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Chest Trauma Score of Thoracic Trauma Patients in Dr. Mohammad Hoesin General Hospital Palembang January-June 2020

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Abstract

Introduction: Thoracic trauma has mortality rates varying from 10% to 60%. Various scoring frameworks have been created for prognostic value in thoracic trauma patients, including the chest trauma score (CTS). This has not been studied in Indonesian patients. The authors decided to study the picture of CTS in thoracic trauma patients in the Indonesian subpopulation, especially in our hospital.

Methods: This research is an analytical observational study at dr. Mohammad Hoesin (RSMH) Palembang in January-June 2020. Our research variables are age, lung contusions, number of rib fractures, bilateral rib fractures, and Chest Trauma Score (CTS). 37 cases could be analyzed with the length of stay, ICU care, mortality, and surgery option.

Results: The most common thoracic trauma occurred at the age between less than 45 years, the highest degree of lung contusions was unilateral minor lung contusions. The most common rib fractures were <3 rib fractures. Chest Trauma Score in this study were less than 5. The CTS score had a significant relationship with length of stay and the need of ICU, but was not significantly associated with mortality and surgery option.

Conclusion: Chest trauma score can be used to consider the length of treatment and priority needs of the ICU which will be prepared for the management of thoracic trauma patients, especially the young who are accompanied by lung contusions and rib fractures.

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Keywords: chest trauma, rib fractures, thoracic trauma

1. Introduction

Trauma is a common medical problem that deserves attention worldwide, because it is a cause of high morbidity and mortality in both developed and developing countries.[1] In Indonesia, trauma is the leading cause of death in the 15-24 year age group and the second leading cause of death in the 25-34 year age group.[2] 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 varying from 10% to 60%.[3]

CTS is derived from several previously identified factors associated with poor outcome.[4] CTS includes 4 parameters including patient age (1-3 points), pulmonary contusions (0-3 points), the number of rib fractures (1-3 points), and bilateral rib fractures (2 points). The scores range from 0 to 11. This score was first developed using a single institutional sample of 649 patients by Pressley et al. and then validated in 1,361 patients at another single institution by Chen et al.[4]

Chen et al. found that this simple score can predict the likelihood of adverse outcomes such as complications and mortality in thoracic trauma patients if CTS is ≥5.[3] Therefore, the authors decided to study the features of CTS in thoracic trauma patients in the Indonesian subpopulation, especially at our hospital.

2. Methods

This research method is an analytic observational study at Dr. Mohammad Hoesin (RSMH) Palembang. This research was conducted at the Emergency Room and Surgical Ward of RSMH Palembang. The population in this study were all thoracic trauma patients at RSMH Palembang from January to June 2020. This sampling method where all members of the population who met the inclusion criteria were included in this study.

Inclusion criteria in this study were patients with a diagnosis of thoracic trauma who were admitted to the ER and Surgical Ward of RSMH Palembang for the period of January - June 2020.

Patients aged <18 years and patients with significant injuries to other body parts were excluded from this study.

The variables used in this study were age, lung contusions, number of rib fractures, bilateral rib fractures, and Chest Trauma Score (CTS). All of these variables are components of the assessment on the CTS. Data in this study were processed descriptively and analytically based on the number of cases obtained in accordance with the variables studied. The research results are presented in tabular form which is further explained in narrative form.

Table 1. General characteristics of research subjects

Characteristics		N	%
Age	< 45 years	24	64.9
	45 – 65 years	11	29.7
	> 65 years	2	5.4
Lung contusion	None	13	35.1
	Minor unilateral	13	35.1
	Mayor unilateral	9	24.3
	Minor bilateral	2	5.4
	Mayor bilateral	0	0
Number of Rib fracture	< 3 rib fracture	30	81.1
	3 - 5 rib fracture	5	13.5
	> 5 rib fracture	2	5.4
Bilateal Rib fracture	None	37	100
	Yes	0	0
Chest trauma score	< 5	27	73
	≥ 5	10	27

3. Results

The general characteristics of thoracic trauma in this study occurred in 24 patients age less than 45 years (64.9%). 11 patients age 45 to 65 years (29.7%). and 2 patients age >65 years (5.4%). This study showed that 13 patients had thoracic trauma without pulmonary contusions (35.1%), 13 patients had unilateral minor thoracic contusions (35.1%), 9 patients experienced unilateral major lung contusions thoracic trauma (24.3%), 2 patients had bilateral minor thoracic contusions (5.4%), and no patient had bilateral major lung contusions (0%). Fractures <3 ribs occurred in 30 thoracic trauma patients, 5 patients had thoracic trauma with 3-5 rib fractures (13.5%), and 2 patients had thoracic trauma with > 5 rib fractures (5.4%). Based on the study, 37 patients experienced thoracic trauma without bilateral rib fractures (100%) and 0 patients experienced thoracic trauma with bilateral rib fractures (0%).

