

Survival rate in patients undergoing emergency thoracotomy for penetrating and blunt thoracic trauma-A retrospective analysis

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Abstract

Objective: To determine the survival rate in patients undergoing emergency thoracotomy for penetrating and blunt thoracic trauma. **Material and Methods:** This retrospective observational study was conducted in Cardiothoracic surgery unit, MTI-LRH, Peshawar, KPK, Pakistan from 1st January 2019 to 31st December 2022. Clinical record of all patients who underwent emergency thoracotomy were retrospectively analyzed. Patients of all ages, both sexes and having isolated penetrating and blunt chest trauma were included in the study, Patients having emergency department thoracotomy or urgent thoracotomy post-surgical and post poly trauma were excluded from the study. Emergency thoracotomy was performed through posterolateral thoracotomy by the consultant with ICU back-up. Survival rate during hospital stay was determined by statistical analysis using latest SPSS version. **Results:** Out of 113 emergency thoracotomy cases, 67 were penetrating chest trauma and 46 were blunt chest trauma, male to female ratio was 3:1 with a mean age of 23 years. Among 67 penetrating chest trauma cases, 49 were firearm injuries while stab injury cases were 18. Thirty-one road traffic accident cases were reported in 46 blunt chest trauma cases, while 15 blunt chest trauma patients presented with the history of fall. Overall mortality was 9.73% and was higher in the blunt chest trauma group than in the penetrating chest trauma group 13.04% vs 7.46%. Overall survival rate was 90.26% and was higher in penetrating chest trauma group 92.53%, than in blunt chest trauma group 86.95%. **Conclusion:** Survival rate after emergency thoracotomy was higher in patients with penetrating chest trauma. The emergency thoracotomy should be performed in both penetrating and blunt chest trauma as quickly as possible and should be limited to damage control. It also emerges that blood loss, acidosis and hypothermia in chest trauma patients need to be treated extremely aggressively before, during, and after emergency thoracotomy.

Keywords: Survival rate, emergency thoracotomy, penetrating chest trauma, blunt chest traum

Introduction

Thoracic trauma is a significant cause of morbidity and mortality all over the world. It occurs in over half of the cases of traumas and is related with a high mortality rate (~25%). Most of chest trauma patients can be managed effectively with chest tube thoracostomy, however, few cases do require emergency room thoracotomy (EDT), likewise named "resuscitative thoracotomy". This procedure is performed in cases having direct major thoracic injury, or as a part of CPR (cardiopulmonary resuscitation) in different trauma patients, or in thoracic trauma patients with massive hemothorax, for example, penetrating cardiac injury or injury to the major intrathoracic vessels¹. The survival rate after EDT revealed by the American School of Specialists Board on Trauma is 15-21%. The high survival rate (15%) was reported in penetrating chest trauma while lower survival rate (2.4%) was observed after blunt trauma. The survival of patients undergoing emergency thoracotomy for both penetrating and blunt thoracic trauma remains a critical concern in the field of trauma surgery. Emergency thoracotomy, a life-saving surgical intervention, is performed to address life-threatening injuries to the thoracic region, including the heart, lungs, and major blood vessels². The decision to perform an emergency thoracotomy is often made in high-stress situations, where prompt intervention can mean the difference between life and death. Thoracic trauma, whether caused by penetrating injuries such as gunshot wounds or stab wounds, or by blunt mechanisms like motor vehicle accidents or falls, can result in severe damage to vital structures within the thoracic cavity. Emergency thoracotomy is aimed at rapidly addressing the injuries and providing immediate resuscitation and surgical intervention when necessary³. However, the outcomes of emergency thoracotomy can vary significantly based on the mechanism of injury, the patient's condition upon arrival, and the timing of intervention. Understanding the survival rates and associated factors in patients undergoing emergency thoracotomy for both penetrating and blunt thoracic trauma is crucial for optimizing trauma care protocols and enhancing patient outcomes⁴.

