ORIGINAL ARTICLE

Prognostic evaluation of cases with thoracic trauma admitted to the intensive care unit: 10-year clinical outcomes

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ABSTRACT

BACKGROUND: Multiple traumas are a leading cause of mortality among young adults worldwide. Thoracic trauma causes approximately 25% of all trauma-associated deaths. This study aims to determine the independent prognostic factors of mortality in cases with thoracic trauma (isolated or with accompanying organ injuries) who were admitted to the intensive care unit (ICU).

METHODS: We retrospectively reviewed data from patients with thoracic trauma who were admitted to our ICU between 2007 and 2016. After excluding pediatric patients (aged <18 years), the study sample included 564 cases. From the records, we collected the patients' demographical data, comorbid diseases, primary trauma as an indication for ICU admission, other traumas accompanying thoracic trauma, type of thoracic injury, and therapeutic interventions. The study sample was divided into two subsets: survival and non-survival groups. These two groups were compared with regards to first ICU day laboratory results and intensive care scores, mechanical ventilation times, and ICU stay lengths.

RESULTS: Of the 8063 patients admitted to the ICU between 2007 and 2016, 616 (7.6%) had thoracic trauma. The median age (min–max) of the 564 patients eligible for this study was 43 (18–87) years. Mortality occurred in 159 (28.1%) cases, while 405 (71.8%) were discharged from the ICU. Multivariate regression analyses were also performed, in which every increment in age was associated with a 1.025-fold increase in the odds of mortality due to thoracic trauma. Additionally, the presence of central nervous system (CNS) trauma was associated with a 2.147-fold increase, and the presence of pulmonary contusion was associated with a 1.752-fold increase.

CONCLUSION: Results of this study indicate that advanced age, the presence of pulmonary contusion, and accompanying CNS trauma are independent predictors of mortality in patients with thoracic trauma in the ICU. Our non-invasive approach is further supported by the trauma and injury severity score (TRISS) scoring system, which is one of the latest scoring systems used in trauma cases.

Keywords: Hospital mortality; intensive care unit; thoracic injuries; thoracic trauma; TRISS; Trauma Severity Indices.

INTRODUCTION

Multiple traumas are often caused by fall from height or motor vehicle accidents. They are among the leading cause of mortality among young adults worldwide.[1] Six percent of patients with trauma have thoracic trauma. Thoracic trauma has been reported to be the cause of approximately 25% of all trauma-associated deaths. It is considered a contributing factor for mortality in more than another 25%. These data may not be entirely accurate due to the inadequacy of trauma registry systems, and because minor injuries are often discharged without being registered.[2–7] Cases with thoracic traumas and other associated organ injuries often require intensive care because they need to be closely monitored

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due to high mortality rates.[3,8] Indications for intensive care unit (ICU) admission typically include respiratory problems and hemodynamic instability. The most frequently affected anatomical structures in thoracic traumas are particularly the chest wall as well as the lung parenchyma, heart, diaphragm, and aorta.[9] With regards to management of thoracic trauma, conservative approaches are sufficient in 90% of the cases; however, a small number of patients require surgical interventions, including urgent thoracotomy.[10] Accurate risk stratification in patients with thoracic trauma who are admitted to the ICU is crucial to understand risk factors for late complications and improve the ICU outcomes. Several trauma-scoring systems have been developed to guide triage and predict mortality. This study aimed to identify independent prognostic factors of mortality in cases admitted to the ICU due to thoracic trauma, either isolated or with other organ injuries.

MATERIALS AND METHODS

The STROBE guideline was used as a guide for this manuscript. In this study, we retrospectively reviewed clinical data from patients admitted to the Anesthesiology and Reanimation ICU due to single or multiple traumas to identify patients with thoracic trauma. Following approval from our university's ethics committee (2016/387), data from patients admitted to the ICU between 2007 and 2016 were collected by reviewing the ICU patient follow-up charts, medical files, and hospital information system.

