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Original Research Article

Clinico-Etiological Co-relation between Clinical and Radiological Findings Vs Autopsy Findings in Road Traffic Accidents: A Large Study from Eastern India

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Abstract: RTA (road traffic accident) is the third major preventable cause of all deaths. The aim was to study the discrepancies between the clinico–radiological findings and autopsy findings in alleged history of RTA. It was a retrospective observational study done in Forensic Medicine and Toxicology Department of M.K.C.G Medical College and Hospital, Berhampur, Odisha. All autopsies of RTA victim's undergone medical evaluations during the period from 30th November 2013 to 29th November 2015 were taken into account. The detection rates of all modalities were calculated with reference to the autopsy. All parameters were expressed in percentage and written in table. About 16.2% of RTA deaths undergone medical evaluations were included in the study. The study revealed male, intoxicated, without helmet bike riders were more vulnerable. 89.7% had head & neck injuries and 60.3% deaths had lower limb injuries. The detection rates of CT for haemorrhage, cerebral edema, mass defect, cerebellar lesion were 58.4%, 73.9%, 47.3% and 17.24% respectively. Similarly the detection rate of USG for chest injuries, abdominal injuries, pelvic injuries are 50%, 80% and100% respectively. The detection rate of X-Ray for skull injuries, chest injuries, vertebral injuries were 15.7%, 50% and 40% respectively. Clinical manifestations were in concordance of autopsy findings in 100%, 80%, 0%, 20%, 50% and 93.75% respectively for head, abdomen, pelvic injuries, traumatic paraplegia, lungs and limb injuries. Concealed injuries if any, the diagnosis of which remains obscure clinically and radio-logically, subsequently established at autopsy strongly emphasizes upon careful evaluation of the RTA victims by treating physicians or surgeons so as to enable them to identify the most dangerous injury earlier to initiate life-saving oriented treatment in order to decrease the morbidity and mortality.
Keywords: Autopsies, CT, Detection Rate, MRI, RTA, USG, X-RAY.

INTRODUCTION

Accident is an event, occurring suddenly, unexpectedly and inadvertently under unforeseen circumstances. Death from road traffic injuries (RTI/RTA) and in particular Motor vehicle Traffic Accidents (MVTA) have been characterized worldwide as a hidden epidemic which affects all sectors of society [1]. "A road traffic accident (RTA)" was defined as accident which took place on road between two or more objects, one of which must be any kind of a moving vehicle [2]." Road traffic accidents account for the highest number of deaths due to head injuries. Traffic accidents are considered as recent pandemic. Traffic accidents remain the single most common cause of traumatic death in the world and the third most common cause of death from any aetiology [3]. Rapid growth of transportation system, industrialisation, urbanisation and increase in population are responsible for this 'veritable epidemic'. If the present scenario is continued, it is projected that the deaths due to Road Traffic Accidents will be 1,85,000 and 3.6 million victims will be hospitalised by the end of 2015. The major causes for Road Traffic Accidents in our country are rapidly increase in personalised modes of transportation, a mixture of slow and fast moving vehicles, lack of road discipline, inebriant condition (drunken driving either) and use of mobile phones while driving [4]. Systemic injuries are the major complications in Road Traffic Accidents. Injury to vital system of the body cause extensive disability and in most cases the death of the victims. The standard modality for investigation in victims remains CT-Scan / USG / X-ray. Since CT scans make it possible to demonstrate precise morphological and anatomico-pathological findings, small brain lesions are frequently found on CT scans, in spite of the short duration of

unconsciousness after head trauma. However, the inability of Radiological examinations to detect certain critical lesions has resulted in inadequate information and thereby incorrect / incomplete treatment of the victim concerned [5].

The objectives of the study was to find out the discrepancies between clinical, radiological and autopsy findings in cases of fatal systemic injuries sustained in Road Traffic Accidents and to identify any traumatic lesion of scalp, skull, brain, thorax, abdomen and extremities at autopsy which were undetectable on clinical and Radiological examinations.

MATERIALS & METHODS

It was a retrospective study, conducted on all admitted cases of Road Traffic Accidents to the IPD of M.K.C.G. MCH and subsequent death during hospitalisation, coming for autopsy in the department of Forensic Medicine and Toxicology, M.K.C.G. MCH, Berhampur during the period 30th November 2013 to 29th November 2015. Statistical analysis was done by SPSS software 20.0. P value was considered significant when less than 0.05.