This study aims to investigate the survival rates and identify potential prognostic indicators that can aid in clinical decision-making for emergency thoracotomy cases. By analyzing a diverse cohort of patients and examining the outcomes based on injury characteristics, this research contributes valuable insights into the challenges and potential strategies for improving survival rates in this critical subset of trauma patients. The management of patients undergoing emergency thoracotomy for penetrating and blunt thoracic trauma presents a complex clinical scenario that demands swift and precise intervention. The thoracic region houses vital structures, including the heart, major blood vessels, and lungs, and injuries to these structures can lead to rapid deterioration and loss of life. Emergency thoracotomy serves as a last-ditch effort to address life-threatening injuries and restore hemodynamic stability in patients who have experienced severe trauma. The decision to perform an emergency thoracotomy is not taken lightly, as it involves a careful assessment of the patient's clinical status, the mechanism of injury, and the likelihood of successful intervention⁵. For penetrating trauma, such as gunshot wounds or stab wounds, the need for immediate surgical control of bleeding is paramount. In cases of blunt trauma, where injuries may be less overt, emergency thoracotomy can still be a critical intervention to manage internal bleeding, cardiac injuries, and lung contusions. Despite the advancements in trauma care, the survival rates of patients undergoing emergency thoracotomy for thoracic trauma remain variable and often challenging to predict. This variability is influenced by a multitude of factors, including the extent of injury, the timeliness of intervention, the availability of resources, and the overall health status of the patient. Understanding these factors and their impact on survival rates is pivotal for refining trauma management protocols and optimizing outcomes for these critically injured patients⁶.

Objective

To determine the survival rate in patients undergoing emergency thoracotomy for penetrating and blunt thoracic trauma.

Material and Methods

This retrospective observational study was conducted in Cardiothoracic surgery unit, MTI-LRH, Peshawar, KPK, Pakistan from 1st January 2019 to 31st December 2022.

Inclusion Criteria:

Patients of all ages who underwent emergency thoracotomy during the specified study period.
Both male and female patients.
Patients with isolated penetrating and blunt chest trauma.

Exclusion Criteria:

Patients who underwent emergency department thoracotomy.
Patients who underwent urgent thoracotomy post-surgery and post-polytrauma.
Patients with incomplete or missing clinical records.

Data Collection

Clinical records of eligible patients were retrospectively analyzed, encompassing demographic details, medical history, injury mechanism, surgical intervention details, and outcome information. The emergency thoracotomy procedure was performed by a consultant in the Cardiothoracic Surgery Unit. The procedure involved a posterolateral thoracotomy approach. The surgical team was supported by an intensive care unit (ICU) team to manage immediate postoperative care.

Statistical Analysis

The survival rate was determined through statistical analysis using the latest version of the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were employed to summarize the demographic characteristics of the study population. Survival rates were calculated as percentages of patients who survived during their hospital stay. A comprehensive statistical analysis was performed to assess the relationship between survival rates and potential influencing factors.

Results

Data was collected from 113 patients. Mean age of the patients was 42.8 ± 15.2 years. There were 80 males and 33 females. Out of 113 emergency thoracotomy cases, 67 (59.29%) was penetrating chest trauma and 46 (40.70%) was blunt chest trauma, male to female ratio was 3:1 with a mean age of 23 years. Among 67 penetrating chest traumas, 49 (73.13%) were firearm injury cases, while stab injury cases were 18 (26.86%).

Thirty-one (67.39%) road traffic accident cases were reported in blunt trauma chest, while 15 (32.60%) cases presented with the history of fall.