From the records, we collected the patients' demographical data, comorbid diseases, primary trauma as an indication for ICU admission, other traumas accompanying thoracic trauma, type of thoracic injury and therapeutic interventions, Glasgow coma score (GCS), laboratory results (hemoglobin, creatinine, BUN, sodium, and platelet), inotropic-vasopressor use, injury severity score (ISS), revised trauma score (RTS), trauma and injury severity score (TRISS), mechanical ventilation (MV) state, ICU stay length, and patient outcomes. The diagnosis of thoracic trauma was based on thoracic CT and chest X-ray images. The RTS is a scoring system based on bed-side clinical and physiological data, including the GCS, systolic blood pressure (SBP), and respiratory rate (RR). It is calculated with the following formula: $RTS = (0.9368 \times GCS) + (0.7326 \times SBP) + (0.2908 \times RR)$. Results yield a value ranging from 0 to 7.8408, with higher scores indicating less severe injury. The ISS is an anatomical scoring system designed for patients with multiple traumas. The region with the highest score from the ISS (i.e., the region where the trauma is most severe or the region most likely to cause mortality) is called the primary trauma region. TRISS is calculated using RTS, ISS, and patient age.[11,12] The study sample was divided into two subsets: survival and non-survival groups. These two groups were compared with regards to first ICU day laboratory results and intensive care scores, MV times, and ICU stay lengths.

All data were analyzed using IBM SPSS V23 (Chicago, USA). The Shapiro–Wilk test was used to determine whether the data were normally distributed. Comparisons of data that were not normally distributed were made with the Kruskal–Wallis test and the Mann–Whitney U test. Categorical data were analyzed with the Pearson chi-square test. The effects of the examined parameters on mortality were investigated with a logistic regression analysis. The ROC analysis was used to calculate the TRISS cut-off score. Non-normally distributed data were presented as median (min–max), while normally distributed data were presented as mean±standard deviation. Categorical data were expressed as frequency and percentage. Values of $p<0.05$ were considered significant.

RESULTS

Of the 8063 patients who were admitted to our ICU during the 10-year study period (between 2007 and 2016), 616 (7.6%) had thoracic trauma. After excluding pediatric cases (aged <18 years), the remaining 564 cases were included in the study sample. Figure 1 is a schematic of patient selection. The median age (min–max) of the 564 patients who were eligible for this study was 43 (18–87) years. There were 133

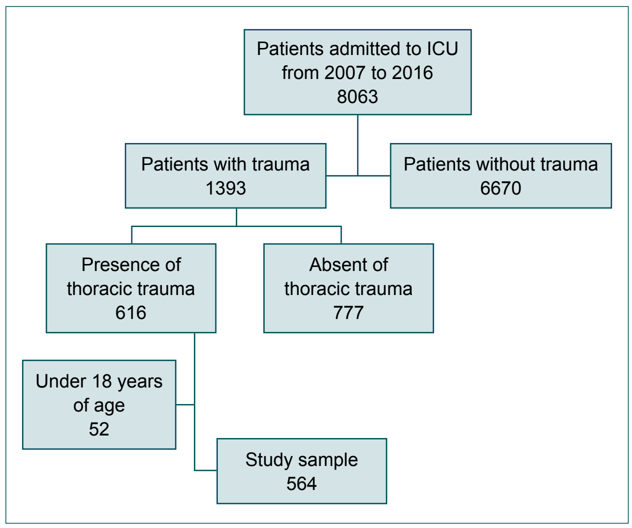

Figure 1. Study sample.

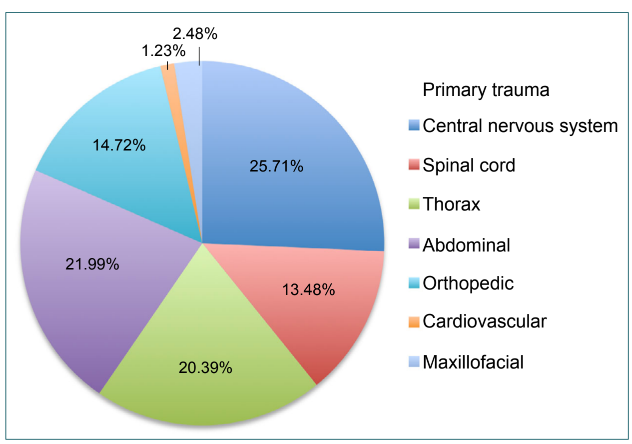

Figure 2. Distribution of patients according to primary trauma sites.

