ÖZGÜN ARAŞTIRMA ORIGINAL RESEARCH

Med J SDU / SDÜ Tıp Fak Derg ▶ 2020:27(4):511-517 doi: 10.17343/sdutfd.757460

ARE THE FACTORS AFFECTING MORTALITY IN ELDERLY POLYTRAUMA PATIENTS DIFFERENT FROM THOSE AFFECTING YOUNGER PATIENTS?

YAŞLI POLİTRAVMA HASTALARINDA MORTALİTEYİ ETKİLEYEN FAKTÖRLER GENÇ HASTALARDAN FARKLI MIDIR?

Buket Altun ÖZDEMİR[1], Güzelali ÖZDEMİR[2], Niyazi Erdem YAŞAR[2], Olgun BİNGÖL[2], Hakan ATAŞ[1], Bülent ÇOMÇALI[1]

[1]Ankara City Hospital, General Surgery Clinic, Cankaya, Ankara, Turkey
[2]Ankara City Hospital, Orthopaedics and Traumatology Clinic, Cankaya, Ankara, Turkey

Cite this article as: Ozdemir BA, Ozdemir G, Yasar NE, Bingol O, Atas H, Comcalı B. Are the Factors Affecting Mortality in Elderly Polytrauma Patients Different from Those Affecting Younger Patients?. Med J SDU 2020; 27(4): 511-517.

Öz

Amaç
Bu çalışmanın amacı, genç ve yaşlı politravma hastaları arasındaki mortalite farklılıklarını değerlendirmektir.

Gereç ve Yöntem
Bu çalışmada Ocak 2014-Aralık 2018 tarihleri arasında hastanemizde tedavi edilen politravma hastalarının tümü retrospektif olarak incelendi. 65 yaşından küçük hastalar Grup I (n = 60), 65 yaş ve üstü hastalar Grup II (n = 60) olarak sınıflandırıldı. Yaş, cinsiyet, yaralanma mekanizması, yaralanma süresi, yaralanma ciddiyeti skoru (YCS), klinik öncesi hemodinami, hastaneye yatış, operatif tedavi, entübasyon oranı, yoğun bakım ünitesinde (YBÜ) tedavi ve 1 yıllık mortalite analiz edildi. Nötrofil-lenfosit oranı, monosit-lenfosit oranı ve sistemik inflamasyon yanıt indeksi hesaplandı.

Bulgular
Grup I'de yaş ortalaması 36,6 ± 13,0 (18-64), Grup II'de 73,5 ± 7,4 (56-91) idi. Gruplar arasında mortalite oranları arasında fark yoktu. Yaşlı politravma hastaları genellikle yaz aylarında kadın, daha düşük YCS, daha yüksek kan basıncı ve düşük enerjili yaralanma tipinde olma eğilimindedir. Grup I ve Grup II'de mortalite ve YCS skorları arasında istatistiksel olarak anlamlı bir pozitif korelasyon bulundu. Nötrofil-lenfosit oranı, monosit-lenfosit oranı ve sistemik inflamasyon yanıt indeksi skorları açısından yaşlı ve genç politravma hastaları arasında istatistiksel olarak anlamlı bir fark bulunmadı.

Sonuç
Yaşlı politravma hastaları ile genç hastalar arasında çeşitli farklılıklar vardır. Yaşlı hasta grubundaki mortalitenin birçok sistem yaralanmasından etkilendiği bulunmuştur. Bununla birlikte, bu çalışma genç ve yaşlı politravma hastaları arasında mortalite oranlarında hiçbir farklılık göstermemektedir.

Anahtar Kelimeler: Yaşlı, mortalite, politravma

Abstract

Objective
The purpose of this study was to evaluate the differences in mortality between young and elderly polytrauma patients.