The characteristic of Chest Trauma Score <5 occurred in 27 patients (73%) and 10 patients experienced thoracic trauma with Chest Trauma Score > 5 (27%). Patients who experienced thoracic trauma with a Chest Trauma Score <5 had an average stay of 3.74 days with the minimum length of treatment was 2 days, the longest treatment was 10 days, the most frequent treatment was 3 days, and a total of 101 days of treatment for all patients. Patients who experienced thoracic trauma with a Chest Trauma Score> 5 were treated for 6 days with a minimum of 3 days of treatment, 8 days of longest treatment, 5 days of treatment most, and a total of 60 days of treatment for all patients.

There were 26 thoracic trauma patients who did not die with a Chest Trauma Score <5 and one thoracic trauma patient who died with a Chest Trauma Score> 5. There were 2 patients who experienced thoracic trauma with a Chest Trauma Score> 5 who died and 8 who did not die. There were 16 thoracic trauma patients who were not done thoracotomy with Chest Trauma Score <5 and 11 thoracic trauma patients who were done thoracotomy with Chest Trauma Score> 5. There were 5 patients who experienced thoracic trauma with a Chest Trauma Score > 5 and 5 people who were not done thoracotomy.

Table 2. Characteristics of the chest trauma score of research subjects (n = 37)

Variable		Chest trauma score		P value (chi square test)
		< 5	≥5	
Length of stay (days)	Average	3.74	6	0.005
		4.35		
	Shortest	2	3	
	Maximum	10	8	
	Most often	3	5	
	Total	101	60	
		161		
Mortality death	Died	1	2	0.107
	Not died	26	8	
Surgery	Thoractomy	11	5	0.614
	Without thoractomy	16	5	
ICU care	ICU	1	5	0.001
	Without ICU	26	5	

Based on this study, there were 26 thoracic trauma patients who were not admitted to the ICU with a Chest Trauma Score <5 and 1 thoracic trauma patient who was admitted to the ICU with a Chest Trauma Score >5. Five patients who experienced thoracic trauma with a Chest Trauma Score> 5 were admitted to the ICU and 5 people who were not admitted to the ICU.

4. Discussion

The results showed that the age group that experienced the most thoracic trauma was the age group less than 45 years, followed by the 45 to 65 year group in second place, with an mean age of 36.8 years. The results of the study in Manado also show that the age of 16-25 years is the age of the thoracic blunt trauma patient.[5] However, the results of the study in Kediri show that the largest age group is 46-60 years.[6] Indonesian productive age is directly proportional to the probability of traffic accident.[7] Traffic discipline compliance, which is dominated by productive working age, is determined by promotional and law enforcement efforts to prevent traffic accidents.[8] The level of awareness of using

helmet while riding also determines the incidence of accidents in motorbike rider aged <45 years as a prevention of thoracic trauma.[9]

Unilateral minor lung contusions were the most common cases in this study as many as 35.1%, followed by unilateral major lung contusions (24.3%), bilateral minor lung contusions (5.4%) and none of the patients had bilateral major lung contusions. The results of the European study also showed that unilateral lung contusions (105 patients) were also higher than bilateral lung contusions (79 patients).[10] The results of this study which showed that pulmonary contusions occurred in 79.2% of thoracic trauma cases were different from the results of studies in India that reported pulmonary contusions occurred in 25-35%.[11] A study in Spain also reported that 22.9% of thoracic trauma had pulmonary contusions with a mortality rate of 35.7%.[12] Pulmonary contusions produced an acute inflammatory response by activation of hypoxia-inducible factor-1α in alveolar epithelial cells type 2.[13] Increased severity of lung contusions was proportional to is straightforward with a decrease in cardiac output which will interfere with the O_2 and CO_2 gas exchange system in the alveolus.[14] Respiratory failure results from a decrease in surfactant during the first 30 minutes of pulmonary contusions followed by a secondary inflammatory response in cases of unilateral pulmonary contusions.[15]

