Comparing the Clinical Features and Trauma Scores of Trauma Patients Aged Under 65 Years with Those of Patients Aged over 65 Years in the Intensive Care Unit: A Retrospective Study for Last Ten Years

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ABSTRACT

Objective: This retrospective study aimed to compare the clinical characteristics and trauma scores of Intensive Care Unit (ICU) trauma patients 65 years and older with the patients under 65 years old.

Materials and Methods: Trauma patients (n=161) who stayed at least 24 hours in ICU were included. Patients younger than 65 years were included into Group 1 (n=109) and patients aged ≥65 years (n=52) were included into Group 2. Patient characteristics and trauma index scores (GCS; APACHE II score, ISS; TRISS and RTS) at ICU admission were calculated.

Results: The patients in Group 2 had more comorbid disease compared with Group 1 (61.5%, 6.4%) (p=0.001). The Trauma-related Injury Severity Score score were higher in Group 1 (49.76±33.75) compared with Group 2 (35.38±34.93) (p=0.006). The APACHE II score were higher in Group 2 (20.08±7.60) compared with Group 1 (17.00±6.90) (p=0.007). The need for invasive mechanical ventilation and tracheostomy were more frequent in Group 2 trauma patients compared with those of patients in Group 1 (92.3%, 73.4%; p=0.003; 26.9%, 8.3%; p=0.002; respectively). The need for transfusion of packed red blood cell suspension (PRBC) was more frequent in Group 2 compared with Group 1 (92.3%, 55.0%; respectively) (p=0.001). The mortality rate was found to be higher in Group 2 compared with Group 1 (48.1%, 19.3%; respectively) (p=0.001).

Conclusion: The elderly trauma patients have more comorbid disease, higher scores for APACHE II and lower scores for TRISS, more mechanical ventilation and tracheostomy requirements and higher mortality rate compared with young trauma patients.

Keywords: Elderly, young, trauma, mortality, morbidity, intensive care unit.

Introduction

Trauma is an important cause of death in all ages and requires a rapid and systematic approach to minimize mortality [1]. Many trauma scoring systems (TSSs) has been created to predict trauma severity and mortality [2-7] . Most commonly used scoring systems in clinics are Glasgow coma score (GCS); Acute Physiology and Chronic Health Evaluation (APACHE) II score, Injury Severity Score (ISS); the Trauma-related Injury Severity Score (TRISS) and the Revised Trauma Score (RTS). The GCS was described in 1974 and it is used to evaluate the coma severity based on eye, verbal, and motor responses (eye opening 1-4, verbal response 1-5, motor response 1-6) [3]. The RTS is a physiological scoring system and it assesses the severity of traumatic injuries based on respiratory rate, systolic arterial pressure, and GCS [4]. The APACHE II score estimates the patient's mortality risk at the Intensive Care Unit (ICU) admission based on a number of laboratory values, age, and underlying health conditions [5]. The ISS is an anatomical scoring system that assess trauma severity and it takes values from 0 to 75 allocating to one of six body regions (head, face, chest, abdomen, extremities, external) [6]. The TRISS provides a simultaneous assessment of anatomic injury and a patient's physiological condition and it is calculated from the ISS and RTS via a formulae [7]. Many studies investigating the effectiveness of scoring systems are available in the literature [8-14].

In recent years, there has been an increase in the number of old people in the world [15, 16]. The number of the people 65 year-old and over, is also increasing each year. It was shown that

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the incidence of comorbidities increases with aging [17, 18]. On the other hand, aging leads to a progressive decline in cellular function, an impaired homeostatic mechanism and an impaired response to injury. Also, the older people receiving additional medical treatment due to their current comorbidities such as hypertension, cardiovascular disease have impaired response to injury [1, 19, 20]. It has been shown that elderly patients with severe trauma have higher mortality rates than young patients [21, 22]. Current comorbidities, advanced age, pre-injury anticoagulation and greater requirement for transfusion was reported to be factors associated with mortality in elderly trauma patients [21-24]. We hypothesized that the mortality rate of elderly trauma patients was higher than that of young trauma patients in the intensive care unit. For this purpose, we compared the clinical characteristics and trauma scores of ICU trauma patients 65 years and older with the patients under 65 years old. Also, we aimed to identify risk factors associated with mortality in these patients.