İletişim kurulacak yazar/Corresponding author: olgunbingol@gmail.com
Müracaat tarihi/Application Date: 26.06.2020• Kabul tarihi/Accepted Date: 16.07.2020
ORCID IDs of the authors: B.A.O. 0000-0002-1043-8108; G.O. 0000-0003-4279-0955; N.E.Y. 0000-0002-6740-6422; O.B. 0000-0003-1720-1709; H.A. 0000-0003-4144-417X; B.C. 0000-0002-2111-1477

Materials and Methods
In the present study, all consecutive polytrauma patients treated at our hospital between January 2014 and December 2018 were reviewed retrospectively. Patients younger than 65 years old were classified as Group I (n = 60), and patients aged 65 years and older were classified as Group II (n = 60). Age, gender, mechanism of injury, time of injury, injury severity score (ISS), preclinical hemodynamics, hospitalization, operative treatment, intubation rate, intensive care unit (ICU) treatment, and 1-year mortality were analyzed. The neutrophil-to-lymphocyte ratio (NLR), monocyte-to-lymphocyte ratio (MLR), and systemic inflammation response index (SIRI) were calculated.

Results
The mean age was 36.6 ± 13.0 (18–64) years in Group I and 73.5 ± 7.4 (56–91) years in Group II. There was no difference in mortality rates between groups. Elderly polytrauma patients tend to be female, and lower ISS and higher blood pressure, as well as low-energy injury types, typically in the summer. A statistically significant positive correlation was found between mortality and ISS scores in both Group I and Group II. There was no statistically significant difference was found between elderly and younger polytrauma patients in terms of NLR, MLR, and SIRI scores.

Conclusion
There are several differences between elderly polytrauma patients and their younger counterparts. It was found that mortality in the elderly patient group was affected by many system injuries. However, the current study presents no differences in mortality rates between young and elderly polytrauma patients.

Keywords: Elderly, mortality, polytrauma

Introduction

Polytrauma has always been considered a challenge for surgeons because of difficulties that may be encountered during decision making, the high complication rates, and the high mortality rates (1).

Traffic accidents are considered to be the most common cause of polytrauma. In younger patients, polytrauma is mostly seen after high-energy injuries. However, in the elderly minor falls (<2m, <3m) are a more common cause of polytrauma. Although injury mechanisms are different, they are an important cause of morbidity and mortality in both age groups (2).

The mortality of elderly polytrauma patients is known to be higher than that of younger polytrauma patients (3–5). However, relatively few studies have examined the factors that predict mortality in elderly polytrauma patients. The majority of these studies have found only standard predictors, such as demographic factors, injury characteristics, pre-existing medical conditions, and physiological state on admission to hospital (3,6–9).

In the treatment of polytraumatized patients, however, it is important to identify those who have a high risk of mortality. Recently, some parameters, originating from routine complete blood count (CBC), have been identified. Among these hematology parameters, neutrophil-to-lymphocyte ratio (NLR), monocyte-to-lymphocyte ratio (MLR), and systemic inflammation response index (SIRI) are frequently preferred parameters. However, there is no consensus regarding hematological parameters in the literature about the injured patients (10).

We hypothesized that, the factors affecting mortality in elderly polytrauma patients are different from younger patients. The purpose of this study, therefore, was to evaluate the differences in mortality between young and elderly polytrauma patients.

Materials and Methods

In the present study, all consecutive patients with polytrauma treated at Ankara Numune Training and Research Hospital between January 2014 and December 2018 were reviewed retrospectively. After Institutional Review Board approval (E-18-2454) we searched the hospital database for patients who had a history of polytrauma.

Patients with polytrauma were included in the study. Patients with incomplete data and those who presented with no signs of life or who died in the emergency department after presentation were excluded from the study.

Polytrauma was defined as an injury severity score (ISS) of 16 or higher. The patients were divided into two groups according to their ages. Patients younger than 65 years old were classified as Group I (n = 60), and patients aged 65 years and older were classified as Group II (n = 60).