(23.5%) female and 431 (76.4%) male patients. The patient distribution according to primary trauma site is presented in Figure 2. Mortality occurred in 159 (28.1%) patients, while 405 (71.8%) were discharged. Among the fatal cases, 48 had sepsis, 28 were diagnosed with brain death, 25 developed hemorrhagic shock, 15 developed multiple organ dysfunction, 13 had ARDS, 10 developed malignant arrhythmia, seven developed disseminated intravascular coagulation, and 13 died due to sudden cardiac arrest as a result of clinical deterioration (due to various reasons).

Data from Survival and Non-Survival Patient Subsets

There were significant differences between the two groups with regards to median age, BUN, creatinine, GCS, RTS, ISS, and TRISS. Evaluation of patient outcomes revealed that the ICU stay length was significantly shorter among surviving patients (p=0.007). Table 1 shows a summary of patient data on hospital admission.

There was no significant difference between the groups (survival, non-survival) regarding distribution of sex (p=0.441). Of the 405 surviving patients, 306 (71%) were male, while 125 of the 159 deceased patients (29%) were male. Evaluation of trauma type as primary indication for the ICU admission revealed that patients with central nervous system (CNS) trauma had the highest mortality rate (43.4%), while patients with maxillofacial trauma had the lowest mortality rate (7.1%). Mortality differed significantly with respect to the primary trauma sites (p<0.001). However, no significant difference was observed according to cause of trauma (p=0.342). The data are summarized in Table 2.

Isolated thoracic trauma was present in only 30 (5.6%) trauma cases. When compared groups as patients with isolated thoracic trauma and multitrauma, there was no statistically significant difference in demographic data (e.g., age, gender, comorbidities), hospital arrival laboratory parameters, trauma scores (ISS, RTS, and TRISS). There was no statistically significant difference between MV treatment and ICU mortality between two groups (respectively, p=0.896, p=0.891). A total of 7 (23.3%) of the 30 patients with isolated thoracic trauma were operated, and 384 (71.9%) of the 534 patients in the multitrauma group were operated. It was statistically significant (p<0.001). Evaluation according to thoracic trauma types revealed that mortality occurred in 77 of 233 (33%) patients with pulmonary contusion, 108 of 389 (27.8%) patients with rib fracture, 10 of 47 (21.3%) patients with sternum fracture, 11 of 35 (31.4%) patients with diaphragmatic rupture, 49 of 170 (28.8%) patients with hemothorax, 65 of 261 (24.9%) patients with pneumothorax, 20 of 67 (29.9%) patients with subcutaneous emphysema, 6 of 26 (23.1%) patients with mediastinal trauma, 1 of 4 (25%) patients with cardiac trauma, and 13 of 39 (33.3%) patients with flail chest. Pulmonary contusion was seen significantly more frequently in the non-survival group (p=0.032) (Table 3). In addition, the mortality rate was significantly higher among cases with the CNS trauma (p<0.001). Other trauma types did not differ significantly in terms of mortality.

Forty-five (7.9%) patients underwent thoracic surgery due to thoracic trauma. Of these patients, 11 (24.4%) died, and 34 (75.6%) were discharged from the ICU in a healthy state (p=0.682). In addition, mortality occurred in 68 (26.6%) of the 256 (45.3%) patients who underwent tube thoracostomy (p=0.433). All patients received passive oxygen support and underwent respiratory exercises.

Mortality occurred in 61 of 88 (69.3%) patients who received inotrope/vasopressor, and mortality also occurred in 154 of 360 (42.8%) patients who were mechanically ventilated. Among the deceased patients, the median MV length was 6.5

