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ORIGINAL RESEARCH

Medicine Science 2017;6(2):328-37

Medicine Science International Medical Journal

Patterns and management of chest injuries patients and its outcome in Emergency Department in Suez Canal University Hospital, Egypt

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Received 16 November 2016; Accepted 08 December 2016
Available online 22.12.2016 with doi: 10.5455/medscience.2016.05.8567

Abstract
Chest trauma is a common cause of morbidity and mortality, especially in the young patients. Road traffic crushes (RTCs) are the commonest cause of blunt chest injuries. Chest trauma may be due to penetrating trauma produced by knife or gunshot and its incidence increases with use of firearms Successful management of thoracic trauma depends on effective resuscitation by the ABCDE approaches with rapid detection and treatment of life-threatening complications outcome and prognosis for the great majority of patients with chest trauma are excellent. to improve management process and outcome of chest trauma patients. This study is a cross-sectional study included 200traumatic patients admitted in Suez Canal University Hospital. Firstly Start primary survey by check Airway, secure cervical spine by neck collar, Breathing and circulation (A B C) and treat the life threading conditions if present. Blunt thoracic trauma was found in 144 patients, while penetrating injuries in only 56 patients. Patients suffered blunt trauma,(87.5%) were males and (12.5%) females, no mortalities were recorded in penetrating trauma patients since all patients were discharged after treatment and improvement. Rib fractures were the commonest injuries in blunt chest trauma, haemothorax is the commonest injury in penetrating chest trauma, tube thoracostomy is the most common surgical interference done.

Keywords: Patterns, chest trauma, management

Introduction

Chest trauma is a common cause of morbidity and mortality, especially in the young patients [1]. Thoracic injuries are the third injuries in trauma patients, after to injuries to head and extremities. Thoracic trauma has an overall mortality rate of 15–25%, which is the highest with cardiac or tracheobronchial-esophageal injuries patients. Really the presence of thoracic injuries in the setting of polytrauma can significantly increase the mortality rate. Injuries such as lung contusion, flail chest, pneumothorax and haemthorax can complicate globally a case management [2,3].

In the United Kingdom annually 720,000 traumatic patients admissions and more than 6 million comes to emergency departments. And over 17,000 traumatic deaths patients, with nearly 25% of them directly to thoracic injuries [4].

Two-thirds of cases of blunt thoracic trauma or more in developed countries are caused by motor vehicle collisions. Other one third of cases are caused by blows from blunt objects or of falls from height [5].

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Chest trauma may be due to penetrating trauma produced by knife or gunshot and its incidence increases with use of firearms, arrows and spears or due to blunt trauma including blast injuries, motor vehicle accidents and iatrogenic injuries secondary to both therapeutic interventions and diagnostic procedures as injury to the lungs and heart during catheterization [6].

Road traffic crushes (RTCs) are common cause of blunt chest trauma in civilian practice which may be more than 70% in some series. Blunt trauma is commonest than penetrating chest injury, nearly more than 90% of thoracic injuries [7].

ABCDE (airway, breathing, circulation, disability and exposure) are the initial steps to resuscitate chest trauma patients as all types of trauma begin with but we should be in mind four threatening conditions that must have appropriate treatment. These include tension pneumothorax, cardiac tamponade, flail chest associated with respiratory distresses, and shock may be caused be to massive haemthorax [8].

The chest radiograph (CXR) is initial routine radiographic study in patients with thoracic blunt trauma. Other imaging study can be done as Ultrasonography, Computed Topography, and Magnetic Resonance Imaging but not essential and less common. Additional workup includes:

arterial blood gas, complete blood cell count, and coagulation profile [9].

The outcomes for the great majority of patients with chest injuries are excellent. Most (>80%) require either non-invasive therapy or thoracostomy tube to resolving their injuries. The most determinant of outcome is the presence or absence of the head, abdomen, and pelvis injuries. Some injuries, such as thoracic aortic rupture, cardiac chamber rupture, delayed recognition of esophageal or diaphragmatic rupture, injuries of the intrathoracic inferior and superior vena cava and are associated with high morbidity and mortality rates which mean bad prognosis [10].