Materials and Methods

Ethical approval for this retrospective study was provided by the Ethical Committee of Ataturk University School of Medicine (The ethics committee approval number: B.30.2.ATA.0.01.00/217). This retrospective study was performed in Level 3 ICU of the Anesthesiology and Reanimation Department of Ataturk University School of Medicine. Informed consent was not obtained because it was a retrospective study. Trauma patients admitted from January 1, 2009 through December 31, 2018 were screened for eligibility to the study. Trauma patients who stayed at least 24 hours in the intensive care unit were included in the study. Patients who had unknown type of trauma, performed cardiopulmonary resuscitation, were younger than 18 years and burn patients were excluded from the study. Patients hospitalized for less than 24 hours in ICU or transferred to another hospital within 24 hours of ICU admission were also considered as exclusion criteria.

Data on patient characteristics, including demographic data, clinical characteristics, laboratory results, mechanism of trauma, the presence of comorbid disease such as diabetes mellitus and/or hypertension, the need for mechanical ventilation and outcomes were collected through electronic medical records. Also, patients' mean arterial pressure (MAP), heart rate and respiratory values at the ICU admission were recorded. Following trauma index scores at ICU admission were calculated using scoring criteria developed in corresponding literature: GCS (11); APACHE II score (13), ISS (14); TRISS (15) and RTS (12). Patients were classified into two groups according to their age: Patients younger than 65 years were included into Group 1 and patients aged ≥65 years were included into Group 2.

Statistical Analysis

Statistical analysis was performed using SPSS for Windows (version 15.0) statistical package (SPSS Inc., Chicago, IL, USA). The normality of variables was tested with the Kolmogorov-Smirnov test. Because of the distribution of all data is not normal, Mann-Whitney U test was used to assess the differences between groups. Chi-squared test was used for categorical data. Results were expressed as mean ± SD or n, % and $p<0.05$ was considered significant.

Results

Records for 161 trauma patients that meet the inclusion criteria were reviewed. One hundred nine patients were younger than 65 years (Group 1), 52 patients were 65 years or older (Group 2). The mean age of Group 1 was 27.96±8.01 and the mean age in Group 2 was 68.44±4.81 years (p=0.001). The percentage of women was similar between groups (16.5% in Group 1, 15.4% in Group 2; p=0.526). Traffic accident was the most common cause of trauma in two groups (79.8% in Group 1, 61.5% in group 2). However, fall was observed at a higher rate in Group 2 (28.8%) compared with Group 1 (12.8%) (p=0.033) (Table 1). The patients in Group 2 had more comorbid disease compared with Group 1 (61.5%, 6.4%; respectively) (p=0.001). No significant differences were detected between groups in terms of respiratory rate and heart rate values at admission. But, Group 2 had higher mean arterial pressure values at admission compared with Group 1 (102.21±20.80, 90.82±11.89; respectively) (p=0.001) (Table 1). There were no significant differences between groups in terms of ISS (38.94±15.86, 43.38±15.94; p=0.096) and RTS (4.59±1.94, 4.57±2.20; p=0.781) scores. The TRISS were higher in Group 1 compared with Group 2 (49.76±33.75, 35.38±34.93) (p=0.006). The APACHE II score were higher in Group 2 compared with Group 1 (20.08±7.60, 17.00±6.90) (p=0.007) (Table 2). The need for invasive mechanical ventilation and tracheostomy were more frequent in Group 2 trauma patients compared with those of patients in Group 1 (92.3%, 73.4%, p=0.003; 26.9%, 8.3%, p=0.002; respectively). The need for transfusion of packed red blood cell suspension

Table 1. Patients' demographic and clinical characteristics

	Group1 (n=109)	Group 2 (n=52)	p
Age (year)	27.96±8.01	68.44±4.81	0.001*
Male (n, %)	91, 83.5%	44, 84.6%	0.526
Female (n, %)	18, 16.5%	8, 15.4%	0.526
Height (cm)	163.58±21.44	170.38±8.01	0.312
Weight (kg)	67.58±9.99	70.08±8.14	0.151
Mean arterial pressure at admission (mmHg)	90.82±11.89	102.21±20.80	0.001*
Heart rate at admission (bpm)	86.83±8.64	86.28±8.96	0.451
Respiratory rate at admission (breaths/minute)	18.77±1.63	18.71±1.66	0.925
The presence of comorbid disease (n, %)	7, 6.4%	32, 61.5%	0.001*
Injury zone (n, %)			
Head-neck trauma	90, 82.6%	42, 80.8%	0.470
Thoracic trauma	88, 80.7%	44, 84.6%	0.358
Abdominal trauma	32, 29.4%	13, 25.0%	0.352
Pelvic fracture	32, 29.4%	18, 34.6%	0.309
Extremity fracture	68, 62.4%	34, 65.4%	0.425
Brain trauma	59, 54.1%	25, 48.1%	0.291
Mechanism of trauma (n, %)			
Traffic accident	87, 79.8%	32, 61.5%	0.112
Fall	14, 12.8%	15, 28.8%	0.033*
Other accidents	8, 7.3%	5, 9.6%	0.421