Table 1. Data from surviving and deceased patients at the admission of hospital

Parameter	Total (n=564)	Survival (n=405)	Non-survival (n=159)	p
Age*	43 (18–87)	41 (18–87)	47 (18–86)	0.002
Sodium*	138 (125–155)	138 (126–155)	138 (125–153)	0.391
Blood urea nitrogen*	16.2 (5.3–89.4)	15.8 (5.3–45)	17.6 (6.7–89.4)	0.01
Creatinine*	0.95 (0.2–8.9)	0.93 (0.2–8.9)	1.01 (0.51–8)	<0.001
Hemoglobin**	11.02±2.64	11.21±2.63	11.02±2.64	0.007
Platelet*	203.5 (16–615)	207 (19–486)	194 (16–615)	0.146
Glasgow Coma Scale*	15 (3–15)	15 (3–15)	3 (3–15)	<0.001
Revised Trauma Score*	7.84 (0.73–7.84)	7.84 (0.73–7.84)	2.93 (0.73–7.84)	<0.001
Injury Severity Score*	17 (2–75)	14 (2–36)	29 (14–75)	<0.001
Trauma and Injury Severity Score*	82.69 (0.04–99.61)	96.19 (3.77–99.61)	20.35 (0.04–98.43)	<0.001
Intensive care unit stay length*	4.5 (1–369)	4 (1–367)	6 (1–369)	0.007

*Shown as median (min-max). **Shown as mean±standard deviation. Statistically significant difference between survival and non-survival groups are shown with bold characters.

Table 2. Primary trauma site and cause of trauma among patients

Parameter	Survival		Non-Survival		Total		p
	n	%	n	%	n	%	
Primary trauma							
Central nervous system	82	56.6[a]	63	43.4	145	100	
Spinal cord	57	75[a,b,c]	19	25	76	100	
Thorax	80	69.6[a,c]	35	30.4	115	100	
Abdominal	94	75.8[b,c]	30	24.2	124	100	
Orthopedic	73	88[b]	10	12	83	100	
Cardiovascular	6	85.7[a,b,c]	1	14.3	7	100	
Maxillofacial	13	92.9[a,b,c]	1	7.1	14	100	<0.001
Trauma cause							
Motor vehicle accident	281	71	115	29	396	100	
Fall	80	71.4	32	28.6	112	100	
Penetrating trauma	28	84.8	5	15.2	33	100	
Other blunt trauma	16	69.6	7	30.4	23	100	0.342

Each superscript letter denotes a subset of primary trauma categories where row proportions do not differ significantly from each other at the 0.05 level. Statistically significant difference between Survival and Non-Survival groups are shown in bold.

(1–177) days, while the median MV length among the surviving patients was 5.5 (1–161) days (p=0.200). Mortality was higher in those who received inotrope/vasopressor or MV support at any time during their ICU stay (p<0.001 for both).

Evaluation of treatments and mortality rates among the 564 patients included in this study revealed that mortality occurred in 91 of the 391 (23.3%) patients who underwent any kind of surgery, and mortality was significantly lower in the group of patients who underwent surgery when compared to patients who did not undergo surgery (p<0.001).

TRISS Score ROC Analysis

The AUC-ROC for mortality for TRISS was 0.922 (95% CI: 0.899–0.946). The ROC analysis using a TRISS cut-off score of 59.93 yielded a sensitivity and specificity of 0.88 and 0.87, respectively, for mortality development. With this cut-off level (59.93), the degree of agreement between TRISS and mortality was 87.4%, the positive predictive value was 72.92%, and the negative predictive value was 94.89% (Fig. 3).

Mortality Predictors (Univariate and Multivariate Logistic Regression Analysis)

To determine predictors of mortality, a univariate analysis including demographic data, other accompanying traumas, type of thoracic trauma, and comorbidities was performed. Results of the univariate analysis revealed that age, presence of accompanying CNS trauma, pulmonary contusion, hypertension, and coronary artery disease were identified as significant predictors of mortality. Results are shown in Table 4.

Although the presence of hypertension and coronary artery disease were found to be significant factors in univariate analysis, they were not significant predictors of mortality in multivariate regression analysis. In multivariate regression analysis, each age increment was associated with a 1.025-fold increase in odds of mortality, while the presence of CNS trauma was associated with a 2.147-fold increase, and the presence of pulmonary contusion was associated with a 1.752-fold increase in odds of mortality. Results are shown in Table 5.