Others predictors of mortality in chest trauma patients as patient-related factors, therapeutic interventions and injury patterns, Age, sex, premorbid medications, and comorbid conditions such as cardiac disease, renal failure and chronic obstructive pulmonary disease affect prognosis for thoracic trauma patients. Pulse rate ≥120, respiratory rate >29, Systolic blood pressure ≤90, GCS <8 at the time of admission are essential predictors of mortality in chest trauma. [11].

Thoracic trauma is the common cause of morbidity and mortality in both children and adults. It is a leading cause of death nearly 25% of polytrauma patients and, when especially associated with other injuries, it may causes death in additional 50% of polytrauma patients**.** [12].

Only10–15% of patients with blunt injuries and 15–30% of those with penetrating injuries require surgical interventions. The remainder treated in the emergency department through the application of initial trauma management and through direct interventions such as intubation and ventilation or tube thoracostomy within the scope of practice of emergency physicians, as thoracic trauma impacts directly on the heart and lungs, the two organs need high follow oxygenation and maintain perfusion state. [12].

Successful management of thoracic trauma depends on effective resuscitation by the ABCDE approaches with rapid detection and treatment of life-threatening complications. [13].

The mechanisms and the main consequences of thoracic injuries are affects both respiratory and cardiovascular functions, which lead to hypoxia and hypovolemia, which have impact directly on the thoracic organs and compound the effects of injuries to other organs. [13].

The aim of our study to improve management process and outcome of chest trauma patients by the study the patterns of presentation, management and outcome of chest trauma patients in different age populations comparing blunt and penetrating chest injuries presented to Emergency Department of Suez Canal University Hospital. Within one year from September 2015 to September 2016.

Material and Methods

Study Design and Site this is a descriptive prospective study (cross sectional). All chest injuries Patients admitted to emergency department in Suez canal university Hospital which considered tertiary hospital and center of referral to five nearly governorate. And all resources available in ED even Emergency resuscitation thoracotomy can be done in emergency department.

Patients were identified according to the following criteria:

Inclusion criteria all ages eligible, Gender eligible for study: both, chest trauma. After approval of Ethics Committee.
Exclusion Criteria Any respiratory disease that affects pulmonary functions; chronic obstructive pulmonary disease, bronchial asthma, cor-pulmonale, etc.-Pregnancy, Malignancy, End organ failure
The study question What are Patterns and Management of Chest Injuries Patients and its Outcome in Emergency Department?
Sample size Sample size was estimated using a predetermined area under the curve for prediction of mortality among chest trauma patients = 0.844 [14] the sample size was calculated for power of the study of 90% and α error of 0.05. An estimated drop out of 10% will be added. A series of equations are being used to estimate sample size using AUC. Computer based software has been used to calculate the required sample size [14]. The least required sample size is 200 patients.

Material and Methods

Data was collected in pre-organized data sheet by the researcher from patients fulfilling inclusion criteria.
Patient was clinically assessed and managed as per the ABC protocol, after stabilizing the patient the following will be studied:-

- **Socio-demographic data** Patient's file number, Patient's personal data: age and sex.
- **Trauma data:** Mechanism of trauma and the related injuries.
- **Clinical examination:**

Clinical evaluation of the patients was carried out on arrival to Emergency Department regarding: Initial assessment ABCDE approach. (Airway and cervical spine control, breathing, circulation, dysfunction of central nervous system and exposure**),** Vital signs: pulse, blood pressure, respiratory rate.

Then regional examination of the chest including inspection, palpation, percussion and auscultation is performed

Investigations

1- Laboratory investigations: complete blood count, arterial blood gases to assess the patient's PaO_2.
2- Imaging studies: chest x ray, computed topography to determine which lobe of the lungs is affected, pleural involvement and fractured ribs, electrocardiogram and/or echocardiography to assess cardiac injury if any.
3- Put the patient's data on the scoring system to fulfill all the parameters included in the score.

Fate at Emergency Room: Fate of the patient will be recorded whether:

1- Had surgical intervention.
2- Admitted to inpatient department under observation.
3- Admitted to intensive care unit.
4- Transferred and indication of transfer.
5- Discharged from Emergency Department.
6- Died at emergency room.

Patient's admission in the hospital: After the victims were assessed, and patient priority for admission to the emergency resuscitation room and for treatment was determined such as patients presenting with hypotension, massive blood loss, open chest wounds, patient with disturbed conscious level or disabling dyspnea were evaluated immediately on admission.

