

Clinicoepidemiological Study of Traumatic Chest Injuries in a Tertiary Care Center

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Abstract

Introduction: Chest trauma is one of the most serious injuries of the chest and also a common cause of significant disability and mortality. Chest trauma is the leading cause of death from physical trauma after head and spinal cord injury. Thoracic injuries are primary or a contributing cause of about one-fourth of all trauma-related deaths. Traumatic chest injuries are on the rise mainly due to increased frequency of road traffic accidents (RTAs) and rise in community disharmony. Chest injuries are one of the common causes of major mortality and morbidity. The management of traumatic chest injuries depends on the severity of injury, patient accessibility to nearby hospital, and availability of resources at tertiary care center.

Materials and Methods: It is a prospective study of a total of 134 patients presenting to the emergency department with chest injuries of varying severity in Sanjay Gandhi Memorial Hospital from 1 June 2018, to 31 May 2019 had been carried out. Data collected regarding common injury modes, age and gender distribution, pre-hospitalization practices, clinical presentations, associated injuries, severity of injuries, and management options from the hospital record section and these data were analyzed with descriptive statistics.

Results: Chest trauma is most common in males in their thirties with mean age of presentation 33.47 years. The most common mode of injury was RTA 69.4%, followed by fall from height 14.9% and assault 11.1%. Pain in chest (53%) was the most common symptom of blunt trauma chest in the patients of our study sample followed by dyspnea (31%) and asymptomatic (9%). Clinical sign was tenderness over chest. About 61.2% of patients found with collection in pleural cavity, in which hemothorax (23.9%) was the most common collection followed by pneumothorax (22.4%) and hemopneumothorax (15.7%).

Conclusions: Chest injury is seen commonly in RTA patients. Most of the patients of chest injury had soft tissue trauma over chest in the form of abrasions and majority of these patients can be managed by symptomatic care and simple life-saving intervention, i.e. intercostal drainage. With increased RTAs, it is needed to have public awareness regarding road safety measures and educating them about the first aid measures for trauma patients.

Key words: Chest injury, Tertiary care, Trauma

INTRODUCTION

Blunt trauma is physical trauma by a non-penetrating impact through a blunt object or surface to a body part. Blunt trauma is the primary trauma, from which develops more specific types such as contusions, abrasions, lacerations, and/or fractures. Traumatic injury is the leading cause of death under the age of 45 worldwide. Approximately

5.8 million people die each year as a result of injuries. This accounts for 10% of the world's deaths, more than the number of fatalities from malaria, tuberculosis, and HIV/AIDS combined. In India, every 1.9 min, trauma-related death occurs. Approximately 1 million people die and 20 million are hospitalized every year due to injuries.^[1]

Chest trauma is one of the most serious injuries of the chest and also a common cause of significant disability and mortality. Chest trauma is the leading cause of death from physical trauma after head and spinal cord injury. Thoracic injuries are primary or a contributing cause of about one-fourth of all trauma-related deaths. The mortality rate in these cases is about 10%. Thoracic injuries account approximately 20–25% of deaths due to trauma. 16,000 deaths occur per year in India alone as a result of chest

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trauma. Blunt trauma chest contributes to major accidental injuries in India due to increased incidence of road traffic accidents (RTAs) (6% of global vehicular accidents) due to increased road traffic, availability of new high-speed vehicles and less awareness regarding traffic rules. A very few studies had been conducted to analyze its magnitude and management in the Indian scenario.^[2]

This study is carried out to determine the epidemiology and mechanism of chest trauma along with analyzing the management scheme and to note the prognosis and improvement of the management of chest injuries.

Chest radiograph is obtained for every blunt trauma chest patient after stabilization of the patient. The diagnosis is generally obvious with standard chest radiography but more subtle sign requires careful analysis with computed tomography (CT)-chest. High-resolution CT (HRCT) is the most important imaging method in this field. Its advantages occur especially due to high speed and high geometric resolution in any plane. Due to its advantages, HRCT has become the first choice method in high-energy trauma. Diagnostic imaging with HRCT plays a key role in the management of high-energy chest trauma. HRCT is the most important imaging method in this kind of injury, as detailed information can be acquired in a short time.

