ORIGINAL RESEARCH PAPER

Volume-8 | Issue-1 | January-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A MEDICO-LEGAL ANALYSIS OF BLUNT CHEST INJURY – A FORENSIC APPROACH

Forensic Medicine

Gummadi Venugopal Rao Assistant Professor, Dept of Forensic Medicine, Osmania Medical College

Gangavarapu Deva Raju* Assistant Professor, Dept of Forensic Medicine, Osmania Medical College *Corresponding Author

ABSTRACT

Trauma to the Thorax is the second most common injury found in trauma patients . Thoracic trauma causes up to 25% of deaths in trauma victims. The present study is carried out to analyze the pattern and severity of chest injuries in fatal road traffic accidents so as to add further knowledge in the evaluation of chest trauma. A descriptive study was conducted at the department of forensic medicine, Osmania Medical College, Hyderabad. Study was conducted during the period of 1 year . And a sample of 161 cases of chest injury were analyzed. 128 had rib fractures on left side and 121 on right side. Fracture of clavicle accounted for one in 20 of all fractures and 44% of all injuries to the shoulder girdle. 5 cases showed fracture of scapula either on one side or both. On the right lung , the middle and the upper lobes together form the common site of pulmonary contusions and on the left lung 23.6 % of contusions are present on upper lobe. Cardiac contusions were found in 34 cases and the usual site was in the right ventricle followed by the right Atrium. 20 cases had cardiac tamponade and 14 cases had pericardial tear.

Conclusion: Blunt chest injuries is the predominant cause of death. The involvement of chest injury alone or in combination with other system is present in majority of cases of road traffic accidents.

KEYWORDS

Blunt chest Injury, fatal road traffic accidents, Forensic approach, Osmania Medical College.

INTRODUCTION

Road traffic accident is defined as an event that occurs on a way or Street open to public traffic resulting in one or more persons injured or killed where at least one moving vehicle is involved. Road traffic accident is a collision between two vehicles or between vehicles and pedestrians or between vehicles and animals or between vehicles and geographical or architectural obstacles. Road traffic accidents are a human tragedy a loss to an individual and also to a family. A premature death involves not only human suffering but also loss of productive life .1.3 million people die every year on the world's roads and 20 to 50 million people suffer from non fatal injuries with many disability. Road traffic accidents are the leading cause of death among young people between 15 to 29 years and cost countries 1-3 percent of GDP. According to the World Health Organization road traffic injuries are the sixth leading cause of death in India which share greater burden on hospitalization and disabilities and finally death. According to the road transport year book an annual Publication from transport research wing of the ministry of road transport and highways Of the total accidents 28.4 percent of accidents took place on national highways 24% on the state highways.[1,2,3]

THORACIC TRAUMA

Trauma to the Thorax is the second most common injury found in trauma patients . It is established that 10% of trauma patients have at least one rib fracture. 15% of those patients have pulmonary conclusions .94% of those patients have rib fractures and other injuries . [4]Thoracic trauma causes up to 25% of deaths in trauma victims. It is second only to traumatic brain injury in mortality. The risk of death after rib fracture increases with the age is more than 65 years because of presence of comorbidities like heart disease or Diabetes and the development of pneumonia while on ventilator. [5]The most frequent mechanism of injury is motor vehicle crash that is up to 80%. In the broad sense injuries to the chest are divided into two categories 1. Direct impact that is Steering wheel on the chest and 2 deceleration injury. Direct impact leads to rib fractures, pulmonary contusion, pulmonary lacerations or Pneumothorax, sternal fracture, clavicular fracture and scapular fracture. Pulmonary contusion occurs due to the transmission of force through the chest wall. Pulmonary laceration occurs due to laceration by the broken ribs or by the pressure from impact during Valsalva. The clavicle or the sternal or the scapula fracture need not to be associated with pulmonary contusion as greater force following impact is spent in Breaking the bones.Deceleration or shear force results in pulmonary laceration due to decelerations against adhesions or at bronchial bifurcations or against deforming ribs; pulmonary conclusions as the shear occurs at the capillary level , tracheobronchial disruption as the shear occurs at the Macro level. Flail chest occurs when three adjacent ribs broken in two places. About 10% of patients who have blunt chest trauma will have a flail segment. Flail chest causes urinary dysfunction due to pulmonary contusion and resultant hypoxia. Causes of hyperventilation in flail chest : increased Dead Space ventilation because of the air moving between areas of differing compliance rather than between the lungs and pharynx. There is local loss of Elastic recoil of the chest wall to counteract the natural recoil of the lungs so that it will not run into the areas on Active inspiration. Work of breathing in flail chest is increased both due to Confusion and to the fact that the same inspirator reaction brings less tidal volume and the process of separation in the flail segment. Pneumothorax is seen in nearly 10% across all trauma patients but in blunt chest injury it accounts for 30- 40% .Causes of Pneumothorax include a. Penetrating trauma , laceration by broken ribs, laceration at previous scar, ruptured blebs and simple overpressure while performing Valsalva. Pneumatocele, the laceration inside the lung rather than along the surface occurs due to shear along the previous scar or over pressure. Pneumatocele heal spontaneously especially when the patient is on ventilator. But they can develop into pulmonary abscess due to pooling of secretions and blood inside.[6]