Patients admitted in the hospital were followed up by

a) Follow up of vital signs (Bp, RR, pulse) and chest examination daily.
b) Daily chest x-ray.
c) Follow up CT when needed.
d) Echocardiography in patient with hemopericardium.
e) Monitoring chest tube drainage output.

Patients were monitored and assessed for thoracostomy. Thoracostomy was indicated according to Richardson (2006) [15] in case of:

a) Initial thoracostomy tube drainage is more than 20 mL of blood per kilogram or more than 1500ml.
b) Persistent bleeding at a rate greater than 2-3 mL/kg/hr or more than 200 ml/hr is present.
c) Increasing haemothorax seen on repeated and compared chest x-ray films by accounting number of rib with increasing level of effusion.
d) Patient remains hypotensive despite adequate blood replacement, and other sites of blood loss have been ruled out.
e) Patient decompensates after initial response to resuscitation.

Patients, who were admitted in the hospital, were followed up for

1. Physical chest examination and its finding.

Data analysis & management Data collected throughout history, clinical examination and laboratory investigations was coded, entered and analyzed using Microsoft Excel software. Gathered data will be presented using (Statistical Package for Social Sciences) (SPSS) software program version 13.0 for analysis. According to the type of data, the following tests was used to test differences for significance; Chi square, t test, and one-way ANOVA with least significant difference. Chi square test and non-parametric tests was used to compare categorical variables. P value was set at <0.05 for significant results.

Laboratory investigations and interventions' budget was covered as a part of the health service provided in Emergency Department in Suez Canal University Hospital.

Ethical consideration

1) Approval of Research ethics committee.
2) Singing written informed consent from participants.
3) Confidentiality of data.
4) Explanation of our study to the participants.
5) An informed consent will be taken from each patient.

Results

Out of 200 patients, Blunt thoracic trauma was found in 144 patients, while penetrating injuries in only 56 patients. Patients suffered blunt trauma, 126 (87.5%) were males and 18 (12.5%) females the male - female ratio was 7:1. The ages of the patients ranged between 1.5 - 70 years. The mean age was 30.7 ± 17.6 years. 73.6 % of patients were older than 18 years (Table, 1).

Table 1. Socio-demographic data of the studied groups

	Blunt trauma (n=144)		Penetrating trauma (n=56)		χ^2	P value
	n	%	n	%		
Sex						
Male	**126**	**87.5**	**52**	**92.9**	**0.591**	0.723
Female	**18**	**12.5**	**4**	**7.1**		
Age						
≤18 years	**38**	**26.4**	**8**	**14.3**	**1.66**	0.197
>18 years	**106**	**73.6**	**48**	**85.7**		
Age					**0.008***	0.99
mean± SD	**30.7±17.6**		**30.1±12.8**			

P > 0 .05 (Insignificant P ≤0.05 (Significant) P < 0.001 (Highly Significant) *U (Mann Whitney test). χ^2 (Chi square test). n: number

On the other hand, Patients suffered penetrating trauma, 52(92.9%) were males and 4 (7.1%) females. The male - female ratio was 13:1. The ages of the patients ranged between 13 - 60 years. The mean age was 30.1±12.8 years. 85.7 % of patients were older than 18 years (Table, 1). In fact, there was no significant difference in relation to either sex or age between patients with blunt trauma and penetrating trauma. Both of them found more among males and patients older than 18 years.

In our study, thoracic trauma was induced by motor vehicle accident, localized chest trauma, falling from heights, stabbing, shot gun and gun shot. Overall, Motor vehicle accident was the leading cause of blunt trauma patients (76.4%) followed by localized chest trauma (12.5%) and falling from heights (11.1%) (Table, 2).On the other hand, Stabbing was the cause of 67.9% of penetrating trauma followed by shot gun (17.8%) and gunshot (14.3) (Table, 2).