Age, gender, mechanism of injury, time of injury, ISS, hemodynamics at the presentation, hospitalization, operative treatment, intubation rate, intensive care

unit (ICU) treatment, and 1-year mortality were analyzed. Parameters originated from routine CBC on arrival; neutrophil-to-lymphocyte ratio (NLR), and monocyte-to-lymphocyte ratio (MLR) were calculated as ratios of lymphocyte, monocyte, and neutrophil counts. The systemic inflammation response index (SIRI) was calculated according to the following formula: SIRI = monocyte x neutrophil/lymphocyte. Normal ranges for lymphocyte, monocyte, and neutrophil were 0.9–5.2 x109/L, 0.0–1.0 x109/L, and 1.9–8.0 x109/L respectively.

Statistical Analysis

Statistical analyses were performed using SPSS software, version 22. The variables were investigated using the Kolmogorov-Smirnov analytical method to determine whether they were normally distributed. Descriptive analyses were presented using mean and standard deviations for normally distributed variables, medians for non-normally distributed data, and frequency tables for ordinal variables. The Mann-Whitney U test was used to compare parametric non-normally distributed variables for between-group comparisons. The Chi-square test or Fisher's exact test was used to compare these proportions in different groups. The Spearman correlation coefficient was used to investigate the correlation between the ordinal data and the non-normally distributed variables. A p-value of less than 0.05 was considered to indicate a statistically significant result.

Results

A total of 120 patients were included in the current study. According to their age, the patients were divided into 2 groups: Group I (n = 60, under 65 years of age) and Group II (n = 60, over 65 years of age). The mean age of the patients was 36.6 ± 13.0 (18–64) years in Group I and 73.5 ± 7.4 (65–91) years in Group II. The demographic and clinical variable results are summarized in Table 1. Younger polytrauma patients tended to be male, and this was statistically significantly different from the elderly polytrauma patients (p = 0.001). However, no statistically significant correlation was found between gender and mortality in Group II compared to the Group I (respectively: p = 0.238, p = 0.357).

A statistically significant weak positive correlation was found between mortality and ISS scores in the group I, and a statistically significant moderately positive correlation was found between mortality and ISS scores in the group II (respectively: p = 0.005, r = 0.36; p = 0.000, r = 0.59; see Table-1).

There was a statistically significant difference be-

Table 1 Demographic and clinical variables

	Group I (n=60)	Group II (n=60)	P value
Age (years)	36.6 ± 13 (18-64)	73.5 ± 7.4 (56-91)	0.000*
Gender Male/Female	54 (90%) / 6 (10%)	38 (63.3%) / 22 (36.7%)	0.001*
Time of the injury: **Season (Winter)** **Season (Summer)**	 33 (55%) 5 (8.3%)	 12 (20%) 18 (30%)	 0.000* 0.003*
Injury Severity Scale Median (IQR)	32 (21)	24.5 (16)	0.002*
Exitus	7 (11.7%)	10 (16.7%)	0.432
Systolic blood pressure (mm/Hg)	110 (29.5)	120 (26.25)	0.015*
Mechanism of the injury: **Low Energy /High Energy**	 0 / 60 (100%)	 15 (25%) / 45 (75%)	 0.000*
Intubation status	17 (28.3%)	15 (25%)	0.680
Operation status	32 (53.3%)	8 (13.3%)	0.000*
Transfusion status	15 (25%)	10 (16.7%)	0.261
Intensive Care Unit (Day)	0.00 (4)	0.00 (26.25)	0.028*
Length of stay (Day)	6 (9.75)	1 (11.25)	0.000*

*p<0.05: statically significant different

tween the groups in terms of time of injury. When the time of injury variable for Group I patients was evaluated, it was seen that injuries in this group occurred mostly in the winter season. However, the injuries in Group II were found to be statistically significantly in the summer season. (Table-1).