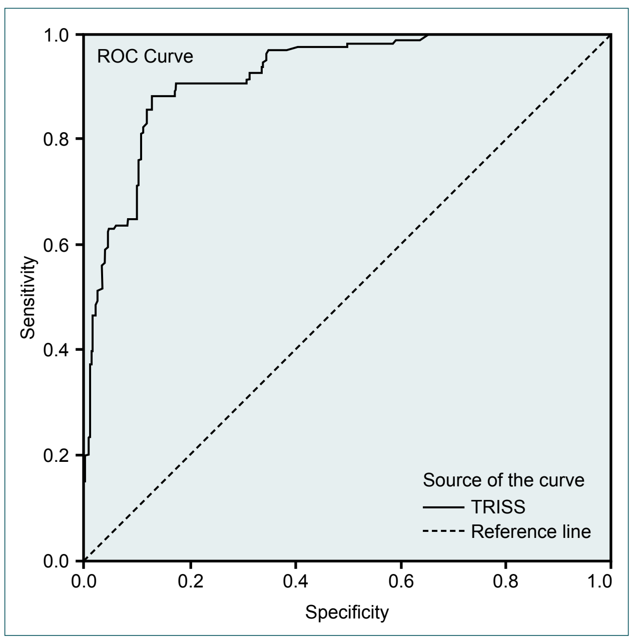

Figure 3. TRISS score ROC analysis (TRISS: Trauma and injury severity score; ROC: reciever operator characteristics).

Table 3. Association between thoracic trauma type and mortality

Thoracic trauma sites	Survival		Non-Survival		Total		p
	n	%	n	%	n	%	
Pulmonary contusion							
No	249	75.2	82	24.8	331	100	
Yes	156	67	77	33	233	100	0.032
Rib fracture							
No	124	70.9	51	29.1	175	100	
Yes	281	72.2	108	27.8	389	100	0.736
Sternum facture							
No	368	71.2	149	28.8	517	100	
Yes	37	78.7	10	21.3	47	100	0.352
Diaphragmatic rupture							
No	381	72	148	28	529	100	
Yes	24	68.6	11	31.4	35	100	0.806
Hemothorax							
No	284	72.1	110	27.9	394	100	
Yes	121	71.2	49	28.8	170	100	0.827
Pneumothorax							
No	209	69	94	31	303	100	
Yes	196	75.1	65	24.9	261	100	0.107
Subcutaneous emphysema							
No	358	72	139	28	497	100	
Yes	47	70.1	20	29.9	67	100	0.86
Mediastinal trauma							
No	385	71.6	153	28.4	538	100	
Yes	20	76.9	6	23.1	26	100	0.710
Cardiac trauma							
No	402	71.8	158	28.2	560	100	
Yes	3	75	1	25	4	100	1.000
Flail chest							
No	379	72.2	146	27.8	525	100	
Yes	26	66.7	13	33.3	39	100	0.579

Statistically significant differences between Survival and Non-Survival groups are shown in bold.

DISCUSSION

In this study, we sought to determine whether mortality could be predicted using information that does not require any calculation and is readily available at the time of ICU admission (e.g., type of thoracic trauma, accompanying traumas, comorbid states, age, and sex). The primary goal of this study was to identify clinical data that can be used to determine prognosis upon ICU admission. Univariate analyses revealed that age, presence of accompanying CNS trauma, pulmonary contusion, hypertension, and coronary artery disease were significant predictors of mortality in patients with trauma in the ICU. With multivariate regression analysis, each age increment was associated with a 1.0-fold increase in mortality risk, the presence of CNS trauma was associated with a 2.1-fold increase, and the presence of pulmonary contusion was associated with a 1.7-fold increase in mortality odds.

