RESEARCH ARTICLE / ARAŞTIRMA MAKALESI

Analysis of Patients Consulted to the Neurosurgery Clinic from the Emergency Department and Evaluation of Mortality

Acil Servisten Nöroşirurji Kliniğine Konsülte Edilen Hastaların Analizi ve Mortalitenin Değerlendirilmesi

Mustafa ALPASLAN[1], Sultan ÖZSELÇUK[2]

[1]*Department of Emergency Medicine, Nevsehir State Hospital, Nevsehir, Turkey*

[2]*Department of Internal Medicine, Faculty of Medicine, Nevsehir State Hospital, Nevsehir, Turkey*

Yazışma Adresi / Correspondence

Mustafa ALPASLAN

Department of Emergency Medicine, Nevsehir State Hospital, Nevsehir, Turkey

e-mail : mustafalpaslan@gmail.com

Geliş Tarihi / Received : 14.06.2024 Kabul Tarihi / Accepted: 16.07.2024

Mustafa ALPASLAN http://orcid.org/0000-0003-3170-0125 mustafalpaslan@gmail.com

Sultan ÖZSELÇUK http://orcid.org/0000-0002-2168-9818sultanaozselcuk@hotmail.com

Hippocrates Medical Journal / Hippocrates Med J 2024, 4(2):40-47 DOI: https://doi.org/10.58961/hmj.1501247

Abstract

Introduction To analyze neurosurgical consultations in emergency department admissions, to reveal the characteristics of patients in need of neurosurgery and to analyze mortality in patients.

Materials and Methods The study was conducted retrospectively in the emergency department of a secondary care hospital. All patients consulted to the neurosurgery clinic from the adult emergency department between 01.01.2023-31.12.2023 were evaluated in the study. Demographic data, admission and/or admission complaint, diagnosis, comorbid disease status, anticoagulant use, surgical procedure status, Glasgow Coma Score at the time of arrival to the emergency department, duration of hospitalization and in-hospital mortality status were analyzed.

Results 595 patients were evaluated in the study. 59.5% of the patients were male and the mean age was 45.17±25.77 years. The most common type of admission was general body trauma due to fall (48.9%). The most common diagnosis was isolated lumbar vertebral fracture (15%). Intensive care unit hospitalization, surgical procedures and mortality rates were significantly higher in patients with a lower Glasgow Coma Score at admission ($p<0.05$). Anticoagulant use was significantly higher in patients with intracranial hemorrhage ($p=0.006$). The length of hospitalization was significantly higher in patients with cranial hemorrhage compared to other cases ($p=0.000$). Surgical procedures were performed in 9.4% of the patients (n=56). In total, 45 patients died (7.6%), including three in the emergency department.

Conclusion Neurosurgical consultations are extremely important in the emergency department and the majority of patients with pathology were found to be at risk for morbidity and mortality due to intracranial hemorrhage and spinal cord injury.

Keywords Emergency Department, Neurosurgery, Head Trauma, Spinal Cord Injury, Mortality.

Özet

Amaç Acil servis başvuruları içerisindeki nöroşirurji konsültasyonlarını analiz ederek nöroşirurji ihtiyacı olan hastaların özelliklerinin ortaya konulması ve hastalarda mortalite analizinin yapılmasıdır.

Gereç ve Yöntemler Çalışma retrospektif olarak ikinci basamak bir hastanenin acil servisinde yapılmıştır. Çalışmada 01.01.2023-31.12.2023 tarihleri arasında erişkin acil servisten nöroşirurji kliniğine konsülte edilen tüm hastalar değerlendirildi. Hastalarda demografik veriler, başvuru ve/veya kabul şikâyeti, teşhis, komorbit hastalık durumu, antikoagülan kullanımı, cerrahi işlem durumu, acil servise geliş anındaki Glaskow Koma Skoru, hastanede yatış süresi ve hastane içi mortalite durumu analiz edildi.