Inclusion Criteria

- Cases reported due to trauma following RTA and those were brought alive entered into the hospital records and investigated with CT/USG/X-Ray/MRI.
- Fatal systemic injury following Road Traffic Accidents which had undergone autopsy and radiological examination.

Exclusion Criteria

- Road Traffic Accident cases brought dead to the emergency department.
- Cases admitted to hospital and subsequently left hospital against medical advice or referred to higher centres and not subjected to autopsy.
- Admitted to hospital, not advised for radiological examination, but subjected to autopsy following death.

Materials Used

Case history were taken from the attendants of the deceased, Measuring tape and magnifying glass, Photographic equipment, Treatment record, X – RAY & CT Scan film, MRI film, view box, X – Ray , CT ,USG, MRI & Other Related investigation Reports, Autopsy table and autopsy instruments. Before proceeding to the proper autopsy examination, all the relevant information regarding the cause and manner of death were collected from the available witnesses, relatives and other accompanying persons with the dead body. The relevant information as available on record either of police or of hospital were also collected for the study and studied in a prospective manner.

RESULTS

Out of a total 2362 autopsies conducted, road traffic accidental deaths constituted 482 i.e. 20.4% and Out of 482 RTA deaths only 78 RTA deaths were found to have undergone medical evaluation which is 16.2% of the total. Peak incidence of RTA were in the month of April (summer) consisting of 13.1% of all RTA deaths reported during the period. About 67.22 % (324) of total RTA deaths are reported during the period from October to April. The lowest incidence was found in the month of June and September i.e. 6.6% each. The numbers of deceased undergone medical evaluation was also highest in the month of April i.e. 15.38%. In this study male deceased were 88.4% and female 11.6%. Male to Female ratio is 23:3. The incidences of RTA deaths undergone medical evaluation among age group of 31-40 years were 26.9%, 21-30 years were 24.4% and 41-50 years were 19.2%. The mean age of RTA deaths undergone medical evaluation was 40.9 years. Incidence of RTA deaths undergone medical evaluation were the highest among the 31-40 years group and the lowest in the 0-10 year's group. Age group 21-40 years shows more than half of total RTA deaths undergone medical evaluation (40 deaths, 51.28%).

Maximum numbers of the deceased were literate (52.6%). High socio economic group comprised of 65.4% followed by medium socio economic group with 26.9% of the total. The incidence of road traffic accident deaths among the RTA deaths undergone medical evaluation were found highest in the businessman groups i.e. 42.3% where the student groups had the incidence rate of 29.5% and that of daily workers were 20.5%. The highest incidences of deaths occurred during 3-6p.m. (18 deaths, 23.07%). 93.59% (73 deaths) of the total deaths undergone medical evaluation occurred on the PUKKA road. 59 deaths i.e. 80.8% of medically evaluated road traffic accident deaths occurred on the highways. 67.95% death took place in light traffic conditions followed by moderately heavy traffic conditions, 25.65%. Bikes were the most offended vehicle i.e. 62.8% followed by light motor vehicles like car etc, which consists 10.3%. Heavy vehicles were the most offending vehicles. Incidences of deaths were the highest among bike riders followed by pedestrians i.e. 62.8% and 21.8% respectively.

Out of 78 deaths 31 deaths(39.7%),(8 with helmet & 23 without helmet) were reported in case of bike riders, 18 deaths (23.1%) were reported in case of pillion riders and that of pedestrians are 17 (21.8 %). Out of 49 bike occupants, 41 deaths did not have used the helmet while 8 deaths had used the helmet. Out of 41 deaths 40 deaths and out of 8 deaths only 1 death had sustained the head injury. The P value was **0.0335**.

Out of 12 car occupants, 09 deaths (75%) did not have used the seat belt while 03 deaths had used the seat belt. Out of 09 deaths no one survived for more than 72 hours whereas out of 3 deaths, all the 3 had survived for more than 72 hours. The P value was **0.0440**. In this study out of 78 deceased, 37 had their Glasgow coma scale score below 8/15. Out of 69 males, 39 deceased those who did not consume alcohol survived for more than 24 hours and those had taken alcohol, survived for less than 24 hours. The P value was less than 0.0001.