Table 2. Modes of blunt and penetrating chest injuries

Blunt trauma modes	Frequency (n 144)	Percent
Motor vehicle accident	110	76.4
falling from heights	16	11.1
localized trauma	18	12.5
Penetrating trauma modes	**Frequency (n 56)**	**Percent**
Stab	38	67.9
Gun shot	8	14.3
Shot Gun	10	17.8

Table 3. Signs present on physical examination of the studied groups

	Blunt trauma (n=144)		Penetrating trauma (n=56)		χ^2	P value
	n	%	n	%		
Tenderness						
Yes	114	79.2	44	78.6	0.004	0.94
No	30	20.8	12	21.4		
Surgical Emphysema.						
Yes	38	26.4	16	28.6	0.049	0.8
No	106	73.6	40	71.4		
Clicks						
Yes	64	44.4	2	3.6	15.2	0.0001
No	80	55.6	54	96.4		
Diminished air entry						
Yes	96	66.7	50	89.3	5.233	0.022
No	48	33.3	6	10.7		
Crepitation						
Yes	62	43.1	12	21.4	4.04	0.044
No	82	56.9	44	78.6		
Vitally stable						
Yes	128	88.9	54	96.4	1.399	0.237
No	16	11.1	2	3.6		
Systolic.blood.pressure	113.13±20.39		116.43±20.9		0.7*	0.48
Diastolic.blood.pressure	72.57±12.86		77.14±15.11		1.5*	0.12
Pulse	96.14±17.9		91.04±13.27		1.07*	0.28

P > 0 .05 (Insignificant P ≤0.05 (Significant) P < 0.001 (Highly Significant)
*U (Mann Whitney test). χ^2 (Chi square test). n : number

When comparing the type of trauma with signs found by physical examination, a highly significant difference between blunt and penetrating trauma patients exhibiting clicks (44.4% in blunt trauma patient, 3.6% in penetrating trauma patients, was found. A significant difference was found between blunt and penetrating trauma patients showing crepitation (43.1% in blunt trauma patient, 20.4% in penetrating trauma patients, P value = 0.044). Also, a significant difference was found between blunt and penetrating trauma patients exhibited diminished air entry (66.7% in blunt trauma patient, 89.3% in penetrating trauma patients, (Table 3).

Our study revealed pathology and type of trauma, there was significant relationship between type of trauma and multiple rib fracture and flail Chest. Fifty two patients (36.1%, p value = 0.001) and eighteen patients (12.5%, p value = 0.05) had multiple rib fracture and flail Chest, respectively of blunt trauma, while non was found in penetrating trauma patients (Table 4).

The commonly associated injuries with blunt chest trauma were orthopedic injury being the most common 34 patients (23.6%) followed by internal organ injury (19.4%), traumatic brain injury (18.1%), skull bone fracture (8.3%) and vertebral injury (1.4%). Skull bone fracture (8.3%), Traumatic brain injury (18.1%) and vertebral injury (1.4%) were associated only with blunt trauma patients as shown in (Table 4).About penetrating trauma internal organ injury (21.4%) is the most common associated injuries followed by diaphragmatic injury (10.7%) then orthopedic injury (7.1%) as shown in (Table 5). There was a high significant difference between blunt and penetrating trauma concerning diaphragmatic injury which was associated only with penetration trauma patients (10.7%, P value= 0.002). There was a significant difference between blunt

and penetrating trauma concerning traumatic brain injury was associated only with blunt trauma patients (18.1%, p value= 0.016) as shown in (Table 5).

There is a significant relationship between type of trauma and treatment offered (p value =0.034). Surgical treatment was offered to 46 out of 56 patient (82.1%) with penetrating trauma and 86 out of 144 patients (59.7%) with blunt trauma, while conservative treatment was offered to 10 out of 56 patient (17.9%) with penetrating trauma and 58 out of 144 patients (40.3%) with blunt trauma as shown in (Table 6). Mechanically ventilated patients in our study were 130 patients (90.3%) in blunt trauma and 50 patients (89.3%) in penetrating trauma with no significant difference (Table 6).

Significant difference was found between blunt and penetrating trauma patients regarding ward admission. In studied group 64.2% penetrating trauma admitted in the cardiothoracic ward compared to 29.1% for blunt trauma patients with non-significant difference in ward stay days. Also, Significant difference was found between blunt and penetrating trauma patients those were ICU admitted (p value = 0.013). Only (35.7%) for penetrating trauma patients admitted in ICU compared to (59.7%) of blunt trauma patients with high significant difference in ICU stay days (p value = 0.009) since blunt trauma patients stayed for 2.74±5.59 days compared to 0.36±0.91 recorded for penetrating trauma patients as shown in (Table,6).