Bulgular Çalışmada 595 hasta değerlendirildi. Hastaların % 59,5'i erkeklerden oluşmakta olup yaş ortalaması 45,17±25,77 oldu. Hastalarda en sık görülen kabul şekli düşmeye bağlı genel vücut travması (%48,9) oldu. Hastalarda konulan teşhislere bakıldığında en sık izole lomber vertebra fraktürü (%15) olduğu görüldü. Kabul anında Glaskow Koma Skoru düşük olanlarda yoğun bakım yatışı, cerrahi işlem yapılma ve mortalite oranı anlamlı derecede daha yüksekti ($p<0,05$). Antikoagülan kullanımının intrakranial kanama olanlarda anlamlı oranda yüksek olduğu görüldü ($p=0,006$). Kranial kanama olan hastaların yatış süresi diğer vakalara göre anlamlı oranda daha yüksekti ($p=0,000$). Hastaların %9,4'üne (n=56) cerrahi işlem yapıldı. Toplamda acil serviste üç olmak üzere 45 hasta ölümle (% 7,6) sonlandı.

Sonuç Nöroşirurji konsültasyonları acil servis açısından son derece önemli olup patoloji saptanan hastaların büyük çoğunluğunun intrakranial kanama ile spinal kord yaralanması gibi durumlara bağlı olarak morbidite ve mortalite açısından riskli hastalar olduğu görüldü.

Anahtar Kelimeler Acil Servis , Kafa Travması, Mortalite , Nöroşirurji Spinal Kord Yaralanması.

INTRODUCTION

Emergency department (ED)s are units where all patient groups are evaluated extensively and medical care and treatment services are provided. Emergency departments offer the diagnosis and treatment of acute and chronic diseases, as well as the opportunity to perform emergency surgical intervention and hospitalization and treatment of patients when necessary in an organized manner with other clinics (1,2). The neurosurgery clinic is one of the most frequently requested clinics for consultation in traumatic and non-traumatic cases (3). The number of neurosurgeons is quite low worldwide and it is reported that there is one neurosurgeon per 80.000 people in developed countries and one neurosurgeon per one million people in African countries (4).

Neurosurgical consultations requested from the ED are most frequently due to head trauma and spinal injuries, and the majority of patients present a high risk in terms of mortality and morbidity (4). It has been reported that traumas are the leading cause of death especially in the young population in underdeveloped and developing countries in the world and the majority of these are due to head trauma (5-7). Prompt treatment of injuries occurring after head trauma is predicted to be effective in preventing morbidity and mortality (5-7). Spinal injuries are quite devastating in terms of individual and social damage and may cause temporary and permanent loss of motor, sensory and autonomic functions (8,9).

In this study, we aimed to reveal the characteristics of patients who needed neurosurgery by analyzing neurosurgery consultations in ED admissions of a secondary hospital and to analyze mortality in patients.

MATERIALS AND METHODS

Data Collection and Analysis

This retrospective study was conducted in the ED of a hospital located in a tourism region and providing secondary health care services. In the study, all patients (including pediatric trauma patients) consulted to the neurosurgery clinic from the adult ED between 01.01.2023-31.12.2023 were evaluated. We obtained data that 608 patients were consulted to the neurosurgery clinic within the specified period. Patients who did not generate sufficient data were excluded from the study and the study was completed with 595 patients. Demographic data, admission and/or admission complaint, diagnosis, comorbid disease status, anticoagulant use, surgical procedure status, Glasgow Coma Score (GCS) at the time of arrival to the ED, duration of hospitalization and in-hospital mortality status were analyzed. When evaluating the Glasgow Coma Score, patients were classified into three groups as low risk (13-15), medium risk (8-12) and high risk (3-8). General comparative analyses were performed within the scope of the study. Data of surviving and deceased patients were compared.

Data were collected through the hospital electronic data system (SISOFT operating system). In the hospital electronic data system, the list of patients consulted from the ED to the neurosurgery clinic within the specified time interval was first filtered. The protocol numbers of the patients were recorded and then the data of these patients were accessed individually. Data on comorbid diseases and medication use were accessed from the demographic data and past examination records of the patients stored in the data system. Data on patient clinical findings were accessed with the information recorded in the system by the relevant physician. Data on the duration of hospitalization and mortality were obtained from the patient's data recorded in the electronic system. Patient data were transferred in the data recording form prepared before the study.

Ethics Committee Approval

Hacıbektaş Veli University Non-Interventional Clinical Research Ethics Committee approval was obtained with decision number 2024/05 and dated 21/03/2024.