MATERIALS AND METHODS

A study of cases of chest trauma admitted in Sanjay Gandhi Memorial Hospital from 1 June 2018, to 31 May 2019 had been carried out. The study was pertaining to blunt chest trauma. Information was obtained directly from the patient whenever possible and from other witness of accident if available.

Number of Patients

134.

Inclusion Criteria

- All patients with blunt trauma chest were included in the study.

Exclusion Criteria

The following criteria were excluded from the study.

- Penetrating chest injury
- Patients who absconded or left against medical advice.

Methodology

The study was conducted over the patients admitted from casualty, outpatient department and those who transferred from other wards. After eliciting the proper history and mode of trauma, vitals were regarded and initial airway, breathing, circulation, and deformities were assessed

without any delay. After stabilizing vitals, the patients who were diagnosed as blunt trauma chest were assessed properly and sent for lab investigations and X-ray done. Those who were in need of inter costal drain (ICD) such as tension pneumothorax, hemothorax, and flail chest were undergone for procedure after proper written consent. The patients were then shifted to ward and sent for CT chest. The reports of X-ray chest and CT chest were analyzed and recorded in pro forma. Those patients who were diagnosed with associated injuries such as head injury, blunt trauma abdomen, and long bone fracture were also included for the study, but after stabilizing from these associated injuries if needed CT chest was done but X-ray chest was done to them as a bedside investigation. Those patients who undergone for ICD insertion were followed up properly by doing repeat X-ray immediately after ICD insertion and on the 3rd day or as when needed and after removal of ICD once patient condition improved. The patients were advised for vigorous chest physiotherapy and their improvement was recorded properly. All these data were recorded meticulously in pro forma and master chart after that systematic tabulation, observation, and analysis done. Summary and conclusion were drawn after discussion with review of literature.

OBSERVATIONS AND RESULTS

All trauma patients with blunt trauma chest fulfilling the inclusion criteria, irrespective of age, sex, and mode of trauma were included in the study.

On admission, patients were briefly interrogated, clinically examined, and resuscitation started according to priority, i.e., patency of airway, breathing, and circulation were restored. Bleeding surface wounds (chest or any other body part) were stitched in time and fracture site if any splinted.

After clinical stabilization of the patients, his/her particulars, i.e., name, age, sex, occupation, residence, etc., were noted. Detailed history regarding the circumstances and mode of sustaining injury was obtained. Thorough clinical examination was conducted to evaluate the nature and severity of injury. All efforts were made to diagnose other associated injuries.

The patients were investigated and treated according to the pre-decided protocol of the study. The data were collected and recorded on predesigned pro forma by principal investigator. The following observations were made and analyzed using necessary statistical tools.

It is evident from Table 1 that majority of the patients 31.3% of the blunt trauma chest belonged to 21–30 years

of age group. A total of 22.4% of patients belonged to 31–40 years of the age group which was also the second most common age group presented with chest injury. Minimum age was 2 years while maximum was 90 years. The mean age was 33.47 years, with standard deviation 16.24.

It is evident from Table 2 that RTA (69.4%) was the most common cause of blunt trauma chest in the patients of our study sample followed by fall from height (14.9%) and assault (11.1%).

It is evident from Table 3 that pain in chest (53%) was the most common symptom of blunt trauma chest in the patients of our study sample followed by dyspnea (31%) and asymptomatic (9%).

