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Cross-Sectional Study on the Pattern of Skull Fractures & Intracranial Hemorrhges in Fatal Road Traffic Accidents in Chitradurga

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Abstract

Background: Deaths due to Road Traffic Accidents (RTAs) are increasing at an alarming rate & posing a major epidemiological and medico-legal problem. Victims in RTAs sustain various injuries, of which head injuries play a major role. Present study was conducted to know the pattern of skull fractures & intracranial hemorrhages in fatal RTAs. **Method:** Present cross-sectional study was carried out on the victims of fatal RTAs with head injuries, by conducting autopsy at mortuaries of Basaveshwara Medical College and District Hospitals, Chitradurga. **Results:** Most common single type of external injuries over face and head included abrasions in 66% and lacerations 64% cases. Dura mater was torn in 80%cases & 20% cases had intact dura mater.72% cases presented with skull fracture and all the victims (100%) presented with intracranial haemorrhage and injury to brain parenchyma and 30% cases developed cerebral oedema. The most common type of brain injury noted was contusions in 52% cases. Fissured fracture was seen in 58% cases, followed by comminuted fracture in 14% & sutural in 6%. Subarachnoid hemorrhage was seen in 90% cases, of which 26% cases was in the age group of 31-40 years. **Conclusion:** This study made an effort to study the pattern of head injuries and intracranial haemorrhages leading to death in road traffic accidents. Appropriate preventive measures should be adopted to reduce head injury related deaths in road traffic accidents in the future.

Keywords: *Fatal RTA, intracranial haemorrhage, skull fracture, head injury, autopsy*

Introduction

Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway (i.e. originating on, terminating on, or involving a vehicle partially on the roadway).[1] WHO defined the accident as, "an unexpected, unplanned occurrence that may involve injury."[2] These accidental injuries and deaths are the prices we have to pay for the life on-wheels that our civilization indulges in. India accounts for about 10% of road accident fatalities worldwide. The magnitude of the accident problem is difficult to define accurately because of the lack of precise figures.Head and neck are most common of all the regional injuries in forensic practice.[3] Head injury is a morbid state where there are gross or subtle structural changes in scalp vault and or the content of the skull. A couple of important dicta to 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 by any kind of blow.' 'No form of craniocerebral injury is too trivial to be ignored or so serious as to be despaired of'.[4] 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.[5]

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Chitradurga being a district headquarters in Central Karnataka has seen growth in population and motor vehicles in a pattern similar to the rest of India. Chitradurga, a city with population of around 1.7 lakh, and being one of the major iron ore mining areas, is well connected by state and national highways. Chitradurga ranks third in road traffic accidents next only to Bangalore and Belgaum in Karnataka. Present study was undertaken to find out the patterns of skull fractures and intracranial haemorrhages among road traffic accident victims brought to Basaveshwara Medical College and Hospital Government Hospital and, Chitradurga.

Objective

To find the proportion of skull fractures and intracranial hemorrhages leading to death in fatal RTAs.

Methodology

This is a cross-sectional study conducted at mortuary of Basaveshwara Medical College and Government District hospital mortuary- Chitradurga. The average number of head injury cases autopsied in the mortuary of Basaveshwara Medical College and Hospital, Chitradurga for a period of six months in 2016 was considered as the baseline. 80% of these cases was considered as the sample size. The average worked out to be 58 cases and 80% of it was 46 cases. Hence approximately nearest whole number of 50 was considered as the final sample size.

In the present study, a case of head injury as defined by the National Advisory Neurological Diseases and Stroke Council "is a morbid state resulting from gross or subtle structural changes in the scalp, skull, and/or the contents of the skull, which is produced by mechanical forces".

Dead bodies of road traffic accidents brought to BMCH and Chitradurga District hospital mortuary where the cause of death was due to head injury were included for the study.

Autopsy included a detailed external examination for external injuries and a complete internal examination as per Lettule's technique.[6] A pretested proforma was used to extract information by interrogating police personnel accompanying the deceased, as well as friends, relatives, neighbours and others who accompanied deceased. The data thus obtained was analysed with respect to socio-demographic patterns like age, sex, cranial fractures, and intracranial haemorrhages. Age of the deceased was estimated as to the nearest completed years. The age groups of victims were categorized in an interval of 10 years. The data so obtained was entered into a Microsoft Excel spreadsheet and analysed. All the categorical variables were presented as frequency and percentages.