Out of 78 deceased under gone medical evaluation 29 deaths (37.2%) occurred due to fall from the motor vehicle. Mean delay in hospitalisation after injury was 9.4hrs. In this study 70 numbers of deceased (89.7%) were having head injury with associated neck injury. Thoracic injuries were 2, abdominal, 10 injury to back, 5 and pelvic injuries in one case. Upper and lower limb injuries included fracture of bones which caused 64 deaths all together. Exclusive brain injuries were found in 66 numbers of deceased (84.62%), exclusive liver injuries in 7 numbers of deceased (8.98%) brain and liver injuries in 2 numbers of deceased (2.56%). Brain injuries along with lung injuries were found in 2 numbers of deceased (2.56%). In 15 numbers of deceased (21.43%) out of 70 head injury deaths, the pupil was constricted (pin point) however in 55 numbers of deceased (78.57%) pupil dilated and was slowly reacting to light. Extradural haemorrhage (EDH) was detected only in 40.9% by CT as compared to autopsy. EDH detection rate by CT scan as compared to autopsy was the highest in the parietal region 53.85% followed by frontal and occipital region. EDH of the temporal region was undetected both in CT and autopsy. Sub Dural haemorrhage (SDH) detection rate by CT scan as compared to autopsy was the highest in the parietal region 53.85% and poorest detection rate was in the occipital region (22.22%). The overall detection rate of SDH by CT in comparison to autopsy was 45.58%. Sub Arachnoid haemorrhage (SAH) detection rate by CT scan as compared to autopsy was the highest in the frontal region (51.72%). CT was not able to detect SAH in the parietal, temporal and occipital region. Intra cerebral haemorrhage was better detected in the CT among the intra cranial haemorrhages i.e. 59.1% detection rate by the CT as compared to autopsy (Table-1).

Contusions were detected only in 51.43% by the CT as compared to autopsy. Contusion of the occipital region had the poorest detection rate. Laceration detection rate by CT scan was the highest in both parietal and temporal lobes i.e. 50% each as compared to autopsy. Whereas the overall detection rate of lacerations by CT as compared to autopsy was 46.81%. The detection rate of Necrosis by CT scan was the highest in the temporal region (54.54%) and poorest detection rate was in the occipital region (33.33%) (Table-2).

Cerebral oedema had a marginally better detection rate of 73.9%. Detection rate of basal ganglia lesions were 40% (2 out of 5), that of inter ventricular lesions were 51.2% (22 of 43 numbers of deceased). Like cerebral oedema detection rate of sub scalpal haematoma had the better detection rate by CT scan as compared to autopsy i.e. 67.1% (47 of 70 deaths). Among basal and non basal fracture, the detection rate of the non basal fractures were better as compared to basal fracture. The detection rate for thalamic lesions were 140% i.e. CT detected 7 numbers of deceased whereas during autopsy the lesions were found only in 5 numbers of deceased. Similarly for the hypothalamic lesions the detection rate were 133.3% i.e. when CT detected the lesions in 4 numbers of deceased, 3 numbers of deceased shown the similar lesion during autopsy. Diffuse axonal injury remains undetected in the CT (tab-3).

The cerebellar lesions were poorly detected in the CT i.e. 22.22% (8 out of 36 numbers of deceased) as compared to the other lesions of the brain. The detection rate for haemorrhages were 20% (1 of 5 numbers of deceased) that of contusions, lacerations and necrosis were 18.18% (2 of 11 numbers of deceased), 16.66% (1 of 6 numbers of deceased) and 14.28% (1 of 7 numbers of deceased) respectively. The CT fell grossly short in detecting herniation. The detection rate of the Tonsillar & Uncal Herniation was 42.86% by the CT scan as compared to the autopsy.

X ray detects skeletal lesions better than soft tissue lesions. The limb fractures had the highest detection rate i.e. 93.6%. The detection rate of skull fractures were15.7% by the X-RAY as compared to the autopsy. The detection rate of ribs and vertebral fractures were 50% and 40% respectively. USG advised in blunt trauma to chest, abdomen and pelvis, had the detection rate of 80% and 100% as compared to autopsy for abdominal and pelvic organ injuries respectively. Detection rate of chest organs are 50% (i.e. 1 of 2 was detected during ultrasound).