Statistical Analysis

Statistical Package for Social Sciences for Windows 21.0 (SPSS 21.0) was used to analyze the data. The conformity of the data to normal distribution was evaluated by histogram and Q-Q graphs and Shapiro-Wilk test. Homogeneity of variance was tested by Levene's test. Independent two-sample Student's T test was used for intergroup comparisons. Pearson $\chi 2$ analysis and Fisher exact $\chi 2$ test were used for comparisons of categorical data. Pearson correlation analysis test was used to evaluate the data related to mortality. The results were presented as mean ± SD or frequency (percentage) and the significance level was accepted as $p<0.05$ with a 95 percent confidence interval.

RESULTS

595 patients were evaluated in the study. 59.5% of the patients were male and the mean age was 45.17±25.77 years (Table 1). When the distribution of admissions according to age ranges was analyzed, it was observed that the highest number of admissions was in the 61-80 age range (24.4%) (Table 2).

Table 1. Comparison of general data and mortality

Datas	**General Distrubition**	**Survival**	**Death**	**p ***
Age (Average)	45.17±25.77	43.79±25.40	61.97±24.56	0.000[a]
Gender				
Male	354 (59.5)	328 (59.6)	26 (57.8)	0.875
Woman	241 (40.5)	222 (40.4)	19 (42.2)	
Comorbidity				
Hypertension	91 (25.3)	65 (71.4)	28 (28.6)	0.000[a]
Diabetes Mellitus	24 (4)	18 (75)	6 (25)	0.006
Coronary Artery Disease	39 (6.6)	32 (82.1)	7 (17.9)	0.021
Previous Surgery	56 (9.4)	45 (80.4)	11 (19.6)	0.002
Anticoagulant Use				
No use	550 (92.4)	512 (93.1)	38 (6.9)	0.393
Acetyl Salicylic Acid	15 (2.5)	13 (86.7)	2 (13.3)	
Warfarin	13 (2.2)	10 (76.9)	3 (23.1)	
Clopidogrel	2 (0.3)	2 (100)	0 (0)	
Acetyl Salicylic Acid + Clopidogrel	6 (1)	5 (83.3)	1 (16.7)	
Rivaroxaban	6 (1)	5 (83.3)	1 (16.7)	
Apiksaban	2 (0.3)	2 (100)	0 (0)	
Tikagrelor	1 (0.2)	1 (100)	0 (0)	
GCS at the Time of Application**				
Average	13.80±3.09	14.36±2.14	6.95±4.41	0.000[a]
3-8 (High Risk)	44 (7.4)	17 (38.6)	27 (61.4)	0.000
9-12 (Medium Risk)	34 (5.7)	24 (70.6)	10 (29.4)	
13-15 (Low Risk)	517 (86.9)	509 (98.5)	8 (1.5)	
Emergency Service Result				
Discharged	294 (49.4)	294 (100)	0 (0)	0.000
Service Hospitalization	66 (11.1)	66 (100)	0 (0)	
Intensive Care Hospitalization	169 (28.4)	128 (75.7)	41 (24.3)	
Referral to Another Center	63 (10.6)	62 (98.4)	1 (1.6)	
Death	3 (0.5)	0 (0)	3 (100)	
Treatment				
Conservative Treatment and Clinical Monitoring	539 (90.6)	505 (93.7)	34 (6.3)	0.002
Surgery	56 (9.4)	45 (80.4)	11 (19.6)	
Length of Hospitalization				
Minimum-maximum	0-111	0-55	0-111	0.000[a]
Average day	4.87±11.68	3.60±7.23	20.46±30.35	
Total	595 (100)	550 (92.4)	45 (7.6)	

Data are expressed as mean±standard deviation and n (%).
*Student's T-test analysis was performed between two independent groups for the comparison of survival and death outcomes.
[a] Pearson correlation analysis was performed between variables.
**GCS: Glascow Coma Score