Results

Table 1: Distribution of intracranial hemorrhages with respect to age

Age	Extra Dural Hemorrhage (EDH)	Sub Dural Haemorrhage (SDH)	Sub Arachnoid Haemorrhage (SAH)	Intra Cranial Haemorrhage (ICH)	Intra Ventricular Haemorrhage (IVH)
0-10	1	3	3	3	1
11-20	2	2	5	2	2
21-30	1	9	11	9	3
31-40	1	5	13	5	5
41-50	0	2	5	2	1
51-60	2	5	3	5	2
61-70	1	1	4	1	0
>70	0	0	1	0	0
Total	**08**	27	45	27	14

As shown in [Table 1]out of 8 cases of EDH, 2 cases each were seen in the age group of 11-20 years and between 51-60 years. One case each was seen in the extremes of age i.e., within 1-10 years and 61-70 years age group. Out of 27 cases of SDH, 9 cases were in the age group of 21-30 years.The SAH is seen in maximum number of cases - 45 cases, of which majority (13 cases) was in the age group of 31-40 years. Intracerebral haemorrhage was seen in 27 cases of which major portion (9 cases) was seen in age group of 21-30 years. Intraventricular haemorrhage was commonly noticed among 31-40 years of age among the 14 cases.

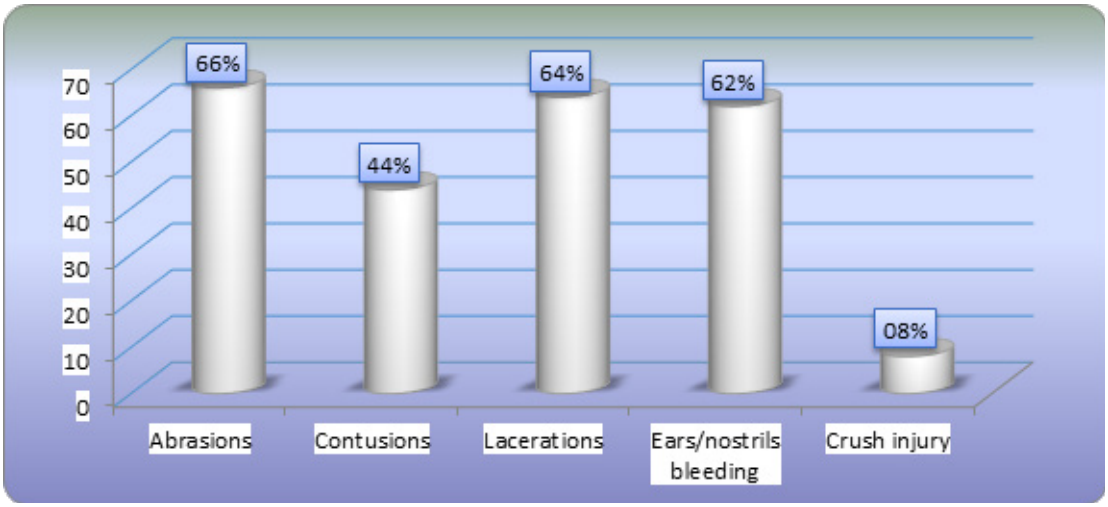

Figure 1: Showing distribution of external injuries over face and head

As evident from [Figure 1] most common single type of external injuries were abrasions seen in 66% cases and lacerations in 64% cases. 44% cases had contusions while 62%cases had bleeding from ears or nostrils. In 8% cases of crush injuries, combinations of all three injuries- lacerations, abrasions and contusions were noticed.

Table 2: Distribution based on meningeal condition:

Meninges	Frequency	Percentage
Torn	40	80
Intact	10	20
Total	50	100

As shown in [Table 2] dura mater was torn in 80% of the cases i.e., had open head injury; 20% cases had intact dura mater. And, 72% presented with skull fracture, all the victims (100%) presented with intracranial hemorrhage, and all victims (100%) showed injury to brain parenchyma and 30% victims had developed cerebral edema.

Table 3: Distribution based on findings of brain

Brain	Frequency	Percentage
Laceration	09	18
Contusion	26	52
Oedema	15	30
Total	50	100

As evident from [Table 3] the most common type of brain injury noted was contusions accounting for 52% cases. Edema of the brain being next common (30% cases), followed by laceration in 18% cases.