Three unconscious patients of suspected traumatic brain injury, having normal NCCT were subjected to MRI. 2 out of 3 were having Diffuse Axonal Injury (DAI) as per the MRI film. Whereas in autopsy all the 3 deceased had diffuse punctate petechial haemorrhage all over the brain suggesting of DAI. Thus the MRI has the detection rate of 66.6% as compared to autopsy. In suspected spinal injury (whiplash injury), due to RTA, 2 patients were subjected to MRI, as there were no significant CT/X-Ray findings. MRI revealed significant findings (cord contusion) with respect to the spinal injury. Similar

spinal cord pathology (contusion & cord edema) were detected during autopsy of the same 2 patients, making the detection rate of 100% by MRI as compared to autopsy.

Provisional diagnosis made before investigation report came, had relatively better detection rate in case of head injury, blunt trauma abdomen and limb fractures as compared to chest and vertebral injuries. The detection rate of head injuries was 100% that of limb fracture was 93.75% when compared with autopsy. The abdominal injuries had the detection rate of 80% and that of chest and vertebral injuries, 50% and 20% respectively. Pelvic injuries were not clinically diagnosed in one hospitalised patient. The average detection rate for haemorrhages was 58.4%, for cerebral edema was 73.9%, for mass defect i.e. lacerations, contusions & necrosis was 47.3%, for cerebellar lesions was 17.24% and for skull fracture was 45%. That of USG, for abdominal injuries was 80% , for pelvic injuries was 100%, for chest injuries was 50%, whereas the X-Ray had the average detection rate of 93.6%, of 40%, of 50% and of 15.7% for the limb injuries, for vertebral injuries, for chest wall injuries, for skull injuries respectively. MRI had the detection rate of 66.6% for Diffuse Axonal Injury (DAI) and that of 100% for spinal injury.

Table-1: Brain haemorrhages

Lobes	Extra Dural Haemorrhage			Sub Dural Haemorrhage			Sub Arachnoid Haemorrhage			Intracerebral haemorrhage		
	CT	Autopsy	Detection rate	CT	Autopsy	Detection rate	CT	Autopsy	Detection rate	CT	Autopsy	Detection rate
Frontal	1	04	25%	13	28	46.43%	30	58	51.72%	5	7	71.4%
Parietal	7	13	53.85%	14	26	53.85%	00	02	00%	5	8	62.5%
Temporal	0	00	00%	11	22	50%	00	02	00%	1	4	25%
Occipital	1	05	20%	02	09	22.22%	00	03	00%	2	3	66.7%
TOTAL	**9**	**22**	**40.9%**	**31**	**68**	**45.58%**	**30**	**65**	**46.15%**	**13**	**22**	**59.1%**

Table-2: Iintracranial injuries CT versus Autopsy

Lobes	Contusions		Detection Rate	Lacerations		Detection Rate	Necrosis		Detection Rate
	CT	Autopsy		CT	Autopsy		CT	Autopsy	
Frontal	15	24	62.5%	05	11	45.45%	06	17	35.29%
Parietal	08	15	53.33%	08	16	50%	07	15	46.66%
Temporal	12	26	46.16%	07	14	50%	06	11	54.54%
Occipital	01	05	20%	02	06	33.33%	02	06	33.33%
TOTAL	**36**	**70**	**51.43%**	**22**	**47**	**46.81%**	**21**	**49**	**42.86%**

Table-3: Brain injury CT versus Autopsy

SPECIFIED REGIONAL LESION	CT of Brain	Autopsy	Detection Rate
Sub Scalpal Haematoma	47	70	67.1%
Cerebral Edema	51	69	73.9%
Inter Ventricular Lesion	22	43	51.2%
Corpus Callosum Lesion	0	11	0
Basal ganglia Lesion	2	5	40%
Brain Stem Haemorrhage	2	15	13.3%
Thalamic Lesion	7	5	140%
Hypothalamic Lesion	4	3	133.3%
Basal Fracture	12	29	41.4%
Non Basal Fracture	17	35	48.6%
Diffuse Axonal Injury	0	3	0.0%

Table-4: MRI versus Autopsy in brain injury and spinal injury

Patient Category	MRI	Autopsy	Detection Rate
With diffuse Axonal Injury (i.e. Brain Injury)	2	3	66.6%
With spinal injury (i.e. whiplash injury)	2	2	100%