When we analyzed the applicants according to gender in age ranges, it was observed that there were more male applicants in general, while there were significantly more female applicants (57.1%) in the 81-100 age range (p= 0.045). In the distribution of admissions by month, the highest number of admissions was in August (11%, n=66) and the lowest number of admissions was in January (5.9%, n=35). The most common mode of admission was general body trauma due to fall (48.9%), headache (18.7%) and impaired consciousness (10.6%), respectively. Comparative analysis of admission patterns according to gender showed no significant difference. However, there was a significant difference in the acceptance patterns according to age ranges (p=0.000). As shown in Table 2, cases of falling and being hit by a falling object were more common in the 0-20 age range, while cases of impaired consciousness and limb weakness were more common in older ages. The most common diagnoses were isolated lumbar vertebral fracture (15%), intraparenchymal hemorrhage (10.6%) and combination of thoracic and lumbar vertebral fractures (10.4%). There was no significant difference in the comparison of diagnoses according to gender (p=0.364). However, there was a significant difference between age groups and diagnoses (p=0.000). As shown in Table 2, skull bone fractures and intraparenchymal hemorrhage were seen in the 0-20 age range, vertebral fractures were mostly seen in the 41-60 age range and subdural hemorrhage was seen in older ages. Table 1 shows the distribution of general data of the patients. In general, hypertension (HT) was the most common comorbid disease (25.3%). The most common anticoagulant use was acetylsalicylic acid (ASA) (2.5%) and warfarin (2.2%). The mean GCS at admission was 13.80±3.09. Regarding the outcome from the ED, 294 patients (49.4%) were discharged. Surgical procedures were performed in 9.4% of the patients (n=56). The mean duration of hospitalization was 4.87±11.68 (0-111) days. In total, 45 patients died (7.6%), including three in the ED. There was a significant result in the comparison between the GCS evaluation at the time of admission to the ED and the type of admission. The most common GCS value was between 3 and 8 in patients admitted with general body trauma and unconsciousness after a fall. In the comparison between the diagnosis and the GCS value at the time of admission, it was seen that the GCS value of patients with skull bone fracture and intraparenchymal hemorrhage was significantly higher than the other cases and was in the range of 3 and 8 points (p=0.000). In terms of clinical outcome, the rate of intensive care unit hospitalization was higher in patients with GCS values between 3 and 8 (79.5%) and 9 and 12 (85.3%) (p=0.000). The proportion of patients who underwent surgical procedures was higher in patients with GCS values of 3 and 8 and 9 and 12 than in patients with GCS values of 13 and 15 (p=0.001).

According to the comparison of the length of hospitalization according to admission status, the length of hospitalization of patients admitted for general body trauma due to fall was significantly higher than the other

cases (p=0.000). When the length of hospitalization was analyzed according to the diagnosis, the length of hospitalization of patients with cranial hemorrhage was significantly higher than the other cases (p=0.000). Although there was no significant correlation between anticoagulant use and mortality (p=0.393), anticoagulant use was significantly higher in patients with intracranial hemorrhage (p=0.006). In the study, a comparison of survivors and cases that ended in death was made. According to the data, the mean age of deceased patients was significantly higher (p=0.000).

Deceased patients had significantly lower GCS at admission (p=0.000). The mortality rate was significantly higher in patients hospitalized in intensive care unit (p=0,000). The mortality rate was higher in patients who underwent surgical procedures compared to those who underwent conservative treatment (p= 0.002). When the length of hospitalization was analyzed, the mean length of hospitalization was significantly higher in patients who died (p=0.000). There was a significant difference between the reasons for admission and mortality (p=0.000). As shown in Table 3, the most common causes of death were general body trauma due to fall (40%) and impaired consciousness (31.1%). The mortality rate was higher in patients admitted with syncope and fainting (50%) and epileptic seizures (25%). There was also a significant difference between diagnosis and mortality (p=0.000). As shown in Table 3, 53.3% of the cases that ended in death were patients with intraparenchymal hemorrhage. In general, cranial hemorrhage was predominant in the majority of cases that ended in death and patients with vertebral fractures had a lower mortality rate. The data are presented in detail in table 1 and table 3. Pearson correlation analysis test was performed on the mortality of the patients and it was observed that the mortality rate increased with increasing age and duration of hospitalization (p=0.000). When comorbid disease status was analyzed, mortality rate was found to be significantly higher in patients with HT (p=0.000). In addition, there was a

significant correlation between low GCS at admission and mortality (p=0.000) (Table 1).