Table 4. Diagnostic pathology of the studied groups

	Blunt trauma (n=144)		Penetrating trauma (n=56)		$\chi 2$	P value
	n	%	n	%		
Pneumothorax						
Yes	64	44.4	34	60.7	2.13	1.44
No	80	55.6	22	39.3		
Haemthorax						
Yes	62	43.1	38	67.9	4.96	0.261
No	82	56.9	12	32.1		
Single rib fracture						
Yes	4	2.8	2	3.6	0.044*	00
No	140	97.2	54	96.4		
Multiple rib fracture						
Yes	52	36.1	0	0.0	13.66	0.001
No	92	63.9	56	100.0		
Surgical Emphysema						0.779
	40	27.8	14	25.0	0.079	
Yes	104	72.2	42	75.0		
No						
Flail Chest						
Yes	18	12.5	0	0.0	3.84*	0.05
No	126	87.5	56	100.0		
Lung contusion						
Yes	60	41.7	12	21.4	3.58	0.06
No	84	58.3	42	75.0		
Hemopericardium						
Yes	6	4.2	4	7.1	0.376*	0.617
No	138	95.8	52	92.6		
Fracture sternum						
Yes	8	5.6	0	0.0	1.62*	0.574
No	136	94.4	56	100.0		
Lung Pneumatocele						
Yes	8	5.6	2	3.6	1.86*	1.00
No	136	94.4	54	96.4		
Fracture clavicle						
Yes	8	5.6	0	0.0	1.62*	0.574
No	136	94.4	56	100.0		
F.B penetrating lung tissue	2	1.4	0	0	0.393*	1.00
Yes	142	98.6	56	100.0		
No						
Mediastinal Hematoma	6	4.2	6	10.7	1.532*	0.325
Yes	138	95.8	50	89.3		
No						
Pneumomediastinum						
Yes	6	4.2	2	3.6	0.019	1.00
No	138	95.8	54	96.4		

Table 5. Associated injuries of the studied groups

	Blunt trauma (n=144)		Penetrating trauma (n=56)		χ2	P value
	n	%	n	%		
Skull bone fracture						
Yes	12	8.3	0	0	2.48	0.18*
No	132	91.7	56	100		
Traumatic brain injury						
Yes	26	18.1	0	0	5.8	0.016
No	118	81.9	56	100		
Vertebral injury						
Yes	2	1.4	0	0	0.39	0.99
No	142	98.6	56	100		
Orthopedic injury						
Yes	34	23.6	4	7.1	3.5	0.059
No	110	76.4	52	92.9		
Diaphragmatic injury						
Yes	0	0	6	10.7	7.95	0.002*
No	144	100	50	89.3		
Internal organ injury						
Yes	28	19.4	12	21.4	0.05	0.8
No	116	80.6	44	78.6		

Table 6. ICU, inpatient ward admission, outcome and types management for the studied groups

	Blunt trauma (n=144)		**Penetrating trauma (n=56)**		χ^2	**P value**
	n	%	n	%		
Ward admission	42	29.1	36	64.2	5.8	0.016
Ward stay(days)						
Mean ±SD	4.96±4.799		5.64±5.6		0.866*	0.387
Range	0 - 25		1 - 30			
ICU admission	86	59.7	20	35.7	6.11	0.013
ICU stay(days)						
Mean ±SD	2.74±5.59		0.36±0.91		2.5*	0.009
Range	0 - 27		0 - 4			
No admission	16 11.1		0 0			
outcome:						
Died	10	6.9	0	0	5.8	0.055
Discharged after complete recovery	118	81.9	56	100		
Not admitted	16	11.1	0	0		
Treatment offered						
Conservative	58	40.3	10	17.9	4.51	0.034
Surgical	86	59.7	46	82.1		

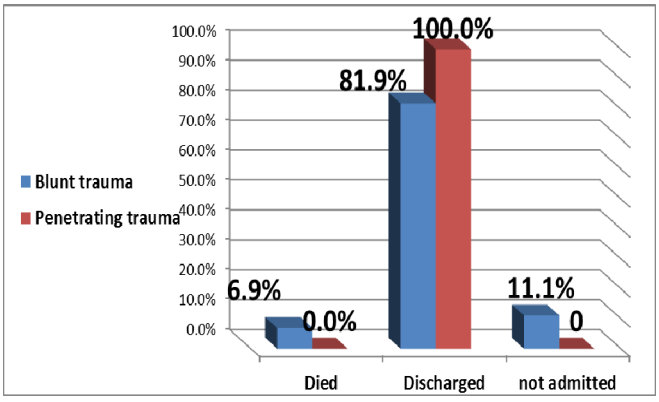

Figure 1. Fate of studied group with blunt trauma in comparable with group with penetrating trauma