It is evident from Table 4 that head injury (18.6%) was the most common associated injury with blunt trauma chest in

Table 1: Age and sex-wise incidence of the patient

S. no.	Age group (years)	Total	Male		Female	
			No.	%	No.	%
1.	<10	4	3	75	1	25
2.	11–20	22	20	91	2	9
3.	21–30	42	32	76	10	24
4.	31–40	30	27	90	3	10
5.	41–50	22	19	87	3	13
6.	51–60	4	3	75	1	25
7.	61–70	7	5	72	2	28
8.	>70	3	2	67	1	33
Total		134	111	82.8	23	17.2

Table 2: Distribution of patients according to mode of trauma

S. no.	Mode of trauma	No. of patient				
		Total	Male		Female	
			No.	%	No.	%
1.	Road traffic accident	93	77	83	16	17
2.	Fall from height	20	17	85	3	15
3.	Assault	15	12	80	3	20
4.	Others	6	5	83	1	17
Total		134	82.8	86	23	17.2

Table 3: Distribution of patients according to mode of presentation

S. no.	Symptoms	No. of patients				
		Total	Male		Female	
			No.	%	No.	%
1.	Pain in chest	71	57	80	14	20
2.	Dyspnea	42	36	86	6	14
3.	Asymptomatic	12	11	92	1	8
4.	Unconsciousness	3	2	67	1	33
5.	External wound	6	5	83	1	17
Total		134	111	82.8	23	17.2

the patients of our study sample, followed by spinal injury, blunt trauma abdomen, long bone fracture, and other injuries.

It is evident from Table 5 that tenderness (84.3%) was the most common clinical finding of blunt trauma chest in the patients of our study sample followed by bruise (79.8%) and bony crepitus (73.9%).

It is evident from Graph 1 that ribs fracture was the most common pattern of thoracic injuries in blunt trauma chest patients of our study sample, followed by clavicle fracture, hemothorax, and pneumothorax.

It is evident from Table 6 that a total of 61.2% of patients found with collection in pleural cavity, in which hemothorax (23.9%) was the most common collection followed by pneumothorax (22.4%) and hemopneumothorax (15.7%).

It is evident from Table 7 that of 134 blunt trauma chest patients, X-ray chest film shows 2 or <2 ribs fracture

Table 4: Incidence and sex-wise distribution of associated injuries with blunt trauma chest in the study sample

S. no.	Associated injury	Total	Male		Female	
			No.	%	No.	%
1.	Head injury	25	18	72	7	28
2.	Blunt trauma face	2	2	100	0	0
3.	Blunt trauma abdomen	8	6	75	2	25
4.	Spinal injury	10	8	80	2	20
5.	Long bone fracture	7	7	100	0	0
6.	Scapula fracture	8	5	63	3	37
7.	Pelvis fracture	4	3	75	1	25
8.	Diaphragmatic injury	7	4	57	3	43
Total		71	53	74.6	18	25.4

Table 5: Distribution of patients according to clinical finding

S. no.	Finding	Total patients	
		No.	%
1.	Tenderness	113	84.3
2.	Bruise	107	79.8
3.	Bony crepitus	99	73.9
4.	Lacerated wound	70	52.2
5.	Abrasion	57	42.5
6.	Subcutaneous emphysema	40	29.8

Table 6: Type of collection in pleural cavity

S. no.	Type of collection	Total no. of patients	No. of patients (%)
1.	Hemothorax	32	23.9
2.	Pneumothorax	30	22.4
3.	Hemopneumothorax	21	15.7
Total		82	61.2

present in 61 patients, in which 56 patients recovered and 5 patients expired; hence, mortality is 8.2%, and more than two ribs fracture present in 32 patients, in which 27 patients recovered and five expired and so mortality is 15.6%. It shows no. of ribs fracture directly proportional to mortality.

It is evident from Table 8 that of 134 blunt trauma chest patients, 14 patients present with flail chest in which 3 are expired, so mortality in flail chest was 21.4% in the present study which was very high compare to other patients which is 9.7%.

