Short Term Mortality Predictors in Patients with Chest Trauma in Emergency Department of Suez Canal University Hospital

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Abstract

***Aim*: To identify the short-term mortality predictors in chest trauma patients presented to emergency department at Suez Canal University hospital. *Patients and Methods:* A cross-sectional study was done to identify short-term mortality predictors in 122 chest trauma patients attended the emergency. *Results:* Age distribution ranged from 16-78 years old with mean age 32.14±12.5. Most of the study population was males (90.2%). Ninety percent of patients were discharged alive and 10% patients died. The mean age of the dead patients was 41.8±6.6 and the mean age of the survived patients was 30.9±12. Violence was responsible for 68 (55.7%) of the total cases, this was followed by 46 cases (37.7%) of road traffic collisions. Most frequent injury was haemothorax (52.5%), followed by simple pneumothorax (47.5%) and pulmonary contusion (41%). *Conclusion*: increasing age, delay in arrival, systolic blood pressure, Glasgow Coma Scale, need for intubation and mechanical ventilation are strong predictors of mortality in chest trauma patients.**

Keywords: Emergency ward, chest injuries, short predictors

Introduction

Thoracic trauma is the leading cause of death, morbidity, hospitalization and disability in Americans from the age of 1 year until the middle of the fifth decade of life[(1)]. Globally, 10% of all trauma admissions result from chest injuries and 25% of trauma-related deaths are attributable to chest injuries[(1)]. Chest trauma may be due to penetrating trauma produced by knife or gunshot. 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 diagnostic and therapeutic interventions as injury to the lungs and heart during catheterization[(2)]. There are many predictors of mortality in chest trauma patients as patient factors, injury patterns, and therapeutic interventions. Age, sex, premorbid medications, premorbid level of functioning, and premorbid medical conditions such as renal failure, cardiac disease, and chronic obstructive pulmonary disease affect outcome for patients with thoracic trauma. Systolic blood pressure ≤90, pulse rate ≥120, respiratory rate >29, GCS <8 at the time of admission are independent predictors of mortality in chest trauma[(3)]. increased mortality is associated with; 1- Injury Severity Score, 2- increasing Abbreviated Injury Scale Score for head, abdomen, and extremities, 3- patient hospital course factors such as intubation,

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tracheostomy, elevated creatinine level, development of pneumonia, and number of days in a cervical collar. There are other predictors as the need for mechanical ventilation, high PEEP, emergency surgery indicate serious injury to the lung parenchyma, which is the main determinant of outcome for patients with thoracic trauma[4]. In major chest injuries, it is necessary to avoid delay that may lead to significant morbidity and mortality. Aggressive management of the chest trauma along with prompt treatment of associated injuries is essential for optimal patient outcome[5]. The majority of chest injury complications are preventable. An understanding of the causes, injury patterns, and outcome of these patients is essential for establishment of prevention strategies as well as treatment protocols. Such data is lacking in our environment as there is no local study has been done[6]. Therefore, this study was conducted to highlight causes, injury patterns, and outcome of these patients, in order to establish prevention strategies as well as treatment protocols in our community.

Patients and Methods

This was a cross-sectional study enrolled all patients with chest trauma (any form of physical injury to the chest including the ribs, heart and lungs). It was conducted at department of Emergency, at the Suez Canal University Hospital, Ismailia, Egypt in the period between January 2013 and June 2013. The study received an approval from the Institutional Research Review Board Ethical Committee of the Suez Canal University, Faculty of medicine, Ismailia, Egypt and was conducted in accordance with the guidelines of the Helsinki Declaration, and performed after obtaining an informed verbal consent from all relatives of participants. The study excluded patients who were referred after doing any surgical maneuver, patients discharged on their demand, transferred to other hospitals or escaped before completing their treatment and patients with life threatening conditions other than chest injuries. Each enrolled patient was subjected to [A] full history (from patient or relative) including 1) personal data (age, gender, occupation, residence, patient's file number. 2) Date of admission and date of discharge to calculate the patient's length of stay (LOS). 3) Timing of injury and timing of admission. 4) Mechanism and type of injury. 5) Associated co-morbidity e.g. common endocrinal, cardiovascular, Drug abuse or previous disability. [B] Clinical examination included 1) vital signs: pulse, blood pressure, respiratory rate 2) Glasgow Coma Scale (based on eye, verbal and motor response). 3) Laboratory measurements (Hb, Hematocrit and PT). 4) Plain chest x-ray to confirm diagnosis of chest trauma (fracture rib, pneumothorax, haemothorax, flail chest). Patients were followed up and recorded until one of the following outcomes is reached; discharged, referred to another hospital or died

Statistical Analysis

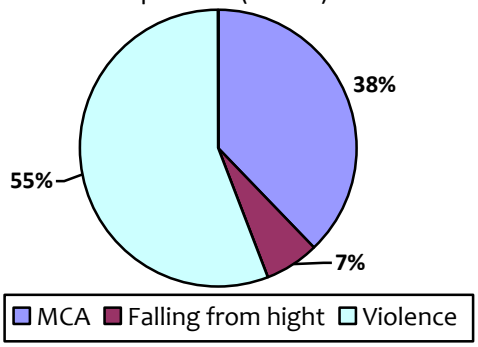
Statistical analysis was performed using SPSS software, version 16 (SPSS, Inc, an IBM Company, Chicago, Illinois). Statistical significance was defined as $p<0.05$.