Table 2. Distribution of the reason for admission and diagnoses

Application / Clinical Finding	Gender		p*	Range of Age					p*
	Female	Male		0-20	21-40	41-60	61-80	81-100	
General Body Trauma due to Fall	112 (38.5)	179 (61.5)	0.173	95 (32.6)	64 (22)	66 (22.7)	50 (17.2)	16 (5.5)	0.000
Headache	45 (40.5)	66 (59.5)		12 (10.8)	30 (27)	30 (27)	31 (27.9)	8 (7.2)	
Disorder of Consciousness	28 (44.4)	35 (55.6)		7 (11.1)	4 (6.3)	12 (19)	27 (42.9)	13 (20.6)	
Low Back Pain	20 (47.6)	22 (52.4)		0 (0)	16 (38.1)	14 (33.3)	8 (19)	4 (9.5)	
Being Under a Falling Object	16 (61.5)	10 (38.5)		8 (30.8)	6 (23.1)	4 (15.4)	7 (26.9)	1 (3.8)	
Limb Weakness	7 (33.3)	14 (66.7)		0 (0)	1 (4.8)	3 (14.3)	11 (52.4)	6 (28.6)	
Neck Pain	5 (35.7)	9 (64.3)		0 (0)	4 (28.6)	7 (50)	3 (21.4)	0 (0)	
Battery	0 (0)	9 (100)		1 (11.1)	6 (66.7)	2 (33.3)	0 (0)	0(0)	
Epileptic Seizure	4 (50)	4 (50)		0 (0)	1 (12.5)	2 (25)	5 (62.5)	0 (0)	
Syncope and Fainting	3 (50)	3 (50)		0 (0)	1 (16.7)	2 (33.3)	2 (33.3)	1(16.7)	
Nausea and Vomiting	1 (50)	1 (50)		1 (50)	1 (50)	0 (0)	0 (0)	0 (0)	
Visual Impairment	0 (0)	2 (100)		0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	
Diagnosis									
Cervical Vertebra Fracture	12 (52.2)	11 (47.8)	0.364	2 (8.7)	5 (21.7)	10 (43.5)	6 (26.1)	0 (0)	0.000
Thoracic Vertebral Fracture	20 (44.4)	25 (55.6)		4 (8.9)	14 (31.1)	16 (35.6)	7 (15.6)	4 (8.9)	
Lumbar Vertebral Fracture	40 (44.9)	49 (55.1)		6 (6.7)	26 (29.2)	34 (38.2)	18 (20.2)	5 (5.6)	
Cervical + Thoracic Vertebral Fracture	0 (0)	2 (100)		0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	
Lumbar + Thoracic Vertebral Fracture	26 (41.9)	36 (58.1)		18 (29)	16 (25.8)	14 (22.6)	11 (17.7)	3 (4.8)	
Skull Bone Fracture	25 (42.4)	34 (57.6)		44 (74.6)	11 (18.6)	3 (5.1)	1 (1.7)	0 (0)	
Skull Bone Fracture + Intracranial Hemorrhage	5 (20.8)	19 (79.2)		11 (45.8)	11 (45.8)	0 (0)	2 (8.3)	0 (0)	
Intraparenchymal Hemorrhage	29 (46)	34 (54)		2 (3.2)	3 (4.8)	15 (23.8)	31 (49.2)	12 (19)	
Epidural Bleeding	7 (33.3)	14 (66.7)		8 (38.1)	5 (23.8)	3 (14.3)	5 (23.8)	0 (0)	
Subdural Hemorrhage	19 (40.4)	28 (59.6)		6 (12.8)	10 (21.3)	4 (8.5)	15 (31.9)	12 (25.5)	
Subarachnoid Hemorrhage	14 (37.8)	23(62.2)		6 (16.2)	8 (21.6)	12 (32.4)	9 (24.3)	2 (5.4)	
Intracranial Mass / Metastasis	18 (40.9)	26 (59.1)		0 (0)	4 (9.1)	15 (34.1)	20 (45.5)	5 (11.4)	
Disc Herniation	6 (50)	6 (50)		1 (8.3)	4 (33.3)	3 (25)	4 (33.3)	0 (0)	
Meningioma	3 (60)	2 (40)		0 (0)	1 (20)	0 (0)	3 (60)	1 (20)	
Hydrocephalus	1 (25)	3 (75)		0 (0)	0 (0)	2 (50)	2 (50)	0 (0)	
Sinus Vein Thrombosis	1 (100)	0 (0)		0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	
Ischemic Stroke	1 (100)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	
Hypertensive Encephalopathy	0 (0)	1 (100)		0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	
No Pathology	14 (25.5)	41 (74.5)		16 (29.1)	14 (25.5)	11 (20)	10 (18.2)	4 (7.3)	
Total	241 (40.5)	354 (59.5)		124 (20.8)	134 (22.5)	143 (24)	145 (24.4)	49 (8.2)	

Data are expressed as n (%).
*Pearson $\chi 2$ analysis and Fisher exact $\chi 2$ test were used to compare categorical data.