Nearly 25% of all trauma-associated deaths are due to thoracic injuries, and thoracic injuries have the highest complication rates among all trauma types.[13] In this study, during a 10-year period, 564 (40.4%) patients admitted to the ICU had thoracic trauma, and among these, 115 (20.39%) patients had thoracic trauma as their primary indication for the ICU admission. The median age of the patients included in this study

Table 4. Univariate logistic regression analyses

	Odds ratio	95% Confidence interval	p
Demographic properties			
Age	1.019	1.008–1.030	**<0.001**
Sex (male)	1.189	0.765–1.850	0.441
Accompanying trauma			
Central nervous system trauma	2.020	1.390–2.935	**<0.001**
Abdominal trauma	0.972	0.647–1.459	0.890
Orthopedic trauma	0.743	0.512–1.080	0.119
Aortic trauma	1.735	0.696–4.328	0.237
Spinal cord trauma	1.116	0.772–1.613	0.561
Isolated thoracic trauma	1.097	0.491–2.450	0.821
Type of thorax trauma			
Pulmonary contusion	1.499	1.035–2.170	**0.032**
Rib fracture	0.934	0.630–1.386	0.736
Sternal fracture	0.668	0.324–1.377	0.274
Diaphragmatic rupture	1.180	0.564–2.469	0.661
Hemothorax	1.046	0.702–1.557	0.827
Pneumothorax	0.737	0.509–1.069	0.108
Subcutaneous emphysema	1.096	0.627–1.916	0.748
Mediastinal injury	0.755	0.297–1.916	0.554
Cardiac injury	0.848	0.088–8.214	0.887
Flail chest	1.298	0.649–2.594	0.461
Comorbidities			
Hypertension	2.063	1.102–3.862	**0.024**
Cardiac failure	7.769	0.802–7.254	0.077
Coronary artery disease	4.351	1.027–1.425	**0.046**
Arrhythmia	2.557	0.159–4.129	0.508
Chronic obstructive pulmonary disease	1.707	0.283–1.313	0.560
Asthma	2.577	0.515–12.904	0.249
Chronic renal failure	5.146	0.463–57.159	0.182
Diabetes mellitus	1.714	0.831–3.535	0.145
Malignancy	2.567	0.358–18.381	0.348

Statistically significant differences are shown in bold.

was 43 (min–max 18–87) years, which was consistent with the literature, and the majority of the patients were male.[14–20] Previous reports have shown that mortality rates in patients with thoracic trauma are markedly high (up to 30%).[21] Emircan et al.[22] reported a 22% mortality rate among patients presenting to the emergency department with thoracic trauma. However, in other studies, the mortality rate varies between 9.4% and 20%.[23] Although there are limited publications regarding ICU mortality, this study found a similar mortality rate among thoracic trauma cases (28.1%).

The severity of thoracic traumas depends on the type of trauma and on the severity of any accompanying traumas. Previous studies have shown that thoracic trauma cases with accompanying head trauma had greater mortality rates than those without it.[24,25] In this study, only 30 (5.6%) cases had isolated thoracic trauma. Of the patients in this study with accompanying traumas, only those with accompanying CNS trauma had significantly higher mortality rates. Lin et al. reported that 36.3% of cases presenting to the emergency department with thoracic trauma required intensive care. As in our study, the study by Lin et al.[26] found that those thoracic trauma cases with accompanying head trauma required intensive care and had prolonged ICU stays, more so than most of the other thoracic trauma cases. However, in that same study, it was reported that the presence of hemothorax in thoracic

Table 5. Multivariate logistic regression analyses

	OR	95% CI	p
Age	1.025	1.012–1.038	<0.001
CNS trauma	2.147	1.441–3.198	<0.001
Pulmonary contusion	1.752	1.162–2.642	0.007
Hypertension	1.414	0.695–2.879	0.339
Coronary artery disease	3.274	0.720–14.879	0.125

Statistically significant differences are shown in bold.
OR: Odds ratio; CI: Confidence interval; CNS: Central nervous system.