Table-5: Clinical versus autopsy diagnosis

SYMPTOMS	PROVISIONAL DIAGNOSIS	Numbers (out of 78)	PERCENTAGE (%)	AUTOPSY	Numbers (out of 78)	PERCENTAGE (%)	Detection Rate of provisional diagnosis as compared to autopsy.
Altered Sensorium Vomitting ENT Bleeding Convulsion Pin point pupil/ Dilated Pupil Plantar Flexor	Head Injury In Low Condition	70	89.7	Head injury	70	89	100%
Shock Dyspnea Abdomen Tensed	Abdominal Trauma In Low Condition	08	10.3%	Abdominal injuries Pelvis	10 1	12.8 1.3	80% Undetected clinically
Weakness of muscle Reflexes Diminished Absent Jerk	Traumatic Paraplegia	01	1.3%	Vertebral injury	05	6.4	20%
Chest pain Dyspneic Swollen thighs	Pulmonary Embolism Following Limb Fracture	01	1.3%	Lung injury	02	2.6	50%
Limb Fracture With Other System Involvement	Limb Fracture	60	76.9%	Injuries associated with Limb fractures	64	82.1	93.75%

DISCUSSION

- Out of total 2362 autopsies conducted, road traffic accidental deaths constituted 482 i.e. 20.4% and Out of 482 RTA deaths only 78 RTA deaths were found to have undergone medical evaluation which is 16.2% of the total. According to a study done by Singh YN *et al.* [6] RTA consisted 23.84% of total autopsies. In a study of Amit Kumar Sahu *et al.* [7] done in MKCG Medical College, Berhampur (our college) proportion of RTA cases was 12.7%. Findings of this study are more or less similar to the findings of above two Indian studies.
- The present study concluded that peak incidence of road traffic accidents are in the month of April (summer) consisting of 13.1% of all RTA deaths reported during the study period. About 67.22 % (324) of total RTA deaths are reported during the period from October to April i.e. beginning of winter to beginning of summer. The lowest incidence was found in the month of June and September i.e. 6.6% each. As per Study of Jha N *et al.* [9]. The highest number of RTAs took place in January (12.9%) followed by August and October (9.0%) each. The variation seen in our study can be explained by rising temperature in summer leading to head reeling, irritability causing RTA , summer storms associated with unpredicted rainfall in the evening time may be the another cause.