Table 3. Comparison of the reason for admission and diagnoses in patients

Application / Clinical Finding	Survivor (n /%)	Death (n/%)	p*
General Body Trauma due to Fall	273 (93.8)	18 (6.2)	
Headache	106 (95.5)	5 (4.5)	
Disorder of Consciousness	49 (77.8)	14 (22.2)	
Low Back Pain	42 (100)	0 (0)	
Being Under a Falling Object	25 (96.2)	1 (3.8)	
Limb Weakness	20 (95.2)	1 (4.8)	0.000
Neck Pain	14 (100)	0 (0)	
Battery	8 (88.9)	1 (11.1)	
Epileptic Seizure	6 (75)	2 (25)	
Syncope and Fainting	3 (50)	3 (50)	
Nausea and Vomiting	2 (100)	0 (0)	
Visual Impairment	2 (100)	0 (0)	
Diagnosis			
Cervical Vertebra Fracture	23 (100)	0 (0)	
Thoracic Vertebral Fracture	44 (97.8)	1 (2.2)	
Lumbar Vertebral Fracture	89 (100)	0 (0)	
Cervical + Thoracic Vertebral Fracture	1 (50)	1 (50)	
Lumbar + Thoracic Vertebral Fracture	61 (98.4)	1 (1.6)	
Skull Bone Fracture	57 (96.6)	2 (3.4)	
Skull Bone Fracture + Intracranial Hemorrhage	19 (79.2)	5 (20.8)	
Intraparenchymal Hemorrhage	39 (61.9)	24 (38.1)	
Epidural Bleeding	19 (90.5)	2 (9.5)	0.000
Subdural Hemorrhage	43 (91.5)	4 (8.5)	
Subarachnoid Hemorrhage	34 (91.9)	3 (8.1)	
Intracranial Mass / Metastasis	42 (95.5)	2 (4.5)	
Disc Herniation	12 (100)	0 (0)	
Meningioma	5 (100)	0 (0)	
Hydrocephalus	4 (100)	0 (0)	
Sinus Vein Thrombosis	1 (100)	0 (0)	
Ischemic Stroke	1 (100)	0 (0)	
Hypertensive Encephalopathy	1 (100)	0 (0)	
No Pathology	55 (100)	0 (0)	
Total	550 (92.4)	45 (7.6)	

Data are expressed as n (%).
*Pearson $\chi 2$ analysis and Fisher exact $\chi 2$ test were used to compare categorical data.

DISCUSSION

Trauma is one of the most important causes of morbidity and mortality in the world (10). In a study, it was observed that the most common trauma-related prehospital and in-hospital deaths in the first 24 hours were due to injuries in the head and neck region (11). Similarly, studies have reported that the majority of patients consulted to the neurosurgery clinic from the ED consisted of traumas. Fall, traffic accident and battery are the most common types of trauma (12,13). In our study, the most common reason for admission was fall-related injuries (48.9%). In a similar study by Senguldur et al. it was observed that the most common reason for admission was injuries due to falls (35.7%) (3). In our study, the mean age of the patients was 45.17±25.77 years. In a study evaluating patients admitted to the ED after head trauma, the mean age was reported to be 34.22±22.2 years (14). In a study in which patients with traumatic spinal cord injury were analyzed, it was observed that the most common age range was 18-44 years (15). In a study by Senguldur et al. similar to our study, the mean age of the patients was 57 (37-68) years (3). The mean age obtained in our study is close to the literature data. In fact, in this study, we found that head trauma-related injuries were more common in younger ages and spinal cord injuries were more common in the young and middle age group. We attribute this to the fact that head injuries due to falls are more common in trauma-related injuries, especially in children, and that the young and middle-aged patients are more active in social life and face more trauma.In a study by Avcı et al. on trauma-related deaths in the ED, 76% of the patients were male (11). In a study conducted on patients for whom neurosurgical consultation was requested from the ED, the rate of male patients was 63.3% (3). In a study on spinal cord injuries, the rate of male patients was 71.6% (15). In our study, the rate of male patients was 59.5%, which is compatible with the literature. We attributed the lower rate of male patients in our study to the fact that non-traumatic cases were also evaluated in the study. Varma et al. reported the order of frequency of vertebral injury as cervical, thoracic and lumbosacral (16). Similarly, Uras et al. reported the frequency of injury in the cervical, thoracic and lumbar regions, respectively (15). In our study, lumbar and thoracolumbar vertebral fractures were more common. According to a study by Varma et al. the mortality rate is higher in cervical and thoracic injuries than in lumbosacral injuries (16). In the study conducted by Uras, it was observed that the mortality rate increased 14.2 times in patients with cervical level injuries compared to those without cervical level injuries (15). In our study, cervicothoracic, thoracic and thoracolumbar injuries were observed in three cases that ended in death. The most commonly used method in terms