The technological revolution in the Quest and fascination for modern high speed vehicles and advancement in the industrial sector has increased the frequency of manmade disasters like accidents since injurious to Thorax in the road traffic accidents are common, it is a very serious matter not only in terms of individual patients but also in terms of numbers affected thoracic injuries constitute a potential factor in increasing the amount of morbidity and mortality. The present study is carried out to add further knowledge in the evaluation of chest trauma.

Aim : To analyze the pattern and severity of chest injuries in fatal road traffic accidents.

OBJECTIVES

1. General characteristics, alcoholic intoxication was studied.
2. Survival period and cause of death in these patients were studied.
3. Pattern and severity of chest injuries was studied.

METHODOLOGY

A descriptive study was conducted at the department of forensic medicine, Osmania Medical College Hyderabad. Study was conducted during the period of 1 year (January 2017 to December 2017). And a sample of 161 cases of chest injury were analyzed.

Inclusion criteria:

All cases showing thoracic injuries following fatal road traffic accidents which were either brought dead or admitted and then succumbed to death were included.

Exclusion criteria:

Decomposed bodies and those cases where the nature of injury not known.

Those RTA cases where fatal thoracic injuries are not found.

The inquest reports scrutinized and cases are selected. The preliminary details regarding the history of illness , alcoholism and other personal details were collected from their relatives of the deceased. Police officer in charge or the available persons who witnessed the accident or in his absence the person who had first hand knowledge regarding the accident were interviewed in detail. The history of vehicle , condition of the road and condition of the weather etc were collected.

Postmortem examination was done in each and every case the injuries was examined in detail and its nature location etc were noted . Internal examination was done according to modified Rokitansky technique , all internal injuries was noted stomach and intestine were examined for any smell of alcohol or presence of any drugs , the cause of Death was noted in all treated cases. Details regarding condition of the patient in hospital, investigation done at the treatment given extra were collected from the clinical case records.

Statistical analysis: Data was entered in Microsoft Excel and the study variables are expressed in terms of frequencies and percentages.

RESULTS

In the present study majority of the victims were males that is 84.5 % and rest were females. Maximum number of victims belonged to the age group of 45 to 60 years followed by the age group of 60 to 70 years. the minimum age of the victim involved was 15 years and the maximum age was 90 years.

TABLE 1 : AGE WISE DISTRIBUTION OF STUDY SAMPLE

Age Group (years)	Gender				
	Male	Female	Total		
	N	%	N	%	
15-30	25	18.4	1	4	26
30-45	23	16.9	1	4	24
45-60	47	34.6	10	40	57
60-75	27	19.8	8	32	35
75-90	14	0.3	5	20	19
Total	136	100	25	100	161

Of the total number of cases maximum number of accidents occurred during the month of August and least happened in the month of October. While analyzing the time of occurrence of the accidents ,maximum number of accidents occurred between 12 p.m. to 6 p.m. followed by 6 p.m. to 12 a.m.

TABLE 2 :DISTRIBUTION OF STUDY SUBJECTS BASED ON THE VEHICLE INVOLVED

Type of Vehicle	Frequency	Percentage
Two Wheeler	86	53.4
LMV	51	31.7
HMV	24	14.9
Total	161	100

Two wheelers were the common vehicles involved in the accidents followed by Light motor vehicles and Heavy motor vehicles.