traumas was associated with the greatest requirement for intensive care. Interestingly, in this study, which included a large patient population, only the presence of pulmonary contusion was found to be associated with mortality. Other conditions that can cause serious respiratory distress (e.g., diffuse hemothorax or flail chest) were not found to be associated with mortality. This may be due to the emergent treatment of hemothorax with surgery or chest tube drainage, and because patients with flail chest often undergo surgical stabilization in the early period. A large study by Horst et al.[19] included over 10 years of experience regarding patients with serious thoracic trauma. In that study, over those 10 years, there was a decrease in the requirement of those patients for urgent surgery, as well as in ventilation time, ICU stay length, and rate of respiratory failure development. The authors explained that these decreases were most likely due to recent advances in diagnostic methods and treatment strategies. Pulmonary contusion occurs in approximately 30%–75% of blunt thoracic traumas caused by motor vehicle accidents.[27] Pulmonary contusion requires close monitoring, as pulmonary contusion-associated mortality rates vary between 6% and 25%, and the clinical situation is often accompanied by pneumonia or acute respiratory distress syndrome.[15,17] One study reported that 5 of 16 ICU patients (31.2%) with pulmonary contusion died. Importantly, the authors of that study found that the APACHE II score, the SAPS II score, the SOFA score, the paO_2/FiO_2 ratio, and ventilator days were correlated with mortality.[14] It is important to note that pulmonary contusion may not manifest itself clinically or radiologically within the first few days following trauma. However, as is the case with any soft tissue contusion, the extent of injury may progress over time, and therefore, the patient should be inspected throughout his or her hospital stay for the development of respiratory failure.

In this study, thoracic injuries were most frequently caused by motor vehicle accidents (70.2%), followed by fall from height (19.8%). In developing countries, particularly rapidly developing Middle Eastern countries, mortality due to motor vehicle accidents has become a more important problem due to an increase in the number of speeding vehicles.[28] In this study, the most frequent type of trauma associated with motor vehicle accidents was rib fracture, followed by pulmonary contusion, pneumothorax, hemothorax, subcutaneous emphysema, sternum fracture, flail chest, mediastinal injuries, and cardiac injury, respectively. In the emergency department, patients must be evaluated according to the severity of their injuries. Further, admission and treatment should start as soon as possible to reduce mortality rates. In addition, the presence of comorbidities may contribute to clinical deterioration. In this study, while comorbid hypertension and coronary artery disease were found to be associated with mortality in univariate analysis, they were not found to be significant risk factors in multivariate analysis. However, our study sample mainly included young adults with a low number of comorbidities, and therefore, we believe a larger study sample is required to validate these results.

Following trauma, the ability to predict patient outcomes is important not only for clinicians, but for the patients and their families as well. Therefore, several trauma-scoring systems have been developed for this purpose. RTS is a physiological scoring system that has been proven for its accuracy in predicting mortality. It is based on GCS, SBP, and RR parameters. Next, ISS was developed for patients with multiple traumas, and is an anatomical scoring system. TRISS is based on ISS, RTS, and patient age, and is used to predict survival after trauma.[29] TRISS combines both anatomical and physiological aspects, and has been proven to be a good predictor of survival in patients with trauma. In a study that retrospectively evaluated 140 patients with thoracic trauma, Bellone et al.[16] reported that only 10 of those 140 patients (7.1%) were admitted to the ICU due to clinical and radiological deterioration. In univariate and multivariate analyses, the authors of that study found that increasing orthopnea and trauma scores could be used to predict intensive care requirement. In this study, we found a significant difference between the surviving and deceased groups of patients in terms of ISS, RTS, and TRISS scores. In this study, a TRISS cut-off score of 59.93 yielded 88% sensitivity and 87% specificity for predicting mortality, and was found to be strongly associated with mortality. Similarly, Esme et al.[18] performed a risk assessment with TRISS in 152 patients with blunt thoracic trauma, and identified that the TRISS scoring system was an independent risk factor for predicting mortality. Darbandsar Mazandarani et al.[30] evaluated patients with trauma in the emergency department with the TRISS score, and reported that the best cut-off point for TRISS mortality prediction was 13.2% (sens.=76.52%; spec.=95.65%). Another study reported that the cut-off point for TRISS was 85.[22] Although there are variations in the reported TRISS cut-off values, in general, we believe that the TRISS scoring system can be used to predict mortality in thoracic trauma.

GCS is another scoring system that has long been used to predict mortality in patients with trauma. As expected, these data revealed a significant difference in GCS between the surviving and deceased groups of patients, with surviving patients having significantly higher median scores ($p<0.001$). Wang et al.[20] evaluated 127 patients with chest trauma, and results indicated that a lower GCS, lower oxygenation ratio, and the presence of shock were independent predictors of mortality in patients with blunt thoracic injuries.