Group 1: Trauma patients aged <65 years, Group 2: Trauma patients aged ≥65 years.
*: p<0.05. Results were presented as mean ± SD or n, %.

Table 2. Comparison of groups in terms of trauma index scores

	Group1 (n=109)	Group 2 (n=52)	p
Glasgow coma score	6.50±3.99	6.90±4.88	0.830
APACHE II score	17.00±6.90	20.08±7.60	0.007*
Injury Severity Score	38.94±15.86	43.38±15.94	0.096
Revised Trauma Score	4.59±1.94	4.57±2.20	0.781
Trauma-related Injury Severity Score	49.76±33.75	35.38±34.93	0.006*

Group 1: Trauma patients aged <65 years, Group 2: Trauma patients aged ≥65 years.
*:p<0.05. Results were presented as mean ± SD.

Table 3. Intensive care unit management and outcomes of the patient groups

	Group1 (n=109)	Group 2 (n=52)	p
The need for invasive mechanical ventilation	80, 73.4%	48, 92.3%	0.003*
Tracheostomy requirement	9, 8.3%	14, 26.9%	0.002*
Invasive mechanical ventilation duration (day)	4.93±5.60	7.62±12.55	0.789
Packed red blood cell transfusion requirement	60, 55.0%	48, 92.3%	0.001*
Length of stay in ICU (day)	8.90±7.40	11.83±11.70	0.094
Mortality in ICU	21, 19.3%	25, 48.1%	0.001*

Group 1: Trauma patients aged <65 years, Group 2: Trauma patients aged ≥65 years.
*: p<0.05. Results were presented as mean ± SD or n, %.

(PRBC) was more frequent in Group 2 compared with Group 1 (92.3%, 55.0%; respectively) (p=0.001). Although the duration of intensive care unit stay was longer in the elderly than young trauma patients, this difference was not statistically significant (11.83±11.70 versus 8.90±7.40 days, respectively) (p=0.094). The mortality rate was found to be higher in Group 2 compared with Group 1 (48.1%, 19.3%; respectively) (p=0.001) (Table 3).

Discussion

In this study, we compared the clinical characteristics and trauma scores of ICU trauma patients 65 years and older with the patients under 65 years old. We observed more comorbid disease, higher scores for APACHE II and lower scores for TRISS, more mechanical ventilation and tracheostomy requirements, more PRBC suspension transfusion requirement and higher mortality rate in the elderly trauma patients compared with young trauma patients.

According to World Health Organization (WHO), the age of 65 years old have been accepted as "elderly" in the most of the developed world countries [25]. As it is known, the aging population represents enormous challenges for the public health system. Elderly people are particularly susceptible to infectious diseases due to the progressive deterioration of the immune function with age. Also, older people have impaired homeostatic mechanisms. On the other hand, the elderly people may have comorbidities such as hypertension, cardiovascular disease and these comorbidities may lead to the impaired response to traumatic injury [15-19]. Interestingly, a retrospective cohort study revealed that preoperative low-dose aspirin treatment is not associated with increased perioperative bleeding, hospital lengths of stay, or in-hospital mortality in elderly patients [26]. In a study evaluating the health problems in elderly population, visual impairment, uncorrected hearing impairment, uncontrolled hypertension, diabetes and ischemic heart disease were observed at high frequency in this population [27]. Kung et al. [28] researched the epidemiologic characteristics and outcomes of 93 severe trauma patients requiring prolonged mechanical ventilation (duration ≥21 days). They reported that 65 patients (70.0%) of these were older than 65 years. In another study, Peñasco et al. [29] analyzed the factors associated to limitation of life-sustaining treatment measures in 49 patients aged 65 years or older admitted to an ICU due to trauma. Patient age, higher APACHE II and ISS scores, admission due to neurological impairment, and the presence of head injuries were found as important factors for hospital mortality, in their study. Similar to these studies, we observed higher mean arterial pressure values in elderly trauma patients at ICU admission compared with young trauma patients. Also, we reported more comorbid disease, more mechanical ventilation and tracheostomy requirements and higher mortality rate in the elderly trauma patients.