Table 4: Association of intracranial hemorrhages with fracture

Intracranial Hemorrhage	No. of cases with fracture	No. of cases without fracture	Total
Extra Dural Hemorrhage (EDH)	08	00	08
Sub Dural Hemorrhage (SDH)	26	01	27
Sub Arachnoid Hemorrhage (SAH)	38	07	45
Intra Ventricular Hemorrhage (IVH)/ Intra Cerebral Hemorrhage (ICH)	12	02	14

As evident from [Table 4] EDH was noted in 8 cases, of which all of them are associated with skull fracture. The SDH was seen in 27 cases of which 26 were associated with skull fracture and 1 without skull fracture. The SAH is seen in 45 cases out of which 38 were with skull fracture and 07 without skull fracture. Intracerebral/intra ventricular hemorrhages are seen in 14 cases of which 12 were associated with fracture of skull.

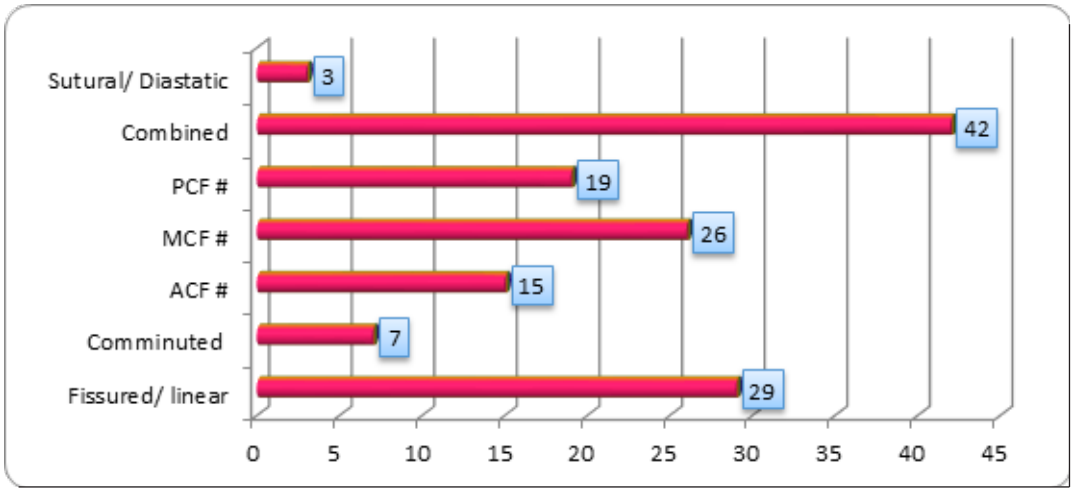

Figure 2: Types of skull fracture

As shown in [Figure 2], fissured fracture was seen in 29 victims(58%), comminuted fracture in 7(14%), sutural in 3(6%), Anterior Cranial Fossa (ACF) fracture in 15(30%), Middle Cranial Fossa (MCF) fracture in 26(52%), Posterior Cranial Fossa (PCF) fracture in 19(38%) and combined fracture is seen in 42(84%) cases. Diastatic fracture constituted 6% of the cases.

Discussion

Road traffic Accident (RTA) is the main cause for head injury and death worldwide and in India. The heavy traffic in metropolitan cities is the main cause for accidents and often results due to negligence and carelessness.

Head injury due to road traffic accidents result in gross or subtle structural changes within the content of skull and scalp and death. However many studies are available across the world and India to describe the pattern of head injury as results of road traffic accident. But such studies are scant in this part of the country. Hence this study was undertaken with the aim of studying the pattern of head injury& intracranial haemorrhages leading to death in Chitradurga city.

Distribution of intracranial hemorrhages with respect to age:

SAH was seen in 26% cases and majority of them were aged between 31 to 40 years. In support to these findings, maximum numbers of SAH was seen in same

age group in most of the studies. In studies conducted at Brisbane, Queensland;[7]AIIMS, New Delhi,[8] the intracranial hemorrhages were more common in the middle age which is similar to the findings of our study. Out of 8 cases of EDH, 2 cases each were aged between 11 to 20 years and 51 to 60 years. One case each was seen in the extremes of age i.e., within 1-10 years and 61-70 years age group. This is similar to a study conducted at the Chief Medical Examiner's Office, Baltimore,[9] where 3 cases of EDH were seen in infants, which is contrary to popular belief that EDH is rare in infants due to the tough adherence of dura to the surrounding bones. The absence of EDH in age group > 70 years in our study could be due to less number of cases encountered in that age group.