In fact, no mortalities were recorded in penetrating trauma patients since all patients were discharged after treatment and improvement , while out of 144 blunt trauma patients, 10 patients(6.9%) died, 118 (81.9%) discharged after treatment and improvement and 16 (11.1%) not admitted as no lesions found by investigation and follow up as shown in (Table 6) and (figure1) . As regard to die patients 8 of them were associated with traumatic brain injury and one had bilateral massive lung contusion. (Table, 6).

Discussion

Thoracic trauma is the common cause of morbidity and mortality in both children and adults. It is a leading cause of death nearly 25% of polytrauma patients and, when

especially associated with other injuries, it may causes death in additional 50% of polytrauma patients [12].

Successful management of thoracic trauma depends on effective resuscitation by the ABCDE approaches with rapid detection and treatment of life-threatening complications [13].

In the present study, out of 200 patients 144 suffered blunt chest trauma while only 56 patient suffered penetrating injuries which, in agreement with Ulutas H et al(2015) who studied nine hundred and ninety-six patients, 761 of them had blunt trauma and 235 penetrating injury trauma [16]. However. Khorsandi M et al (2015) study showed more prevalence in penetrating trauma patients than those with blunt trauma among studied patients. [17].

Males predominates females in the present study with either blunt 126 male out of 144 patient (87.5%) (male:female 7:1) or penetrating trauma 52 male out of 56 patient (92.9%) (Male: female 13:1) which is in accordance with Ulutas H et al(2015) who studied 149 patients with chest trauma they were 121 males and 28 females (81.2% vs. 18.8%; male: female = 4:1). This male predominance may be explained by being more mobile, physically active and are more involved in outdoor activities like drivers, industrial workers, construction sites, other hazardous occupations, and laborers etc. [16].

As regard the mode of trauma, in the present study MVA (All traffic related Accidents) was the most common in blunt chest trauma out of 144 patient MVA was 110 patients (76.4%) ,which in accordance with Ustundag M et al. traffic related injuries (63%) of blunt trauma patients. [12].

Regarding penetrating trauma in the present study, Stab wounds are the most common mode of injury 38 patients (67.9%) out of 56 patients in agreement Yazici et al. (2012) studied penetrating chest injuries in Ankara and found that stab wounds were the most frequent mode of injury, comprising 89 cases (89.9%); the remaining 10 patients (10.1%) suffered from gunshot wounds [18]. but penetrating injuries more than we know from the national trauma registries in the US, Germany and the UK because in Egypt in last six year gun shot and shot gun are highly increasing especially after 25 January revaluation [19].

In our study, it's found that there is a significant difference between blunt and penetrating trauma regarding thoracic cage fracture presented only in one case 3.6 % in comparison to blunt trauma in which thoracic cage fracture blunt chest trauma involving 51.4 % rib fractures, 5.6 % Sternal fracture, 5.6 % clavicular fracture .

Regarding the most common thoracic injury in chest trauma, it's found that rib fracture 51.4 % is the most common in blunt chest trauma in comparison to penetrating trauma.67.9 % haemthorax being the most common thoracic injury.

Huber et al. (2014) studied poor outcome predictors after significant chest trauma in multiply injured patients found rib fractures in 11475 (51%) including (35% rib fractures 7794 patient, 16% Flail chest 3681 patient) in accordance with the present study 37(51.4%) patients with blunt chest trauma included (36.1% Multiple rib fracture, 12.5 % Flail chest, 2.8% Single rib fracture) [20].

Kessel et al. (2014) stated that mortality of rib fracture patients was mostly affected by the presence of extra thoracic injuries. [21].

Clavicular fractures and Sternal fracture in the present study complicates only blunt chest trauma each of them presented in 8 patients 5.6 %.

