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The Relationship between Thoracic Trauma Scoring and Mortality in Blunt Thoracic Trauma Patients at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

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A B S T R A C T

Introduction: Closed thoracic trauma is frequently associated with rib fractures and pulmonary contusions. Thoracic trauma can be life-threatening if it is not treated immediately and properly. This study aimed to determine the relationship between thoracic trauma scoring and mortality in blunt thoracic trauma patients in sub-population Indonesia, especially at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. **Methods:** This study is a cross-sectional observational study. A total of 70 research subjects participated in this study. Data analysis was carried out using SPSS in univariate and bivariate to determine the relationship between thoracic trauma scoring and mortality. **Results:** There is a significant relationship between CTS scores and mortality (p = 0.000). Patients with a CTS score ≥ 5 were significantly more at risk of dying than patients with a CTS score < 5 (p = 0.000). **Conclusion:** There is a relationship between CTS score and blunt trauma patient mortality thorax at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

1. Introduction

Thoracic trauma is the third most common cause of death from trauma, after head and spinal cord injuries. Thoracic trauma accounts for 15-20% of all injuries, with mortality rates ranging from 10% to 60%.[1-4] Based on the 2018 Riskesdas, the highest incidence of injuries in Indonesia occurred in the home environment (44.7%), roads (31.4%), and workplaces (9.1%). The percentage of chest trauma incidents is 2.6% in Indonesia and 3.0% in South Sumatra. The incidence of injuries that interfere with daily activities is 8.05%, with the incidence of injuries to the chest around 4.05% in Palembang.[5]

Thoracic trauma has a wide spectrum ranging from injuries to the chest wall to vital organs within the thoracic cavity. Thoracic trauma can be either penetrating or blunt, and management varies from conservative to invasive.[4] Thoracic trauma can occur at all ages and genders, with the most common causes being traffic accidents, falls from heights, and crush injuries. Closed thoracic trauma is frequently associated with rib fractures and pulmonary

contusions. Thoracic trauma can be life-threatening if it is not treated immediately and properly.[2,3,6]

Various assessment frameworks have been devised for prognostic value in thoracic trauma patients, among others, chest trauma score (CTS), thoracic trauma severity score (TTS), injury severity score (ISS), abbreviated injury score thoracic (AIS thoracic), and pulmonary contusion score (PCS).[2,4,7] Due to the difficulty of applying multiple scores, lack of significance for predicting outcomes, or limited resources, there is no universal scoring system. Studies conducted on scoring systems for thoracic trauma recognize age, rib fractures, lung contusions, and bilateral injuries as the most important factors influencing the prognosis of thoracic trauma patients. These factors, individually or in combination, can help in predicting outcomes.[4,7] CTS stems from several previously identified factors that are associated with poor outcomes.[9] CTS includes 4 parameters, including patient age (1-3 points), pulmonary contusion (0-3 points), number of rib fractures (1-3 points), and bilateral rib fractures (2 points). Scores range from 0 to 11. This score was first developed using a single institutional sample of 649 patients by Pressley et al. and later validated in 1361 patients at another single institution by Chen et al.[4,7,9] This study aimed to determine the relationship between thoracic trauma scoring and mortality in blunt thoracic trauma patients in the Indonesian subpopulation, especially at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

2. Methods

This study is an analytic observational study with a cross-sectional approach. This study uses secondary data obtained from the Medical Records Installation of Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. A total of 70 research subjects participated in this study, and the research subjects met the inclusion criteria. The inclusion criteria in this study are:

Patients with a diagnosis of blunt thoracic trauma were admitted to the emergency department and the surgical ward of Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, period January - December 2022, and has complete medical record data. This study was approved by the medical and health research ethics committee at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

The chest trauma score (CTS) is derived from several previously identified factors that are associated with poor outcomes. CTS includes 4 parameters, including patient age (1-3 points), pulmonary contusion (0-3 points), number of rib fractures (1-3 points), and bilateral rib fractures (2 points). Scores ranged from 0 to 11. Data analysis was carried out using SPSS version 25. Analysis was performed using univariate and bivariate methods. Univariate analysis was performed to present the distribution of each data variable test. Bivariate analysis was carried out to determine the relationship between CTS scores and mortality in research subjects, with a p-value <0.05.

3. Results

Table 1 presents the characteristics of blunt thoracic trauma subjects. The majority of research subjects were male and aged <45 years. The majority of research subjects had bilateral rib fractures. The subject study majority have a pulmonary contusion. In this study, 10 out of 28 patients (35.7%) died with a CTS score ≥ 5, while none of the patients with a CTS score < 5 died. With statistical analysis, the results showed that there was a significant relationship between CTS scores and mortality (p = 0.000). Patients with a CTS score ≥ 5 were significantly more at risk of dying than patients with a CTS score < 5 (p = 0.000), shown in Table 2.

4. Discussion

In this study, 14.3% of blunt thoracic trauma patients died. When associated with CTS values, there is a significant relationship between CTS values ≥ 5 and mortality. In line with this research, other research revealed that a CTS score ≥ 5 was significantly associated with mortality. Patients with a CTS score ≥ 5 were significantly at risk of 6,136 deaths

compared to patients with CTS < 5. Other studies reported that the CTS score had a sensitivity of 100%, a specificity of 67.6%, a positive predictive value of 68.7%, a negative predictive value of 0%, and a 71.8% accuracy value in predicting mortality.[10-13]

Table 1. Characteristics of blunt thoracic trauma subjects.

Characteristics	Frequency	Percentage (%)
Gender		
Male	59	84,3
Female	11	15,7
Age		
< 45 years	41	58,6
45 - 65 years	20	28,6
> 65 years	9	12,9
Age		
Mean ± SD	41,37 ± 19,31	
Median (Min-Max)	42 (4 – 88)	
Bilateral rib fracture		
Yes	3	4,3
No	67	95,7
Number of rib fractures		
No rib fractures	26	37,1
< 3	14	20,0
3 -5	21	30,0
> 5	9	12,9
Lung contusion		
No	32	45,7
Minor unilateral	17	24,3
Minor bilateral	7	10,0
Mayor unilateral	10	14,3
Mayor bilateral	4	5,7

Table 2. Correlation between CTS score and mortality in blunt thoracic trauma patients.

Characteristics	Mortality		P value
	Yes	No	
CTS score			
≥ 5	10	18	0,000*
< 5	0	42	

Fisher exact test, *p < 0,05.

Thoracic trauma is on the rise, and many patients die before being admitted to hospital. Most of the causes of mortality and morbidity in blunt thoracic trauma are delayed pulmonary complications. The preventable in-hospital death rate in trauma patients is between 4% and 60% worldwide. The degree of pulmonary contusion plays an important role in developing respiratory complications, such as pneumonia and acute respiratory distress syndrome (ARDS). The presence of a severe pulmonary contusion is an important prognostic factor leading to long-term intubation with the risk of developing pneumonia and ARDS and more than double the mortality rate when a pulmonary contusion is complicated and flail chest.[14-16]

Various pathophysiological mechanisms can cause problems in patients with blunt trauma thorax and can cause premature death if not recognized and treated promptly. However, only 10 to 15% of patients with thoracic injuries require a thoracotomy. The primary goal of such an emergency thoracotomy is to release the pericardial tamponade; control

intrathoracic vascular or cardiac bleeding; control massive air embolism or bronchopleural fistula; do open heart massage; and allow temporary occlusion of the descending thoracic aorta to redistribute restricted blood flow to the myocardium and brain and limit subdiaphragmatic bleeding.[17-19]

5. Conclusion

There is a relationship between CTS score and blunt trauma patient mortality thorax at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

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