In the comparison between the groups, a statistically significant difference was observed in the Group I for chest and abdominal injuries. (Table-2). In our study, chest, external injury showed a statistically significant positive correlation with mortality in the Group I. In the elderly group, face, head, neck, chest, abdomen

Table 2 Inter-group Injury Severity Score Comparison

	Group I Median (min-max)	Group II Median (min-max)	P value
Face	0 (0-9)	0 (0-16)	0.137
Head-Neck	9 (0-25)	9 (0-25)	0.369
Thorax	9 (0-25)	4 (0-36)	0.000*
Abdomen	4 (0-25)	1 (0-16)	0.001*
External	0 (0-16)	0 (0-9)	0.288
Extremity	9 (0-25)	9 (0-25)	0.658

*p<0.05: statically significant different

Table 3 Relationship between Injury Severity Score and mortality

		Face	Head-Neck	Thorax	Abdomen	External	Extremity
Mortality	**Group I**	r=-0.097 p=0.461	r=0.042 p=0.749	r=0.301* p=0.019	r=0.070 p=0.597	r=0.587* p=0.000	r=0146 p=0.267
	Group II	r=0.318* p=0.013	r=0.296* p=0.021	r=0.260* p=0.045	r=0.309* p=0.016	r=0.058 p=0.661	r=0.291* p=0.024

*p<0.05: statically significant different

Table 4 The parameters which were originated from routine complete blood count

	Group I (n=60)	Group II (n=60)	P
Hemoglobin level (g/dl)	14.4 (2.18)	12.6 (2.97)	0.000*
Hemotocryte level (%)	41.9 (5.73)	38.7 (6.50)	0.001*
Neutrophil level (10^3/µl)	9 (7.85)	7.2 (5.88)	0.041*
Lymphocyte level (10^3/µl)	3.6 (3.45)	2.7 (1.90)	0.002*
Monocyte level (10^3/µl)	0.85 (0.58)	0.7 (0.5)	0.077
Neutrophyl Lymphocyte Ratio	2.28 (3.34)	2.95 (3.30)	0.342
Monocyte Lymphocyte Ratio	0.21 (0.25)	0.28 (0.31)	0.104
Systemic Inflammation Response Index	2.15 (3.21)	2.47 (3.22)	0.826

*p<0.05: statically significant different

and extremity injuries showed a statistically significant positive correlation with mortality. (Table-3).

Mean hemoglobin, hematocrit, neutrophil, and lymphocyte values were statistically significantly lower in Group 2 than in Group 1 (respectively; p=0.000, p=0.001, p=0.041, p=0.002). However, there were no statistically significant differences in mean monocyte, NLR, MLR, and SIRI values between groups I and II (respectively; p=0.077, p=0.342, p=0.104, p=0.826). The parameters which originated from routine complete blood count, were summarized in Table-4. (Table-4).

Discussion

The current study presents no differences in mortality rates between young and elderly polytrauma patients. In this study found that elderly polytrauma patients had lower ISS, lower hemoglobin level, and higher systolic blood pressure than their younger counterparts.

Population age is increasing globally, though trauma in older patients is becoming a major health issue worldwide (8). Researchers suggest that polytrauma in the elderly is increasing (11,12). However, the affecting mortality of elderly polytrauma patients were not well understood (8). Relatively few studies have examined the factors that predict mortality in elderly polytrauma patients. The majority of them have found standard predictors; such as demographic factors, injury characteristics, pre-existing medical conditions, and physiological state on admission to hospital (3,6–9). There is no clear agreement on the relative impact of these diverse factors on mortality in elderly polytrauma patients (8).

In contrast to younger counterparts elderly polytrauma patients have higher mortality rates (3,13,14). The meta-analysis studies demonstrated that, patients older than 74 years experiencing traumatic injuries were at a higher risk of mortality than the younger geriatric group (7,8). Contrary to the literature, in the present study there was no statistically significant difference between younger and elderly polytrauma patients regarding mortality rates (p=0.432). We believe that this situation is closely related to the occurrence of low energy trauma in the elderly causing to polytrauma unlike younger patients. Not all polytraumas in the elderly occur with high energy mechanisms. Also, in another study model that will be done by excluding low energy injuries, these results may be change.

The studies that investigated the impact of gender on mortality in older trauma patients found that; male sex was correlated with significantly higher mortality rate than female sex (8,15). In the present study younger polytrauma patients tended to be male, and this was statistically significantly different from the elderly (p=0.001). However, no statistically significant correlation was found between gender and mortality in the elderly and young groups (respectively; p=0.238, p=0.357).