TABLE 3: DISTRIBUTION OF STUDY SUBJECTS BASED ON THE VICTIMS INVOLVED

Type of Victim	Frequency	Percentage
Pedestrian	62	38.5
Driver	18	11.2
Rider	57	35.4
Pillion Rider	15	9.3
Side Seater	3	1.9
Back Seater	6	3.7
Total	161	100

Most of the victims involved in the road traffic accidents were pedestrians followed by the riders of motorcycles.

TABLE 4: DISTRIBUTION OF STUDY SUBJECTS BASED ON COLLISION BETWEEN VEHICLES

Type of Collision	Frequency	Percent
2*4 LMV	23	14.3
2*4 HMV	21	13.0
2*2	6	3.7
LMV*LMV	1	0.6
LMV*HMV	11	6.8
2*Stationary Object	5	3.1
4*Stationary Object	4	2.5
Fall From Bike	19	11.8
Others	71	44.1
Total	161	100

Collision of light motor vehicles colliding with motorbike was commonly found followed by collision between heavy motor vehicles and two wheelers .Regarding safety measures 83 persons did not have any protective measures. It was found that 42.9% cases were found to have consumed alcohol Either by history or smell of alcohol , out of the them 22 were the drivers.

TABLE 5: DISTRIBUTION OF STUDY SUBJECTS SHOWING SAFETY MEASURES USAGE

Protective Measures	Frequency	Percentage
No helmet/seatbelt	83	51.6
Helmet	17	10.6
Seat belt	2	1.2
Not Applicable	59	36.6
Total	161	100

17 cases have died on the spot and 38.5 percent of cases survived for less than 6 hours remaining cases have survived more than 24 hours.

TABLE 6: DISTRIBUTION OF STUDY SUBJECTS SHOWING BLOOD IN THE AIR PASSAGES

Blood in air passages	Frequency	Percent
Yes	62	38.5
No	99	61.5
Total	161	100

Out of total cases analyzed 38.5 percent of victims had blood in the air passage whereas 61.5 percent of victims did not have blood in air passage.

TABLE 7: DISTRIBUTION OF STUDY SUBJECTS SHOWING FRACTURE OF STERNUM AMONG DIFFERENT VICTIMS

Type of victim	Distribution	Fractures of sternum	Total	
		Yes	No	
Pedestrian	n	25	37	62
	%	40.3	59.7	100
Driver	n	10	8	18
	%	55.6	44.4	100
Rider	n	12	45	57
	%	21.1	78.9	100
Pillion rider	n	5	10	15
	%	33.3	66.7	100
Side seat	n	1	2	3
	%	33.3	66.7	100
Back seat	n	2	4	6
	%	33.3	66.7	100
Total		55	106	161

Out of 62 pedestrians , 25 persons had fracture of sternum.Fracture of sternum seen in direct impact is one of the causes for hemothorax and injuries to the pericardium and heart of victims .

TABLE 8 : DISTRIBUTION OF STUDY SUBJECTS BASED ON NUMBER OF RIB FRACTURES

	On Left Side	
Number of Rib fractures	Frequency	Percent
<5	54	33.5

>5	74	46.0
No fracture	33	20.5
Total	161	100
	On Right Side	
Number of Rib fractures	Frequency	Percent
<5	51	31.7
>5	70	43.5
No fracture	40	24.8
Total	161	100

128 persons had fracture of ribs on the left side of chest wall, out of them 54 cases showed fractures involving less than 5 ribs , 74 cases had fractures involving more than five ribs. On the right side 51 persons had showed fracture involving less than 5 ribs and 70 cases showed fracture involving more than 5 ribs on the right chest wall .

TABLE 9 : RELATION BETWEEN FRACTURE OF RIBS AND LACERATIONS OF THE LUNG

Rib fracture		Lacerations of the Lung	Total	
		Present	Absent	
Present	Frequency	63	58	121
	Percent	52.1	47.9	100
Absent	Frequency	2	38	40
	Percent	5	95	100
Total	Frequency	65	96	161

Lacerations of the lung is directly proportional to the rib fractures . It was found that most of the rib fractures had blood in chest cavity 92.5%.149 cases out of 161 cases had blood in the chest cavity.19 cases and 9 cases showed more than 500 ml of blood in the right and left chest cavity respectively . 27 cases had more than 500 ml of Blood on both sides.

Fractures of the vertebrae : 11 cases showed fracture of body of T4 vertebrae followed by four cases each showing fracture of T 1 and T 12 vertebra.

