



Photograph 3: Shows sagittal suture separation (Diastic fracture), Anterior fontanelle is not closed (Closes by the age of 1.5 to 2 years)

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