- In this study male deceased are 88.4% and female deceased are 11.6%. Male to Female ratio is 23:3 in almost every study the males face more RTAs [7, 8]. Most of the RTA occurred in pucca road. The highways contribute 80.8% (59 numbers of deceased). Maximum numbers of road traffic accident deaths i.e. 53 numbers of deceased (67.95%) are taken place in light traffic conditions followed by moderately heavy traffic conditions i.e. 20 numbers of deceased (25.65%). In the study of Amit Kumar Sahu *et al*. [7]. Major people were from rural areas. The discrepancy of results in various studies can be explained by high speed vehicles in urban areas, impulsive attitude of drivers in lonely roads, presence of villages near highways, unwarranted movement of stray dogs and cattles to the highway.
- Bikes are the most vulnerable and heavy vehicles are the most offending vehicles. Helmet is a great saviour in two wheeler accidents. Out of 12 car occupants 09 deceased (75%) did not used the seat belt while 03 deaths had used the seat belt. Out of 09 deaths in the former case, no one survived for more than 72 hours whereas out of 3 deaths in the later, all the 3 had survived for more than 72 hours. The association is considered to be extremely significant. As per the study of Amit Kumar Sahu *et al*. [7] the risk factors associated with accidents shows that majority (58.86%) of drivers had reckless driving with high speed in intoxicated condition, 17.06% had no license & 14.66% were not using the seat belt. Findings of this study are similar to our study. But the percentage of drivers not using seat beat are much more higher as the sample size of our study is less because of our exclusion criteria. In a study of Velmahos, George C [9] the prospective study included consecutive patients involved in road traffic accidents who were admitted at an academic Level 1 trauma center. Of 650 car occupants, 63% were restrained and 12% had a SBM (seat belt mark) across the abdomen, chest or neck. Unfortunately in our study people using seatbelts were very meagre and the people who had used seatbelts survived longer. We didn't get any SBM in autopsy. So our study doesn't support the hypothesis "seatbelt causes more injury than no seatbelts." We would rather agree with conservative knowledge: Seat belt is protective from injury. It not only reduces the mortality but also the morbidity.
- In this study 47.44% have their Glasgow coma scale score below 8/15, 32 deaths (41.02%) have their Glasgow coma scale score below 12/15 at the time of admission. Out of 69 male deceased, in 30 had consumed alcohol during the. In female deceased, evidence of alcohol consumption was not detected. Out of 69 males, 39 those who did not consume alcohol survived for more than 24 hours and those who consumed, survived for less than 24 hours. The association is extremely significant. As per Jha N *et al*. [8] out of 254 drivers, 14.9% were found to have consumed alcohol. It's a very common association. Every year alcohol intoxication kills many youths nationwide.
- From this study it appears that fall from motor cycle resulted in death in 37.2% of total deaths undergone medical evaluation and hit from back resulted in death in 32% of total deaths undergone medical evaluation. In a study done by Nilambar Jha the commonest mode of sustaining injury was by being knocked down by a vehicle. As many as 37% of victims were injured by this mode [10]. Falling from a moving vehicle and collision between two vehicles was responsible for 20% and 19% respectively. In this area of India people mainly rely upon two wheelers for remote transport. This caused more injury due to falling from motor bike rather than crushed down by big vehicle.
- Maximum number of deceased had been admitted within 3-6 hours of occurrence. As per Akhilesh Pathak *et al*. [11] study, 63.29% cases the head injury was so severe that the victims could not survive even for 12 hours after the incidence. Only 6.33% could survive up to 24-48 hours, 18.98% up to 3-7 days and 11.4% could survive more than 7 days following the intervention of particular treatment or appropriate surgery. Major numbers of hospitalizations within six hours in this study depict improved referral system in our state.
- Total head injuries in this study were 89.7% (70 deaths). From this study it was observed that the **Extradural haemorrhage (EDH)** has the detection rate of 40.9% by CT as compared to autopsy (9 out of 22 deaths). EDH detection rate was the highest in the parietal region (53.85%) followed by frontal and occipital region i.e. 25%, 20% respectively. EDH of the temporal region was undetected both in CT and autopsy. **Sub Dural haemorrhage (SDH)** has the highest detection rate in the parietal region (53.85%) followed by temporal region (50%), frontal region (46.43%). The poorest detection rate was in the occipital region (22.22%). The overall detection rate of SDH by CT in comparison to autopsy was 45.58%. **Sub Arachnoid haemorrhage (SAH)** has the

highest detection rate in the frontal region (51.72%). CT is not able to detect SAH in the parietal, temporal and occipital region. The overall detection rate of sub arachnoid haemorrhage is 46.15% i.e. detected only in 30 deaths in CT as compared to 65 deaths in autopsy. **Intra cerebral haemorrhage** is better detected in the CT among the intra cranial haemorrhages i.e. 59.1%. ICH detection rate by CT scan as compared to autopsy is the highest in the frontal region (71.4%) followed by occipital (66.7%) and parietal region (62.5%) respectively and the poorest in the temporal region (25%). In the Study of Bhat, V J *et al*. [12], Extra dural haemorrhage (EDH) revealed detection rate of 35.71% with respect to autopsy, EDH of the occipital region had the poorest detection rate of 0% and parietal EDH had a low detection rate of 25%, traumatic Sub-Dural haemorrhage (SDH), which was detected in 41.86% of cases and that of Sub-Arachnoid Hemorrhaae (SAH) in 44.44%. In SAH cohort 40% had frontal where as temporal, parietal and occipital all had 0% detection rate. High detection of SDH in frontal, parietal & temporal areas can be explained by basic mechanism of CT Scan which causes less contrast uptake in posterior fossa.