Fracture of clavicle: accounted for one in 20 of all fractures and 44% of all injuries to the shoulder girdle. 3.7 % of cases had bilateral fractures of clavicle ,25.5 % of cases had fracture on the right side and 19.3 % of cases had fracture of clavicle on the left side.
Fracture of Scapula : Only 5 cases showed fracture of scapula either on one side or both.

Pulmonary contusions : On the right lung , the middle and the upper lobes together form the common site of contusions that is 15.5%, followed by upper lobe that is 11.8% and in the middle lobe 11.2% . 41.6 % of cases with fatal chest injuries did not have bruise. On analyzing the contusions of the left lung it was noticed that 23.6 % of contusions are present on upper lobe and 55 cases with fatal chest injuries did not have contusions .

On analyzing lacerations, 37.9 % of cases showed lacerations. In the right lung, most of the lacerations were found in the middle lobe and the least in the lower lobe. In the left lung, lower lobe showed 16.1 percent of lacerations .

TABLE 10: DISTRIBUTION OF STUDY SUBJECTS BASED ON PRESENCE OF LACERATION OF HEART, CARDIAC TAMPONADE AND PERICARDIAL TEAR.

Laceration of heart	Frequency	Percent
No injury	155	96.3
Right Atrium	5	3.1
Left Ventricle	1	0.6
Total	161	100
Cardiac Tamponade	Frequency	Percent
Present	20	12.4
Absent	141	87.6
Total	161	100
Pericardial Tear	Frequency	Percent
Yes	14	8.7
No	147	91.3

Laceration of aorta: A total 26 cases showed lacerations in which 4 cases showed transection of aorta. It was seen that pedestrians had maximum involvement of aorta followed by motorcycles and least incidence was found in the back and side seaters.

Contusion of heart : In the present study cardiac contusions were found in 34 cases. The usual site was found in the right ventricle followed by the right Atrium that is 10.6% and 9.9% respectively. Cardiac Contusion were most common in the pedestrians followed by Riders and least inside seaters of light motor vehicle.

Cardiac tamponade: in the current study 20 cases had cardiac tamponade of which 8 cases are of pedestrians who showed the maximum incidence followed by the riders of motorcycles.

Pericardial tear :In the current study 14 cases had pericardial tear. Most of the cases with pericardial tear were pedestrians.

DISCUSSION

In the present study the maximum incidence was seen among the age group of 45 to 60 years. In a study conducted by Adel Hamed Elbaih the ages of the patients ranged between 1.5 - 70 years. 73.6 % of patients were older than 18 years.[7] In a study conducted by Farooqui JM the most commonly affected age group was 20-39years and men died in RTA more than women which is similar to our observation.[8]In the present study males outnumber females , similar observations were observed in a study conducted by M Zargar where males comprised of 93.8 percent. [9] In the present study maximum number of accidents occurred between 12 p.m. to 6 p.m. followed by 6 p.m. to 12 a.m. Study conducted by Lakshmi Prasad showed that grievous injuries were seen more during 8pm-8am than between 8am-8pm (Z=3.36,P<0.05) and most of the injuries occurred between 4pm to 8 pm (30.8%) of the day followed by 8 pm-12 noon (21.2%). [10]Two wheelers were the common vehicles involved in the accidents followed by Light motor vehicles and Heavy motor vehicles which are in similar lines with study conducted by Lakshmi Prasad .[10]In the present study it was found that 42.9% cases were found to have consumed alcohol, study conducted by Aditya madhab Baruah observe that , 188(952) cases had evidence of alcohol in the blood. [11] Pankaj Murkey and colleagues in their research on the pattern of chest injuries on various road users found that multiple rib fractures were seen in 94% cases , out of these 39.3 percent had unilateral fracture and 61% of cases had bilateral multiple fractures these findings are in accordance with the present study.[12]In the present study 19 cases and 9 cases showed more than 500 ml of blood in the right and left chest cavity respectively study conducted by El-Menyar A et al. observed hemothorax in 23 % of cases. [13]A Study conducted by G Rubin et al revealed that 17% cases had fracture of clavicle whereas in the present study it is accounted for 44 %. [14]Buttress KP in their Study found that displaced fracture of the scapula constituted about 6% which is also similar to the present study findings. [15]According to the study conducted by Harnam Singh lacerations of lungs accounted for 29.8 %. Whereas in the present study 37.9 % of cases showed lacerations.[16] In the present study cardiac contusions were found in 34 cases. The usual site was found in the right ventricle followed by the right Atrium that is 10.6% and 9.9% respectively. Cardiac Contusion were most common in the pedestrians followed by Riders and least inside seaters of light motor vehicle. Amit Kumar in his study stated that right ventricle was commonly involved which is a similar finding in the present study. [17]According to Christopher et al among patients with traumatic aortic injury 71% were drivers, 23% were front seat passengers and 6% were backseat passengers.[18]