Thoracic trauma with <3 rib fractures accounted for 30 patients or 81.1% of the total cases followed by thoracic trauma with 3-5 rib fractures (13.5%) and thoracic trauma with> 5 rib fractures (5.4%). Thoracic trauma with <3 rib fractures (298 cases) more than 3 rib fractures (28 cases) was also reported by the Turkish study.[16] However, the Kediri study reported that only 29% of thoracic trauma cases were associated with rib fractures. 40% of thoracic fractures were also reported by a study in Manado.[17] The number of rib fractures is directly proportional to the amount of energy that causes thoracic trauma.[18] The location of the rib fracture will also determine the complications of the viscera organ that will be lacerated.[19] However, it is not a determinant of the length of the post-rib fracture medical rehabilitation program, which is determined by the presence or absence of comorbid Chronic Obstructive Pulmonary Disease (COPD) before the occurrence of thoracic trauma.[20]

Thoracic trauma was not accompanied by bilateral rib fractures in this study. This is different from a study in the United States which reported that 120 patients out of 385 cases of thoracic trauma experienced bilateral rib fractures.[21] Bilateral rib fractures also occurred in 4 cases out of a total of 295 thoracic trauma events in Taiwan.[22] Bilateral rib fractures are indicative of complications. respiration.[23] Flail chest can occur in cases of thoracic trauma accompanied by bilateral rib fractures.[24] Cardiac

pulmonary resuscitation deserves attention because it has been a deadly secondary cause of bilateral rib fractures in children.[25]

The number of patients with Chest Trauma Score <5 is more than patients with Chest Trauma Score> 5. The results of another study with higher CTS <5 results were also reported from the United States which enrolled 724 patients with CTS <5 and 637 patients with CTS> 5.[4] Patients with a Chest Trauma Score of 7 or 8 reflected a higher risk of mortality, intensive care, and intubation. large.[26] Chest Trauma Score> 5 predicts longer hospitalization and ventilator use. This scoring system may aid in earlier diagnosis on which to base decisions such as epidural anesthesia, ventilation, and fracture fixation surgery. However, CTS is considered less superior than RibScore (RS) in the approach to diagnosis and management of rib fractures.[27] Another US study of 385 thoracic trauma patients showed that the RibScore predicts respiratory system complications and represents a standardized assessment of the degree of rib fracture severity that might be used. for communication and determining the prognosis of thoracic trauma patients.[21]

The significant relationship between the length of treatment and the CTS value is shown by the P value of the chi square test of 0.005. The CTS value was directly proportional to the mean length of patient care 4.35 days. Patients with CTS <5 had a median of 3.74 days and CTS> 5 had a mean of 6 days. Low CTS scores (<5) can be treated for the shortest of 2 days compared to high CTS (<5) with the shortest treatment for 3 days. The most frequent length of stay and CTS values were also directly proportional according to the CTS data <5 most often received treatment for 3 days and CTS> 5 most often were treated for 5 days. The results of a European study showed that patients with thoracic trauma were hospitalized for 4.5 days.[28] The UK study also showed that the length of treatment for thoracic trauma patients was> 72 hours. The US study also reported that patients with lower CTS scores were treated only stay for <5 days.[26]

However, data on maximum length of stay and total length of stay were inversely proportional to the CTS value according to data for CTS <5 for the longest stay of 10 days and CTS> 5 for the longest stay of 8 days. A study in Turkey reported that thoracic trauma from stab wounds was treated for 10 days.[29] The total duration of 101 hours of treatment for the lower CTS group was greater than the total length of stay of 60 hours for the higher CTS group. This is related to the survival rate of thoracic trauma patients with a lower CTS score compared to the survival rate of thoracic trauma patients with a higher CTS score.[30] Survival rate is directly proportional to the length of stay of patients in hospital.[31] Shorter hospital stay was associated with higher mortality so patients were discharged earlier.[32]

Mortality was not significantly associated with the CTS value with the P value of the chi square test of 0.107. Thoracic trauma patients with CTS > 5 died more than thoracic trauma patients with CTS <5. There were also fewer patients who did not die in the CTS > 5 group than in the CTS <5 group. The total mortality of thoracic trauma patients in this study was 8.18%. The German study reported 7.9% mortality from the total thoracic trauma studied.[33] However, the mortality in this study was smaller than that in the UK study which reported a total mortality of 18.7%.[34] The Turkish study reported 10.8% mortality with details of the mortality of 8.6% stab wounds and 13.8% gunshot wounds associated with abdominal injury, diaphragm, Injury Severity Score (ISS), chest Abbreviated Injury Severity (AIS) scale, blood transfusion volume and systolic blood pressure.[29]