- The Mass effect resulting in contusions, lacerations and necrosis has the detection rate of 51.43%, 46.81% and 42.86% respectively. The detection rate is highest for contusions in the frontal region (62.5%), for lacerations in both parietal and temporal region (50% each) and for necrosis in the temporal region (54.54%). The poorest detection rate for contusions, lacerations and necrosis is found in the occipital region i.e. 20%, 33.33% and 33.33% respectively. According to Bhat, V J *et al*. [12] study, it shows the detection rate for parietal lobe lesions was 50%, 28.57% in occipital lobe and 50%in temporal lobe lesions**.**
- Cerebral oedema had a marginally better detection rate. In the present study the CT Scan fell grossly short in detecting pontine haemorrhage and corpus callosum lesions. Like cerebral edema, detection rate of sub scalpal haematoma has a better detection rate by CT scan as compared to autopsy i.e. 67.1% (47 of 70 deaths). Among basal and non basal fracture, the detection rate of the non basal fractures are better as compared to basal fracture. The CT scan is seen to over diagnose the thalamic lesions as well as the hypothalamic lesions as their detection rates are 140% and 133.3% respectively, which were not found during autopsy. Bhat, V J *et al*. [12] study shows Pontine haemorrhage was very poorly diagnosed having detection rate of 8.33%. The contusions and laceration of the inferior aspects of the temporal and frontal lobes are not readily visualized in CT scan because of beam hardening artefact which is a well documented limitation of the CT scan procedure.
- The **cerebellar lesions** are poorly detected in the CT i.e. 22.22% (8 out of 36 deaths) as compared to the other lesions of the brain. The detection rate for haemorrhages are 20% (1 of 5 deaths) that of contusions, lacerations and necrosis are 18.18% (2 of 11 deaths), 16.66% (1 of 6 deaths) and 14.28% (1 of 7 deaths) respectively. The CT fell grossly short in detecting herniation. The detection rate of the Tonsillar & Uncal Herniation are 42.86% by the CT scan as compared to the autopsy. Goyal M K [13] study shows: in 9 cases the injuries to the cerebellum as contusions and lacerations are detected at autopsy but only in 2 cases they were detected on CT scan. The failure of the CT scan to detect these lesions may be due to the technical fault while planning the CT scanning. This result is consistent in other studies also[12]. Cerebellar contusions deserve a special mention because of high rate of failure in detection due to less contrasting feature of posterior fossa.
- X ray detects better skeletal lesions rather than soft tissue lesions. The limb fractures have the highest detection rate of 93.6%. The detection rate of skull fractures is 15.7%. The detection rate of ribs and vertebral fractures are 50% and 40% respectively. Study C.T. of the spine showed fracture of the Atlas which was not detected on the plain films." Peter Armstrong[53] stated the importance of C.T. in complex anatomic areas including sterno-clavicular joint, pelvis and spine. The poor detection rate might be due to old generation X-Ray machines and technical error which can be improvised by adoption of new generation X-Ray tubes (Digital), which will indirectly help in improving the prognosis by early management of the bony injuries of the victims'.
- USG advised in blunt trauma to chest, abdomen and pelvis, has the detection rate of 80% and 100% for abdominal and pelvic organ injuries respectively. Those of chest organs are 50% i.e. 1 of 2 deaths. Our study go in hand with the others' study [14], however in negative cases with strong clinical suspicion one should go for CT thorax to improve the detection rate of thoracic injuries.

- `In our study diffuse axonal injury and spinal injury had the detection rate of 66.6% and 100% in MRI as compared to autopsy, which were undetected by NCCT/X-Ray. Our study goes in hand with others [15]. The sensitivity of MRI is significantly higher than CT in detecting diffuse axonal injury, brain stem lesion, non-haemorrhagic contusion or subacute subdural bleed, sinus invasion and spinal injury. In our study very less number of patients were subjected to MRI due to following limitations:
  - MRI is a tiresome procedure. It cannot be used in emergency condition.
  - Patients may require sedation to minimize motion artefacts.

But when there is radiological and clinical discordance then MRI can be the best modality of diagnosis, especially in case of diffuse axonal injury and whiplash injury of spine (spinal cord injury without radiographic abnormality – the SCIWORA [16] syndrome).

CONCLUSIONS

We observed, the summer season, reckless alcoholic young male populations, helmet less bikers, seat belt less drivers are more prone to death in RTAs. Whatever the vehicle is, the death due to head injury tops the list of organ damage. For detection of site of injuries autopsy is the golden modality. As autopsy is a posthumous procedure it's not beneficial for the management purpose, but the co-relation of clinico-radiological pictures with autopsy is much essential for clinicians to prevent further avoidable deaths. In this study our findings suggest clinical criteria (GCS) and other clinical parameters provide a better analysis of patient's clinical conditions than the radiological counterpart like CT, X-Ray and USG. However in doubtful situations the clinical acumen should be supported with appropriate radiological investigation in appropriate time, so that one can localize the injuries more efficiently and early interventions could be carried out timely, to prevent the avoidable deaths thereby preserves the precious human life.

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