Trauma is an important cause of death at any age. In a study investigating injury patterns according the age in trauma patients, mortality was found to increase with age in spite of similar severity scores [30]. Many trauma scoring systems (TSSs) has been created to predict trauma severity and mortality [8-14]. In a recent study, Madni et al. [31] validated the Geriatric Trauma Outcome Score (GTOS) and they compared GTOS' performance to that of the TRISS in injured elders. They reported that GTOS and TRISS have similar function in predicting probability of death for injured elders. Jin et al. [21] investigated the predicting factors to determine early mortality in trauma patients. For this purpose, they analysed 6288 trauma patients and reported that a combination of the GCS score, age, and systolic blood pressure (GAP model), peripheral oxygen saturation, base excess, platelet count and International normalized ratio (INR) may be used to predict the early mortality in trauma patients. In another study, Unlu et al. [9] retrospectively evaluated 349 trauma patients and they found a significant correlation among age and mortality. In a retrospective cohort study, Loftus et al. [22] compared elderly (age ≥65 years) to young (age 18-64 years) trauma patients in terms of the need for packed red blood cell (PRBC) transfusion, length of stay, and mortality. They reported more PRBC transfusions, fewer ICU-free days and higher in-hospital mortality in elderly patients. They concluded that aging may have a negative impact on postinjury anemia. In accordance with the results of the above studies, we observed more PRBC suspension transfusion requirement and higher mortality rate in the elderly trauma patients compared with young trauma patients in the ICU. Also, we observed longer intensive care unit stay in the elderly patients than young trauma patients, but this difference was not statistically significant. On the other hand, APACHE II and TRISS scores were significantly different between elderly and young trauma patients, while other trauma scores were not different. We speculated that the effectiveness of trauma scoring systems in predicting mortality declines due to the modernization and developing quality of intensive care units recently.

In the elderly population, the most common mechanism of injury is falling. However, the most common injury mechanisms in the young people are car and motorcycle accidents [17, 32]. In this current study, fall was significantly more frequent among the elderly trauma patients compared to the young patients with trauma. As expected, elderly patients are more susceptible to fall due to the impaired reflexes and blunted senses [23, 24]. Brown et al. [32]

investigated the comorbidities, mechanisms, injury patterns, and outcomes in geriatric (≥65 years) blunt trauma patients. They found that falls are the most common mechanism for geriatric trauma patients and older age is an independent risk factor for mortality for the overall population. In a study designed similar to our study, Parreira et al. [33] compared the characteristics of elderly (over the age of 60) patients suffered trauma with younger trauma victims. They reported a higher frequency of falls from their own height, concomitant diseases and severe intracranial injuries in the elderly group compared to the younger trauma victims. In another study, Erlebach et al. [34] analyzed clinical features, age-related outcomes and long-term outcomes of patients with traumatic brain injury (TBI). Similar to our results, they found that falls were the most common cause of TBI in elderly (≥65 years) patients. Within six-months after TBI, they observed unfavorable outcomes in the majority of elderly patients (80%). They reported a significant association between age, pre-existing cardiovascular disease, use of anticoagulants and/or antiplatelet agents, abnormal pupillary reactivity, lower hemoglobin levels and a higher glucose level and unfavorable outcomes in elderly patients with TBI. They concluded that older patients are at higher risk for long-term unfavorable outcomes than younger patients. There was a limitation of our study. This limitation is the lack of data on long-term outcome of the patients included in this present study. Also, we have no information about the short-term and long-term disabilities following injury in these patients. In a longitudinal follow-up study [35]; elderly patients, long hospitalization and patients with extremity injuries were found to be at high risk for disability. More comprehensive studies including long - term outcomes of elderly trauma patients are needed.

In conclusion, the elderly trauma patients have more comorbid disease, higher scores for APACHE II and lower scores for TRISS, more mechanical ventilation and tracheostomy requirements, more PRBC suspension transfusion requirement and higher mortality rate compared with young trauma patients. All trauma patients, especially the elderly patients should be evaluated with a rapid and systemic approach. Special trauma management modalities should be developed for elderly patients and new strategies should be introduced to reduce mortality in these patients.

Ethics Committee Approval: Ethics committee approval was received from the Ethics Committee of Ataturk University School of Medicine (Approval Number: B.30.2.ATA.0.01.00/217).

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