Sternal fracture mostly occurs in car accident due to direct impact injury to the sternum was shown to be the steering wheel or the seatbelt seat belt. [21].

Lung contusion was found in the current study in 60 patient (41.7%) suffered blunt trauma including 8 patients with Pneumatocele and only 12 patient (21.4%) suffered penetrating trauma including one patient with Pneumatocele which nearly similar to Huber et al. (2014) results who studied multiple injured patients and the lung contusion was found in 48% of the patients. [20].

According to Rashid et al. pulmonary contusion is considered to be a relatively benign lesion that does not add to the morbidity or mortality of patients with blunt chest trauma, if managed properly [22].

According to Huber et al. Lung injuries such as contusions or lacerations were only predictive of mortality if major or bilateral [20].

Haemthorax in penetrating trauma presented in 67.9 % of cases in comparable to 43.1% in blunt and pneumothorax presented in 60.7% of penetrating trauma patients in comparable to 44.4% of blunt chest trauma .

Khan et al. in a study of 120 penetrating trauma patients had similar data with the present study finding 78 (65%) patient with haemthorax [23].

Abd El Wadod studied penetrating trauma incidence, pattern and short term outcome in Alexandria university hospital emergency department and found; Simple pneumothorax in 25 cases (40.3%), Tension pneumothorax in 3 cases (4.8%), Pneumothorax with pulmonary contusions in 3 cases (4.8%) which nearly similar to our finding 60.7 % pneumothorax [19].

The most common extra thoracic injuries associated with penetrating chest trauma is internal organ injuries 12

patients (21.4%) followed by diaphragmatic injuries 6 patients (10.7%) then orthopedic injuries 4 patients (7.1%).

El Naggar study included all patients with acute blunt chest trauma presented to ED in Main University Hospital in Alexandria, Egypt through a period from May 2010 till April 2011 and stated that Skeletal injuries were the commonest injuries occurred in the studied patients in agreement with our study in which orthopedic injuries is the most common injury in blunt trauma 17 patient (23.6%) [24].

Diaphragmatic injury in the present study found only in penetrating trauma 6patients (10.7%), gunshot caused four and Stab wounds caused two.

El Naggar reported that the commonest mechanism of penetrating diaphragmatic injury was Gunshot wounds in agreement with the current study [24].

In the present study, only blunt chest trauma had mortality, 10 cases mortality was found (6.9%) 8 of them was associated with traumatic brain injury.

Concerning treatment offered for our studied group of patients surgical treatment mainly offered to penetrate chest trauma 82.1% in contrary to 59.7% in blunt chest trauma with significance value (p value 0.034).

Tube thoracostomy was the most common surgical treatment used in either penetrating 82.1 % or blunt chest trauma 55.6 % with more prevalence in penetrating in a significant way (p 0.013).

Emergency thoracotomy (ET) is a life-saving procedure used to control hemorrhage and relieve cardiac tamponade. ET indications include aortic cross clamping for exsanguinated patients after abdominal injury; pericardial decompression; intrathoracic hemorrhage control; open cardiac massage; and correction of Bronchovenous air embolism [18].

Thoracotomy in penetrating trauma patients involved two Emergency thoracotomy doing cardiac repair 3.6%, urgent thoracotomy doing diaphragmatic repair 7.1 % and lung repair 3.6%, Late thoracotomy doing pleural decortications 3.6 %. Khan et al. performed a prospective study of 120 penetrating chest traumas and found that tube thoracotomy done in 110 patients, the most commonly treatment used in agreement with our study [23].

Regarding the outcome of patients in the present study no mortality occurred among penetrating trauma patients , all patients discharged after complete recovery in contrary to 6.9% mortality 10 patients in blunt trauma died, 81.9% discharged after complete recovery and 11.1% discharged for home treatment without admission.

Ekpe et al. studied determinant of mortality in chest trauma patients and stated nearly similar results to our study describing the overall mortality rate 5.4% in comparable to 6.9% in our study and found that Associated extra thoracic organ injury, high on admission modified early warning score (MEWS) >9, delayed presentation with injury to presentation interval longer than 24 h, and severe chest injury as characterized by bilateral chest involvement correlated positively with mortality [25].