CONCLUSIONS

Blunt chest injuries is the predominant cause of death. The involvement of chest injury alone and in combination with other system is present in majority of cases of road traffic accidents .Hence this study emphasized the usage of protective measures like helmet seatbelt and airbag can reduce the morbidity and mortality in the fatal road traffic accidents.

REFERENCES

[1] A Report on Road Accidents in India 2016. Published by Transport Research wing under Ministry of Road Transport & Highways, Government of India. Available at: www.morth.nic.in. (Accessed on June 30 2018).
[2] World Health Organization. Global status report on road safety 2015.Available at: www.who.int/violence_injury_prevention/road_safety_status/2015/en/. (Accessed on June 30 2018).
[3] Road accidents in India - 2015 .Published by Government of India, Ministry of road transport & highways transport research wing New delhi. Available at

www.morth.nic.in. (Accessed on Aug 13 2018).
[4] "Pillay V V. Textbook of forensic medicine and toxicology; 17th edition 2016 :Paras Medical Publishers ;P13:293.
[5] "Krishan V .Textbook of Forensic Medicine and Toxicology ,6 th edition 2014:Elsevier publications ;p 270-287.
[6] Vijay Kumar AG, Shivaramu MG, Kumar U, Shridhar KC, Ajay Kumar TS . The Comprehensive Analysis of Traumatic Rib Fractures and their Complications: A Post Mortem Study. J Forensic Res 2011 S2:004. doi:10.4172/2157-7145.S2-004.
[7] Adel Hamed Elbaih. Patterns and management of chest injuries patients and its outcome in Emergency Department in Suez Canal University Hospital, Egypt. Medicine Science 2017;6(2):328-37.
[8] Farooqui JM, Chavan KD, Bangal RS, Syed MMA, Thacker PJ, Alam S, Sahu S, Farooqui AAJ, Kalakoti P. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. AMJ 2013, 6, 9,476-482.
[9] Zargar M,Khaji A ,Karbakhsh M .Pattern of motor cycle related injuries in Tehran. Eastern Mediterranean Health Journal .2006;12:81-7.
[10] Kesava Lakshmi Prasad Kandipudi , Krishna Veni A, Appalanaidu S. Profile Of Road Traffic Accident Cases Admitted In A Tertiary Care Hospital, Visakhapatnam, Andhra Pradesh. Int J Res Med. 2013; 2(2);166-169.
[11] Aditya MB, Rituraj C . A study of incidence of Alcohol use in Fatal Road Traffic Accidents.J Indian Aca Forensic Med;2015:37;p 1.
[12] Murkey P,Nagrale N,Tirpude B ,Wankhade P ,Patond S .Pattern of chest Injuries in Fatal Vehicular accidents in Central India.Journal of Forensic Medicine ,Science and Law :Vol 21 ;P 2.
[13] Ayman El-Menyar, Husham Abdelrahman,Ammar Al-Hassani, Mohammad Ellabib,Mohammad Asim et al. Arch Trauma Res. 2016;5(1):e31888 .
[14] Rubin G ,Peleg K ,Givon A ,Rozen N .Upper extremity fractures among hospitalized road traffic accident adults. Am J Emerg Med.2015Feb;33(2):250-3.
[15] Buttress KP .Fractures and dislocations of the scapula. Rockwood CA , Green DP .Fractures in adults 4th edition. Lippincott Raven Publishers; Philadelphia :1996 .p 1163-1189.
[16] Harnam Singh , Dharttarwal S k . Pattern and distribution of injuries in fatal road traffic accidents in Rohtak. J I A S M ; 2004 :26/1.
[17] Amit K ,Mousami S, Varma A K , Rastogi AK. Blunt injuries of the chest: A medico legal analysis . J Indian Acad Forensic Med. April-June 2012,Vol.34: P 2.
[18] Michetti CP, Hanna R , Crandall JR ,Fakhrey SM . Contemporary analysis of thoracic aorta injury : importance of screening based on crash characteristics .J Trauma .2007;63(1):18-24.