It is evident from Table 9 that of 134 patients, intercostal drain placement done for 64 patients, of 64 patients, 23 right sided and 26 left sided and 15 bilateral drain placement done, exploratory laparotomy done for 11 patients,

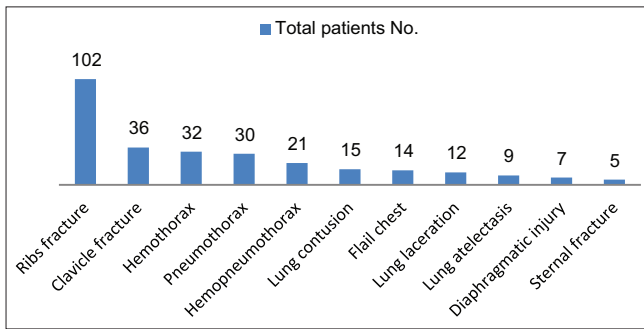
craniotomy done for 4 patients, and rest 55 patients of the study sample not required any surgical intervention and managed conservatively.

It is evident from Table 10 that mortality high when chest trauma associated with other injuries as compared to isolated chest trauma.

It is evident from Table 11 that maximum number of patients (33.6%) had hospitalization for 11–15 days followed by 6–10 days. Average duration of hospitalization was 8.23 days in our study with standard deviation of 4.31 days.

DISCUSSION

Chest injury is one of the leading causes of mortality and morbidity. This prospective study of 1-year duration included 134 patients with traumatic chest injuries, which included only the admitted cases. In the study, chest injuries were predominantly seen in male sex as they are more involved in public activity and vehicle driving. Chest injury was seen to be more in the 3rd decade of life as it is the more active and adventures period of life. Mean age of presentation was 33.47 years of age. In another study by Sharma *et al.*^[3] of a total of 730 patients, the maximum of 452 was in the age group of 21–30 years and the next common decade was found to be in 4th decade, i.e., 31–40 years, with 98 patients. As with other studies, in our study also RTA was the most common mode of injury. More of industrialisation and urbanisation with non strict laws has lead to increase in RTAs and associated chest injuries. Next common mode was fall from height followed by assault. This suggests that the government has to come



Graph 1: Pattern of thoracic injuries in blunt trauma chest

Table 7: Ribs fracture present in X-ray associated with death

Ribs fracture (no.)	≤2	>2
Recovered	56	27
Death	05	05
Total	61	32

Table 8: Flail chest incidence and mortality

Flail chest	No. of patients	No. of death	%
Present	14	3	21.4
Absent	120	10	8.3
Total	134	13	9.7

Table 9: Surgical management of blunt trauma chest with associated injuries

Management	Intercostal drain			Exploratory laparotomy/ Diaphragmatic repair	Craniotomy
	Right sided	Left sided	Bilateral		
No. of patients	23	26	15	11	4
% of patients	17.2	19.4	11.2	8.2	3.0

Table 10: Distribution of patients according to cause of death

S. no.	Type of injury	Total no. of patient	Death	
			No.	%
1.	Chest trauma with head injury	25	3	12.0
2.	Chest trauma with abdominal trauma	8	1	12.5
3.	Chest trauma with spinal injury	10	1	10.0
4.	Chest trauma with pelvis injury	4	1	25
5.	Isolated chest trauma	87	7	8.04

Table 11: Duration of hospital stay

S. no.	Duration of hospital stay (days)	Total patients	
		No.	%
1.	1–5	41	30.6
2.	6–10	43	32.1
3.	11–15	45	33.6
4.	16–20	5	3.7
Total		134	100