Some studies reported that the mortality correlates closely with ISS in elderly polytrauma patients (6–8,14). On the other hand, some investigators suggested that ISS did not predict survival (13). In the present study the mean ISS value of the younger polytrauma patients was statistically significantly higher than the elderly (p=0.002). Although ISS was higher in younger patients than in elderly patients, the correlation of ISS with mortality rate was more prominent in elderly patients. In addition, some of the polytrauma in elderly patients was seen to be caused by low energy trauma, unlike younger polytrauma patients.

Some authors reported differences in mortality of elderly polytrauma patients for different injury patterns. Upper limb injuries showed reduced mortality risk than lower limb injuries in elderly polytrauma patients (16). The leading cause of the mortality was considered as severe brain injuries in younger and elderly polytrauma patients (4). Extremity injuries showed reduced mortality risk compared to head injuries in elderly polytrauma patients (17). In the present study; face, head-neck, chest, abdomen and extremity injuries in the elderly group showed a statistically significant positive correlation with mortality. It was found that mortality in the elderly patient group was affected by many systems. However, when this situation was evaluated for the young patient population it was found that chest and external injury were especially prominent in mortality.

Lower hemoglobin level was correlated with mortality of elderly polytrauma patients (13). At the present study mean hemoglobin and hematocrit values were statistically significantly lower in elderly polytrauma patients than their younger counterparts (respectively; p=0.000, p=0.001).

Elderly polytrauma patients initially presented a higher rate of hemodynamic instability (3). Low systolic blood pressure on presentation has been defined as a significant risk factor for mortality in elderly trauma patients (7–9). In the present study, mean systolic blood pressure was statistically significantly higher in elderly polytrauma patients than their younger counterparts (p=0.015). This could be due to the higher incidence

of hypertension in the elderly population (18). However, in our study, we could not access these data, and this is a limitation of our study

Elderly patients had to be ventilated longer (3). However, in the present study there was no statistically significant difference in intubation status between elderly and younger polytrauma patients (p=0.680).

The time of the injury is another issue, which has not been completely discussed in the literature. There was a statistically significant difference between the groups in terms of time of the injury. Polytrauma was seen mostly in winter season in young patients. However, it was seen mostly in the summer season in elderly patients. According to literature review, this has not been mentioned before.

NLR and MLR are novel indicators of baseline inflammatory response. Several authors were found NLR as an independent predictor of mortality in critically ill ICU patients, after emergency abdominal surgery in the elderly, after major cardiac and vascular surgery (19–24). In the present study, there were no statistically significant differences in mean NLR and MLR values between elderly and younger polytrauma patients (respectively; p=0.041, p=0.077).

Recently, SIRI has been determined to be a reliable prognostic factor in a variety of cancers (25–28). SIRI was considered to be better than MLR and NLR in terms of predictive accuracy in patients with pancreatic cancer and clear cell renal cell cancer (25,26). In the present study, there was no statistically significant difference between mean SIRI value in the elderly and younger polytrauma patients (p=0.826).

The limitation of this study was the use of data obtained from retrospective screening, lack of comorbidities, and that it was conducted in a single center. In addition, comparing the study with patients of different age ranges causes limitations in evaluating the results. The strength of the study is that hematological data of elderly and younger polytrauma patients were compared for the first time in the literature.

Conclusion

Elderly polytrauma patients are not just older adults, and there are several differences between them and their younger counterparts. This study showed that elderly polytrauma patients tend to be female, with lower ISS, higher blood pressure, low energy injuries which occur in the summer season.

In the present study; face, head-neck, chest, abdomen and extremity injuries in the elderly group showed a statistically significant positive correlation with mortality. It was found that mortality in the elderly patient group was affected by many system injuries.

However, the current study presents no differences in mortality rates between young and elderly polytrauma patients. Also, there is no statistically significant difference was found between elderly and younger polytrauma patients in terms of NLR, MLR and SIRI scores.

The existing differences in the treatment of elderly polytrauma patients need to be considered during decision making.

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