Results

This study enrolled 122 patients with chest trauma; 110 (90%) patients were discharged alive and 12 (10%) patients died. Figure (1) shows different types of chest trauma. Mortality rate was (9.8%) and statistically related to age ($p=0.03$). Mortality increased from 5.5% in the age group (21-40) to 27% in the age group (41-60) and to 100% in age group (61-80).

The mean of age in survived and dead patients were (30.9±12 and 41.8±6.6) respectively; in which the difference was not statistically different. Most of the patients (86.9%) arrived to hospital in 30-60 min after trauma, (7.8%) arrived within 1-2 hours after trauma, and only (4.9%) arrived to hospital in more than 2 hours. Out of 122 patients, 106 (86.9%) reached in 30-60 min following injury of which 6 of them died (5.7%), and 10 patients reached within 2 hrs following injury 4 of them died (40%). Moreover, among six patients reached after two hrs following injury 2 patients died (33.3%). Indicating that delay in arrival is statistically strongly related with percent of mortality (Table 1). Tables (1, 2) show the relation between different short predictors and mortality. There was a statistically significant difference with delay in arrival, type of trauma, history of co-morbidity and primary history of clinical evaluation. Table (3) shows type of treatment and Figure (2) shows the outcomes.

Figure 1: Mechanism of injury among the studied patients (n=122)



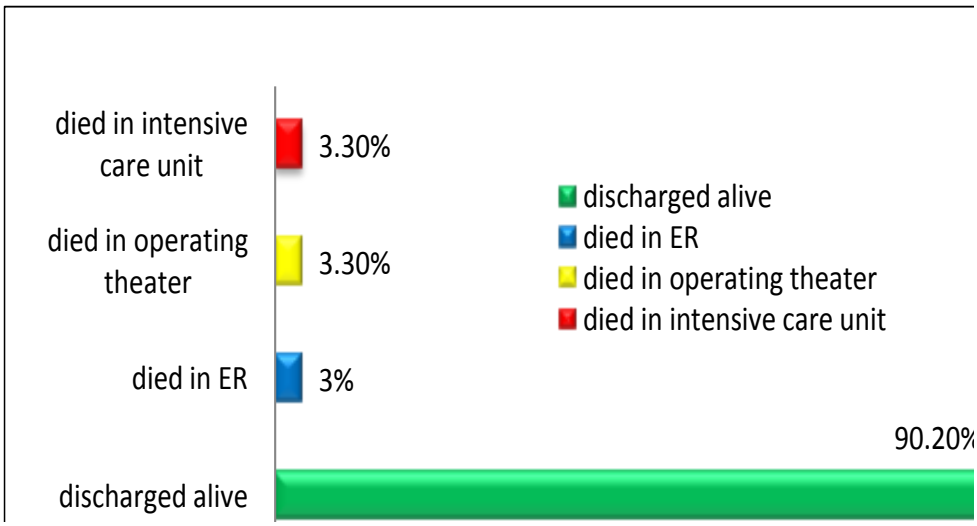


Figure 2: Distribution of the studied patients was according to their outcome

Table 1: relation between delay in arrival and mortality (n= 122)

	Time in arriving hospital	Survived (n=110)	Died (N = 12)	Mortality %	*Chi square*	P value
Delay in arrival	30 – 60 min	100	6	(5.7%)	20.3	0.02*
	1 – 2 hour	6	4	(40%)		
	≥ 2 hours	4	2	(33.3%)		
Type of trauma	Blunt	10	42	19.2%	4.5	0.034*
	Penetrating	2	70	2.8%		

*****=*Statistically significant*

Discussion

Regarding age, Jaspelsingh et al stated that mortality increases with age[7]. Copes et al. in a large study showed that mortality becomes near ly double for patients >50 years of age for the same degree of injury severity as compared to patients below 50 years of age[8].