Out of 27 cases of SDH, 9 cases were in the age group of 21-30 years. Intracerebralhaemorrhage was seen in 54% cases of which major portion 18% was seen in age group of 21-30 years. Intraventricularhaemorrhage was commonly noticed among 31-40 years of age.

Distribution of external injuries over face and head:

Most common type of external injuries on head and face were abrasions seen in 66%, laceration accounting to 64% of injuries and 44% had contusions, 62% cases had bleeding from ears or nostrils. The combination of all three injuries- lacerations, abrasions and contusions were noticed more frequently in this study.

Type of cranial and intracranial lesions:

Dura mater was torn in 80% of the cases in this study i.e., had open head injury; 20% of the cases had intact dura mater. On analysing the type of brain injury- the most common type noted was contusions accounting for 56% of the cases, oedema of the brain being next common (30%) type, followed by laceration in 18% cases.

In a similar study by Shobhana et al,[10] 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. 34% of the cases showed diffuse involvement of brain.

Intracranial haemorrhages:

In the present study, brain haemorrhages were classified as extradural haemorrhage, subdural haemorrhage, subarachnoid haemorrhage, and intra cerebral/cerebellar haemorrhage. Subarachnoid haemorrhage was seen in 90% of the cases followed by subdural haemorrhage in 54% of the cases. Intra cerebral/cerebellar haemorrhage and intra ventricular haemorrhage was observed in 28% of the cases.

Subarachnoid haemorrhage was associated with subdural haemorrhage in more than half of the cases in our study. Subarachnoid haemorrhage was associated with intracerebral haemorrhage in 28% cases.

Extradural haemorrhage was appreciated in only 16% cases in this study. EDH was swept out in most of the cases due to fracture of the skull. Hence it was not appreciated at autopsy. All the 8 cases of extradural haemorrhage had fracture of the skull. Among the 54% of the cases with subdural haemorrhage, 52% had fracture of skull. Among the 90% cases of subarachnoid haemorrhage, 76% had fracture of the skull.

Among the 28% cases intra cerebral/cerebellar haemorrhage, 24% had fracture of the skull. Significant association was seen between subarachnoid and subdural haemorrhage in our study. According to various studies, SDH is the most common haemorrhage which differs from our study.[11,12,13]

In the study by Shobhana et al[10], 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. Similar results were also obtained in studies conducted at Chief Medical Examiner Office, Baltimore[9] (75% of skull fractures are associated with intracranial haemorrhage).

Types of skull fracture:

Fissure fracture of the skull was the commonest fracture seen in 58% of the victims in our study followed by MCF and PCF fractures. Combined fracture was seen in 84% of the victims. Fracture of skull was also observed in studies conducted atBrisbane, Queensland (48.3%)[7] and PGIMS, Rohtak (51.6%).[14]

In a study conducted based on autopsy findings at AIIMS, New Delhi, skull fractures was present in 79.87% of the road traffic accident victims. The fissured fracture was the most common type, followed by depressed, comminuted and compound fractures. These findings are consistent with the findings in our study.[8]

In our study, on considering the skull base fracture, majority of cases had combined fractures in 84% of the victims. Fracture of MCF was present in 52% of the cases and PCF in 38% cases and then ACF in 30% cases. This study was in contrast to the study conducted in Northeast Delhi, which had shown the involvement of PCF in 40% of the cases followed by ACF involvement in 20% cases.[15] In contrast a study conducted at Manipal, MCF was involved in 26% of cases, PCF in 17% of the cases and ACF in 15% of the cases.[16]

Higher occurrence of skull fracture can be due to recent increase in number of vehicles that too motor cycles, anatomy of skull and its movement in relation to the jerk, sudden brake and acute turns in accidents might be the cause of impact to head.

Conclusion

The study revealed the patterns of skull fractures and intracranial haemorrhages leading to death in fatal RTAs. Abrasions were more frequent type of external injuries noted followed by combination of other types of injuries like contusions and lacerations. This study has made an effort to study the pattern of head injuries and intracranial haemorrhages leading to death in road traffic accidents.

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Conflict of Interest – None declared.

Ethical Approval – The study was approved by Institutional Ethics Committee.

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