of determining prognosis and clinical follow-up in the neurologic examination of patients with head trauma at the first examination is GCS. Head traumas are graded with this scoring and it has been reported that the mortality rate increases when low scores are observed in patients at the first examination (17,18). Patients with a GCS score between 3 and 8 are classified as having severe head trauma, those with a score between 9 and 12 are classified as having moderate head trauma and those with a score between 13 and 15 are classified as having mild head trauma (19). In our study, it was observed that the GCS values of the cases that ended in death were significantly lower at presentation (p=0.000). When we looked at the relationship between the GCS score and the clinical outcome of the patients, we found that the rate of emergency surgery or hospitalization in the neurosurgery clinic increased as the GCS score of the patients in our study decreased. In the study by Gomez et al. the need for hospitalization and surgery was higher in patients with low GCS scores (18). Similarly, in the study by Catal, the rate of emergency surgical intervention and hospitalization increased in patients with low GCS scores (20). This suggests that the incidence of intracranial hemorrhage increases in patients with low GCS score. Anticoagulant or antiplatelet drugs increase bleeding tendency by inhibiting the coagulation mechanism cascade or by preventing platelet adhesion and/or aggregation (20). In our study, the rate of intracranial hemorrhage was significantly higher in patients using anticoagulants (p=0.000). When anticoagulant use was analyzed in our study, it was observed that ASA and warfarin use was the highest. In a thesis study conducted
by Catal, warfarin and ASA were found to be the most common drugs causing intracranial hemorrhage (20). In
a study by Swap et al, intracranial hemorrhage was found at a higher rate in patients using ASA and warfarin (21). In our study, we found that the most important cause of mortality in patients consulted to the neurosurgery clinic was intracranial hemorrhage due to head trauma. Studies in the literature have reported that the most common cause of trauma-related mortality is intracranial hemorrhage occurring after trauma (22-24). Evans et al. reported that 33% of deaths due to high-energy trauma were of central nervous system origin and 33% of these were due to cranial hemorrhage (23).

CONCLUSION

In this study, we found that any pathology was detected in 90.7% (n=540) of the neurosurgical consultations requested from the ED. We would like to emphasize that the majority of the patients with pathology were at high risk for morbidity and mortality due to head trauma, intracranial hemorrhage and spinal cord injury. There should always be good coordination between the ED and the neurosurgery clinic for early intervention. We think that the number of neurosurgeons in our country, as in the whole world, is low compared to the population. We anticipate that the referral processes experienced especially in secondary care hospitals with the absence of neurosurgeons from time to time increase morbidity and mortality for patients. As seen in our study, we suggest that the number of physicians in such a clinic with a high risk of mortality and morbidity should be increased and necessary arrangements should be made to increase the number of neurosurgeons, especially in secondary hospitals.

Ethics Committee Approval:
Hacıbektaş Veli University Non-Interventional Clinical Research Ethics Committee approval was obtained with decision number 2024/05 and dated 21/03/2024.

Conflict of Interest: The authors reported no conflict of interest.

Declaration of Financial Support: The authors did not declare financial support.

Ethical Statement: The authors declare that they comply with research and publication ethics.

Study Limitations:
In this study, only the patients consulted to the neurosurgery clinic from the ED were evaluated and the data of neurosurgery consultations requested from outpatients and inpatients of other clinics were excluded. In the mortality analysis, the evaluation of patients referred to another center was excluded.