In mismatch with our study Abd El Wadod studied 62 patients with acute penetrating chest trauma presented to Emergency Department of Alexandria Main University Hospitals through retrospective and prospective period from January 2012 to January 2013 and found that seven patients were deceased (11.3%) due to circulatory failure secondary to cardiac penetrating injury in 1 case, massive hemorrhage in 4 cases, and sever lung laceration in 2 cases [19].

Absence of mortality in penetrating trauma patients in our study may be explained by presence of emergency residents rapidly managing any critically ill patients by ATLS guidelines for management and resuscitation in cooperation with our cardiothoracic resident rapid response to consultation and early surgical interference if needed.

The availability of an efficient ambulance service helps to avail of the precious ‘Golden Hour’, so patients suffering from fatal injuries can reach a hospital early [25].

In the present study, blunt trauma patients significantly needed ICU admission (59.7%) more than penetrating trauma (35.7%) which explained by, First the type of pathology resulted from the blunt trauma like multiple rib fractures, flail chest, lung contusion which all of them compromise the respiratory function indicating ICU treatment and monitoring, Second the variety of associated injuries with blunt chest trauma more than penetrating chest trauma which needs ICU admission increasing morbidity and mortality .

Length of hospital ward stay (LOS) nearly similar in blunt and penetrating ranging from 0 to 25 and 1 to 30 day respectively in matching with Khorsandi et al. that found no significant difference in length of hospital stay between patients who suffered blunt trauma and those who sustained penetrating trauma [17].

Length of ICU stay significantly higher in blunt trauma than penetrating ranging from 0 to 27 day in blunt trauma while 0 to 4 days in penetrating trauma in a mismatch with Khorsandi et al. Eleven-year review of outcomes of major cardiothoracic trauma in the North West of England concluded that no significant difference in intensive treatment unit stay between patients who suffered blunt trauma and those who sustained penetrating trauma [17].

Long ICU stay in blunt trauma patients may be explained by the long time needed for treatment of pathology resulted from blunt trauma only as flail chest, multiple rib fracture or lung contusions which present more and in a severe degree in blunt chest trauma patients than penetrating also due to associated injuries as traumatic brain injury which needs long time until recovery.

According to Lema et al. Thirteen patients (8.7%) were admitted in the ICU in lower incidence than our study either blunt (59.7%) or penetrating (35.7%), Lema et al. was found that the need for ICU admission in chest injuries patients still associated with high mortality rate (P = 0.021) [2].

Chest trauma has still a very important type of polytrauma despite advanced in trauma team management. The mortality rate is ranging from about 10% to 60% and the prevalence of chest trauma is still high accounting for 10% of trauma admissions so we need more efforts to decrease these accidents and different educational programs for people and physicians [3].

Conclusions from our work:

1. The incidence of chest trauma was higher in males than females.
2. The incidence of blunt chest trauma was higher than that of penetrating chest trauma.
3. Motor vehicle accidents are the most common mode of blunt chest trauma.
4. Stab injury is the most common mode of penetrating chest trauma.
5. Penetrating injuries require more frequent admission in ward.
   Rib fractures were the commonest injuries in blunt chest trauma.
6. Haemthorax is the most common injury in penetrating chest trauma.
7. Diaphragmatic injury appeared only in penetrating chest injury.
8. Orthopedic injuries are the most common associated injury among blunt trauma patients.
9. Internal organ injuries are the commonest associated injury present with penetrating chest trauma.
10. Tube Thoracotomy is the most common surgical interference done
11. ICU stay period was significantly more in blunt chest trauma than penetrating.
12. Traumatic brain injury was the most common associated injury in blunt chest trauma mortality.
13. There are lot of the limitations of my study so chest injuries require further studies
14. at the end of my study "the careful driving of the drivers".

Recommendations

In the light of the results and conclusions of the current study, the followings are recommended:

1. Further studies of chest trauma patients should be done.
2. All ED staff should be trained and qualified for urgent surgical procedures needed by chest trauma patient as tube thoracotomy, pericardiocentesis, and emergency room thoracotomy.
3. Minimizing chest trauma by providing more safe roads by building Wider roads with safety measures and strict traffic rules.
4. There must be courses to train all people especially the drivers the first aid and how to use aid boxes and not to put them in cars only.
5. Building more trauma centers with training courses about emergency thoracotomy and supplementation of these trauma centers with required tools and trained surgeons.
6. Increasing ICU beds serving trauma patients.

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