As expected, in this study, we found markedly increased mortality rates among patients requiring MV or inotrope/vasopressor support ($p<0.001$ for both). Indeed, previous studies have shown that MV time is associated with trauma severity and the development of complications.[31,32]

There are several limitations associated with this study. First, this study has a retrospective and single-centered design. Second, the study sample comprised only of patients who were admitted to the Anesthesiology and Reanimation ICU. Since cardiac or major cardiovascular injuries are typically followed by cardiovascular surgery, there were no such patients in this study sample. Third, because of this study's retrospective design, MV parameters could not be closely monitored in patients requiring MV and also APACHE II and SOFA scores were not given due to scores could not be obtained from all patients over a 10-year follow-up period.

Conclusion

Mortality can be predicted in patients with thoracic trauma who are admitted to the ICU without the use of any invasive interventions or calculations; these predictions can be made by accounting only for clinical and demographic properties, trauma types, and comorbid states. The results of this study indicate that advanced age, pulmonary contusion, and accompanying CNS trauma are independent risk factors for predicting ICU mortality in patients with thoracic trauma. Our non-invasive approach is further supported with the TRISS scores, which is one of the latest scoring systems used to predict mortality in patients with trauma. Prompt diagnosis, close monitoring, and early therapeutic interventions can help to reduce mortality rates in such patients.

Conflict of interest: None declared.

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ORİJİNAL ÇALIŞMA - *ÖZET*

Yoğun bakım ünitesine başvuran toraks travmalı olguların prognostik değerlendirmesi: On yıllık sonuçlar

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AMAÇ: Çoklu travmalar ülkemizde ve dünyada özellikle genç erişkinlerin ölüm nedenlerinin başında gelmektedir. Bu çalışmanın amacı yoğun bakımlarda takip edilmekte olan izole ya da diğer organ yaralanmaları ile birlikte olan toraks travmalı olgularda mortalite için bağımsız prognostik faktörlerinin predikte edilmesidir.
GEREÇ VE YÖNTEM: Bu çalışmada, 2007–2016 yılları arasında yoğun bakım ünitemizde takip edilmiş olan toraks travmalı hastaların verileri geriye dönük olarak incelendi. Bu yıllar içerisinde yoğun bakım hasta kayıt sisteminde yer alan 8063 hasta arasından verilerine sağlıklı bir şekilde ulaşılan 616 toraks travma hastası saptandı. On sekiz yaş altı olgular dışlanarak kalan 564 hasta çalışma grubu hastası olarak belirlendi.
BULGULAR: Çalışmaya alınan 8063 hastanın 616'sında (%7.6) toraks travması saptandı. Çalışma kriterlerini sağlayan 564 çalışma grubu hastasının yaş ortalaması medyan (min-maks) 43 (18–87) idi. Hastaların 159'u (%28.1) mortalite ile sonlanırken 405'i (%71.8) yoğun bakım ünitesinden taburcu edildi. Travma ve Yaralanma Şiddeti Skoru'nun (TRISS) mortalite takibi için, AUC değeri: 0.922 (%95 CI: 0.899–0.946) idi. ROC analizine göre mortalite gelişme olasılığı için TRISS skoru 59.93 sınır kabul edildiğinde (Sensitivite; 0.88, Spesifisite: 0.87) olarak tespit edildi. Multivaryant lojistik regresyon analizinde mortaliteyi ön görmede her bir yaş artış mortalitede 1.025 kat, santral sinir sistemi travması varlığı mortalitede 2.147 kat, pulmoner kontüzyo varlığı mortalitede 1.752 kat artışla ilişkiliydi.
TARTIŞMA: Bu çalışmanın sonuçları ile toraks travma hastalarında ileri yaş, pulmoner kontüzyon ve eşlik eden santral sinir sistemi travması yoğun bakım mortalitesini göstermede bağımsız birer risk faktörü olarak tanımlanmıştır. Travma hastalarında en güncel skorlama sistemlerinden olan TRISS skoru da bu non-invaziv yaklaşımımızı desteklemektedir.
Anahtar sözcükler: Göğüs; hastane mortalite; toraks travma; torasik yaralanma; TRISS; yoğun bakım ünitesi.

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