The P value of 0.107 on the chi square mortality test with CTS in this study is in accordance with a study in Nigeria which reported that age, sex and type of thoracic trauma were not shown to be associated with mortality with P values of 0.468, 1,000 and 1,000.[35] Thoracic trauma mortality was associated with extra thoracic organ injury, Modified Early Warning Signs (MEWS) score> 9 at emergency room presentation, clinical condition after 24 hours and severe thoracic trauma with bilateral thoracic involvement.[35] However, European studies have shown that mortality has a significant association with the number of rib fracture, patient age and Injury Severity Score.[28] Research in England reported that thoracic and abdominal trauma in the case of a motorcycle accident in 1993-1999 needed to be diagnosed and treated early to reduce mortality.[36] Thoracic trauma patients with CTS ≥ 5 had the mortality rate was four times greater than the mortality rate right in thoracic trauma with CTS <5.[4]

The relationship between the choice of thoracotomy action and the CTS value was not significant with the P value of the chi square test 0.614. Thoracotomy was performed on 16.22% of thoracic trauma patients in this study. 40.74% of thoracic trauma patients with CTS <5 were thoracotomies. 50% of thoracic trauma patients with CTS> 5 were thoracotomy. The Swiss study also reported that conservative therapy or surgery had no significant impact on the severity, length of stay in the ICU, number of days of intubation, complications or mortality of thoracic trauma patients.[37] The Turkish study also reported that thoracotomy was performed at 14.07% cases of thoracic trauma.[29] However, a study in the United States reported that only 2.6% of thoracotomy was required, while 18.32% of patients required tube thoracostomy.[38] A meta-analysis study of thoracic and cardiovascular surgeons in China also reported that open thoracotomy options were lacking. effective compared to Video Assisted Thoracotomy Surgery (VATS) in controlling patient hemodynamics and reducing complications.[39] Cito thoracotomy is also rarely performed in Iceland considering the mechanism of thoracic trauma, injury severity score (ISS), revised trauma score (RTS), and probability of survival (

PS) for clinical stability in> 50% of post-patients thoracotomy.[40] Thoracic trauma as 75% of the leading causes of death in trauma cases in the Emergency Department (IGD) is known that 15-20% will require surgery of vital organs and blood vessels, while 80% of cases of thoracic trauma do not require surgical management.[41] UK study reported that the effectiveness of thoracotomy by surgeons depends on resuscitation by the ER triage doctor prior to the referral of a thoracic trauma case.[42]

The need for ICU and CTS scores in this study were significantly associated with the P value of the chi square test of 0.001. Thoracic trauma cases at Dr. Mohammad Hoesin Palembang for the period January 2020 - June 30 2020 required ICU as much as 16.22%, with details of 2.7% of patients with CTS <5 and 13.51% of patients with CTS> 5. A study in the United States also showed that the ICU was more needed by patients with greater CTS, namely 29.7% of thoracic trauma cases with CTS ≤ 6 with a P value of correlation test <.0001.[26]. A study in Texas reported that 62.5% of thoracic trauma patients with cito thoracotomy died in the ER, 8.3% died on the operating table and 19.4% died in the ICU, while minimally invasive treatment was performed with Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) mortality data show 16.6% in the ER, 12.5% at the operating table and 33.3% in the ICU.[43] A German study showed that thoracic trauma patients were admitted to the ICU for an average of 11.7 days.[44] In Canada also reported that 82% of flail chest patients were admitted to the ICU for a median of 11.7 days.[45] Age is directly proportional to the length of stay of traffic accident victims in the ICU.[46] The mortality of patients in the ICU is also determined by the type of fluid selected at resuscitation. in the ER.[47] The type of surgery chosen also determines the length of stay for thoracic trauma patients in the ICU.[48]

5. Conclusion

Thoracic trauma happened mostly at less than 45 years old patients, the most degrees of lung contusions were unilateral minor lung contusions, rib fractures that most often occurred were <3 rib fractures, none bilateral rib fracture cases, and the total Chest Trauma Score of patients in this study was less than 5. The CTS score had a significant relationship with length of stay and ICU need, but it was not significantly related to mortality and surgery in thoracic trauma patients in this study.

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