Table 01: Demographic characteristics of patients

Characteristics	Total Participants (n=113)	Penetrating Chest Trauma (n=67)	Blunt Thoracic Trauma (n=46)
Age (years)	Mean: 42.8 ± 15.2	Mean: 40.5 ± 14.1	Mean: 46.7 ± 16.3
Gender	Male: 80 (70.79%) Female: 33 (29.20%)	Male: 48 (71.64%) Female: 19 (28.35%)	Male: 32 (69.56%) Female: 14 (30.43%)

The overall mortality rate observed in the study was 9.73% (11 out of 113 cases). Notably, the mortality rate was higher in the blunt chest trauma group (7.46%, 5 out of 67 cases) compared to the penetrating chest trauma group (13.04%, 6 out of 46 cases). On the other hand, the overall survival rate during hospitalization was 90.26% (102 out of 113 cases). This survival rate was found to be higher in the penetrating chest trauma group (92.53%, 62 out of 67 cases) compared to the blunt chest trauma group (86.95%, 40 out of 46 cases).

Table 02: Types of Injuries

Characteristics	Total Cases (n=113)	Penetrating Chest Trauma (n=67)	Blunt Thoracic Trauma (n=46)
Trauma Type			
- Penetrating Chest Trauma	67 (59.29%)	67 (100%)	-
- Blunt Thoracic Trauma	46 (40.70%)	-	46 (100%)
Mechanism of Injury (PCT)			
- Firearm Injury	49 (73.13%)	49 (73.13%)	-
- Stab Injury	18 (26.86%)	18 (26.86%)	-
Mechanism of Injury (BTT)			
- Road Traffic Accident	-	-	31 (67.3%)
- Fall	-	-	15 (32.6%)

Table 03: Survival rate

Outcomes	Total Cases (n=113)	Penetrating Trauma (n=67)	Blunt Trauma (n=46)
Mortality (n, %)	11 (9.73%)	5 (7.46%)	6 (13.04%)
Survival Rate (n, %)	102 (90.26%)	62 (92.53%)	40 (86.95%)

Table 04: Mortality comparison between PCT and BCT

Trauma Type	Mortality (n)	Mortality (%)
Penetrating Chest Trauma	5	7.46%
Blunt Chest Trauma	6	13.04%

Discussion

Our study defines differing results and patterns related with thoracic trauma, giving significant experiences to clinical practice and further exploration. The socioeconomics review of the study population uncovered the group of people and a mean age of 23 years with the pattern of thoracic trauma being more common among young age group⁷⁻⁸. Penetrating chest trauma was more common than blunt trauma, with gunshot wounds being the main source in the penetrating and road traffic accidents in the blunt chest trauma. These observations are consistent with the previous studies that highlights the higher incidence of gunshot wounds in penetrating chest trauma and road traffic accidents in blunt chest trauma cases⁹. The mortality rate observed in our study was 9.73%, with a higher mortality rate in the blunt chest trauma cases (13.04%) compared with the penetrating chest trauma cases (7.4%). This could be related to the major thoracic injury due to blunt chest trauma, for example, road traffic accidents, which frequently bring about serious injury to the intrathoracic organs¹⁰. The survival rate, then again, was higher in the penetrating chest trauma cases (92.53%) compared with the blunt chest trauma cases (86.95%). These results reflect the potential for additional thoracic and associated non thoracic injuries in blunt chest trauma cases. The results of this study highlight the basic idea of emergency thoracotomy and the significance of brief and viable mediations in trauma patients¹¹. The higher mortality observed in blunt chest trauma highlights the importance of relevant and urgent surgical intervention to address major thoracic injury. Our study likewise emphasizes the significance of early detection, assessment, and

appropriate management for both penetrating and blunt chest trauma cases. Recognizing the limitations of our study is important^{12,13}. Being an observational review, it is dependent upon innate inclinations and restrictions related with such plans. Furthermore, the review was restricted and directed at a solitary foundation, which might restrict the generalization of the outcomes to more extensive populaces^{14,15}.

Conclusion

Our study explains the survival rates and mortality outcomes in patients undergoing emergency thoracotomy for penetrating and blunt thoracic trauma. The findings stress the significance of tailored interventions based on the type of trauma, emphasizing the need for prompt and effective management strategies. Blunt chest trauma demonstrated a higher mortality rate, highlighting the urgency and complexity of injuries associated with such cases.

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