up with more safety measures for construction workers. In the emergency department, chest pain was the most common presentation in chest injury patients followed by some form of external injury on the chest; most of the patients it was abrasion over the chest. These suggest that patients with chest pain should be given importance even if there is no external injury or breathlessness. Most of the patients had multiple findings, but on consideration, individual tenderness presents over chest (84.3%) and was the most common clinical finding of blunt trauma chest in the patients of our study sample followed by bruise (79.8%) and bony crepitus (73.9%). In another study, Choudhary *et al.*^[4] done a study and all injury type data were collected and it includes small chest abrasion to complex chest injuries. In the present study, totally 61.2% of patients developed some type of pleural collection. Most commonly, patients had hemothorax 23.9% followed by pneumothorax 22.4% and hemopneumothorax 15.7%. Most of these cases were managed with intercostal drainage tube. Another study Kumar *et al.*^[5] hemothorax was found in 38.3% and pneumothorax 20.7% of cases. In other studies also find similar result, Lin *et al.*^[6] found 31.8% traumatic hemothorax, 15.6% pneumothorax, and 9.6% hemopneumothorax. Most of these patients were treated with standard intercostal drainage procedure. Most of the patients were polytrauma cases and were associated with other body injuries, most common being head injury, followed by abdominal, spinal, and long bone injuries with equal incidence each and least was pelvic bone fractures. In the present study, of 134 blunt trauma chest patients X-ray chest film shows 2 or <2 ribs fracture present in 61 patients in which 5 patients expired, so mortality was 8.2%, and more than two ribs fracture present in 32 patients in which 5 patients expired, so mortality was 15.6%. It shows a number of ribs fracture directly proportional to mortality. Also found that ribs fracture is the most common skeletal injury following blunt chest trauma. In the present study, of 134 patients, 39 requiring intubation with ventilator support in intensive care unit (ICU) care mostly had polytrauma in which injury severity score was more than 15. Intercostal drain required for 64 patients, of 64 patients, 26 ICD placement done left side, 23 right side, and 15 bilateral; intercostals drain placement done for flail chest patients, most of hemothorax, pneumothorax, and hemopneumothorax patients. Patients had small collection in there pleural cavity and vitally stable are managed conservatively. Exploratory laparotomy done for 11 patients, of 11 patients, 6 had diaphragmatic injury in which diaphragm repair done, 1 had diaphragmatic injury with splenic rupture so splenectomy with diaphragmatic repair done, and 4 laparotomy more done, in which 2 had ileal perforation and other 2 had jejunal perforation so primary closure of ileal and jejunal perforation done. Craniotomy done for 4 patients, of 3 extradural

hemorrhage occurs in 3 patients and 1 had hemorrhagic contusion. Moreover, rest 55 patients of study sample not required any intervention and managed conservatively.

In the present study, of 134 blunt trauma chest patients, ICD placement done in 64 patients in which 59 (92.2%) was recovered and 5 (7.8%) was expired. Conservative management done in 70 patients in which 62 (88.6%) was recovered and 8 (11.4%) was expired. ICD placement shows better result for the management of blunt trauma chest.

Of 134 patients, 87 patients had isolated chest trauma in which 80 (91.96%) recovered and 7 (8.04%) expired and 47 patients had associated head, abdominal, spinal, pelvis, and other injuries in which 42 (89.4%) recovered and 5 (10.6%) expired. Mortality was higher in patients had associated injury with blunt trauma chest.

CONCLUSIONS

This study shows blunt trauma chest most commonly occurs in young adult male mostly in 3rd decade of life due to RTA. Patients presented mostly with complaints of chest pain and most common clinical finding was tenderness over thorax region. Ribs fracture was seen in most of patients. Hemothorax, pneumothorax, flail chest, or lung injuries were also seen in some patients. X-ray chest was found to be very useful and a cost-effective initial diagnostic modality for blunt trauma chest. In majority of the patients, ribs fracture and pleural cavity collection were present in X-ray, while in those patients with inconclusive X-rays, HRCT chest was found to be useful in detecting parenchymal lung injuries, occult collection, or ribs fracture. In the diagnosis of blunt trauma chest, HRCT chest was found to be more sensitive and specific in comparison to X-ray chest. In polytrauma patients, head injury is most commonly associated with blunt trauma chest. Other injuries such as abdominal trauma, spinal injuries, and long bone fractures were also seen. Most of the polytrauma patients with injury severity score of more than 15 needed ICU care with or without intubation or ventilatory support. Approximately half of the patients needed intercostals drain insertion. Clinical outcome in this study was found to be dependent on nature of injury, number of ribs fracture, associated injuries and injury severity score. Mortality was higher when chest trauma was associated with other injuries of head, abdominal, or other organs as compared to isolated chest trauma.

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