Table 2: Relation between different short predictors and mortality (n=122)

Variables		Died (N = 12)	Survived (n=110)	P value[@]
History of co-morbidity	DM	2	6	0.2
	Respiratory disease	2	2	0.05
	Cardiovascular disease	4	8	0.04*
	Others	2	2	0.05
primary clinical evaluation	Heart rate	10 (17.8%)	46 (82.2%)	0.053
	> 100	2 (3%)	64 (97%)	
	60 – 100			
	Systolic blood pressure	0	82 (100%)	<0.01*
	> 90	12 (30%)	28 (70%)	
	≤ 90			
	Respiratory rate	6 (7.5%)	74 (92.5%)	0.3
	< 20	6 (14.3%)	36 (85.7%)	
	≥ 20			
	Galascow coma scale	4 (3.6%)	106 (96.4%)	<0.01*
	> 8	8 (66.7%)	4 (33.3%)	
	≤ 8			
	Hb (gm/dl) mean ± SD	10.017±1.38	12.2± 2.2	0.07[$]
	HCT (%) mean ± SD	30.11± 4.55	34.55± 6.35	0.2[$]
	PT (seconds) mean ± SD	17.6 ±3.6	15± 2.02	0.02*[$]
	No. blood units mean ± SD	3.5 ± 3.3	0.8 ± 1.7	0.054[$]
	Need for intubation	8 (50%)	8 (50%)	<0.01*
	Yes	4 (3.7%)	102 (96.3%)	
	No			
	Need for ICU	8 (33.3%)	16 (66.7%)	0.02*
	Yes	4 (4%)	94 (96%)	
	No			

***** *=Statistically significant (p-value < 0.05);* [@]*= chi square;* [$]*= T test*

In our results out of 122 patients, 110 (90%) patients were discharged alive and 12 (10%) patients died. Our results showed a significant increase in mortality with the increase in age. As regards the delay in arrival to the hospital after injury, the study by Jaspelsingh et al stated that there was a graded increase in mortality with increase in delay in arrival[7]. This agreed with our study results that indicated a significant association between increased in mortality rate and delay in arrival. As regard to concomitant morbidity, one study reported that mortality was significantly associated with pre-morbid illness[6].

Table 3: patients according to the type of treatment (n=122)

Trauma management	Number	%
Conservative		
Conservative treatment	4	3.3%
Chest tube under water seal	104	85.2%
Operative (open thoracotomy)	14	11.5%

VirgósSeñor et al., reported relevant medical history included chronic bronchial disease in 20.3% and ischemic heart disease in 14.8% and 6.5% had a history of both[9]. In 2007, a study reported concomitant comorbidities were found in 66.7% of patient. No association was found between comorbidities and hospital outcomes except in those who were diabetic and those with chronic lung disease)[1]. In our study out of 122 patients only 24 (19.7%) patients had a history of comorbidity and only cardiovascular diseases showing statistically significant relation with the patient survival. In agreement with our results, VirgósSeñor et al., found that haemodynamic instability was in 100% of the dead patients and 44% in survived patients with statistically significant relation. As regard to need for intubation, David et al. reported that 12 % of patients were intubated, and 4.3% required a tracheostomy[10]. VirgósSeñor et al. reported that 68.7% of patients needed mechanical ventilation in comparison to 31.3 % didn't need it[3]. In our results, the need for intubation shows statistically significant relation with mortality. VirgósSeñor et al found that the mean length of ICU stay is 5±2.6 days[3]. The need for ICU admission was found to be significantly associated with mortality in other study [11]. In agreement with our results mean days of ICU admission was 0.7 ±1.9. ICU admission was found to be significantly related with mortality. Another study reported that the overall length of hospital stay ranged from 1 day to 120 days (mean =13.17 days). The LOS for non-survivors ranged from 1 day to 14 days (mean =4.43 days)[10]. In our results, the mean length of hospital stay in the survived patients was 8.4±3.5 days in contrast to 1±1.5 day for the dead patients with statistically significant difference between them.

Conclusion

Delay in arrival was strongly related to the percent of mortality. Mortality was higher among those who reached after 2 hours following injury. Violence was responsible for more than half of the total cases; this was followed by road traffic collisions. Blunt trauma was less common than penetrating one. Cardiovascular diseases showed a statistically significant relation with the patient survival. Systolic blood pressure and Glasgow coma scale could predict mortality with statistically signifi-

cant relation. The most frequent chest injury was haemothorax, followed by simple pneumothorax and pulmonary contusion. Only tension pneumothorax and tracheobronchial injury were positive predictors of mortality. Head, spine, and extremities injuries were good predictors of mortality in chest trauma patients as it was statistically significant associated with mortality. Most of the patients can be managed by underwater seal chest tube. Few needed conservative management and minority needed thoracotomy. Most of the patients needed intubation, with statistically significant relation with mortality. Mean days of ICU admission had a statistically significant relation with mortality. The mean length of hospital stay showed a statistically significant difference between the two groups (Survived and dead patients). Most of the patients were discharged alive.

Declaration of interest

The authors report no declarations of interest. The authors alone are responsible for the content and writing of the paper.

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