References

1. *Burt CW, McCaig LF. Trends in hospital emergency department utilization: United States, 1992-99. Vital Health Stat 13. 2001; 150: 1-34.*

2. *McCaig LF, Burt CW. National hospital ambulatory medical care survey: 2002 Emergency department summary. Adv Data 2004; 18: 1-34.*

3. *Senguldur E, Selki K, Tuncer C, Demir MC. Emergency department neurosurgical consultations in a tertiary care hospital. Konuralp Medical Journal. 2023; 15(3): 412-6.*

4. *Park KB, Johnson WD, Dempsey RJ. Global Neurosurgery: The Unmet Need. World Neurosurg. 2016; 88: 32-5.*

5. *Cırak B, Guven MB, Isık S, Kıymaz N, Demir O. An epidemiologic study on trauma patients presenting to the emergency department. Ulus Trauma and Emergency Journal. 1999; 5: 157-9.*

6. *Karasu A, Sabancı PA, Cansever T, Hepgul KT, Imer M, Dolas I, et al. Epidemiological study in head injury patients. Ulus Trauma and Emergency Journal. 2009; 15: 159-63.*

7. *Markogiannakis H, Sanidas E, Messaris E, Koutentakis D, Alpantaki K, Kafetzakis A, et al. Predictors of in-hospital mortality of trauma patients injured in vehicle accidents. Ulus Trauma and Emergency Journal. 2008; 14: 125-31.*

8. *Witiw CD, Fehlings MG. Acute spinal cord injury. Clinical spine surgery. 2015;28(6):202-10.*

9. *Bonner S, Smith C. Initial management of acute spinal cord injury. Continuing Education in Anaesthesia, Critical Care & Pain. 2013; 13(6): 224-31.*

10. *Lyn-Sue J, Siram S, Williams D, Mezghebe H. Epidemiology of trauma deaths in an urban level-i trauma center predominantly among African Americans implications for prevention. J Natl Med Assoc. 2006;98:12.*

11. *Avcı S, Arslan ED, Buyukcam F. Retrospective evaluation of traumatic deaths in the emergency department. Sakarya Medical Journal. 2017; 7(1): 13-9.*

12. *Jayakumar N, Kennion O, Villabona AR, Paranathala M, Holliman D. Neurosurgical referral patterns during the coronavirus disease 2019 pandemic: A United Kingdom Experience. World Neurosurg. 2020; 144: 414-20.*

13. *Kelly DF, Becker DP. Advances in management of neurosurgical trauma: USA and Canada. World J Surg. 2001; 25(9): 1179-85.*

14. *Akgül M,Burulday V. Evaluation results of the cases applied to the emergency unit with cause of head trauma. Journal of Kirikkale University Faculty of Medicine. 2016; 18(3): 134-8.*

15. *Uras M. Factors affecting mortality and morbidity in traumatic spinal cord injury patients in the early period [Medical Specialty Thesis]. Samsun: Ondokuz Mayıs University, Faculty of Medicine; 2018.*

16. *Varma A, Hill EG, Nicholas J, Selassie A. Predictors of early mortality after traumatic spinal cord injury: a population-based study. Spine. 2010; 35(7): 778-83.*

17. *Sogut O, Al B. Prehospital approach and emergency department management in patients with head trauma. Journal of General Medicine. 2009; 19(2): 85-90.*

18. *Gomez PA, Lobato RD, Ortega JM, De La Cruz J. Mild head injury: differences in prognosis among patients with a Glasgow Coma Scale score of 13 to 15 and analysis of factors associated with abnormal CT findings. Br J Neurosurg. 1996; 10(5): 453-60.*

19. *Nguyen R, Fiest KM, McChesney J, Kwon C-S, Jette N, Frolkis AD, et al. The international incidence of traumatic brain injury: a systematic review and meta-analysis. Canadian journal of neurological sciences. 2016; 43(6): 774-85.*

20. *Catal Y. Evaluation of patients admitted to the medical faculty emergency department due to mild head trauma and using anticoagulants or antiplatelet drugs in terms of the risk of delayed intracranial hemorrhage [Medical Specialty Thesis]. Ankara: Ankara University Faculty of Medicine; 2020.*

21. *Swap C, Sidell M, Ogaz R, Sharp A. Risk of delayed intracerebral hemorrhage in anticoagulated patients after minor head trauma: the role of repeat cranial computed tomography. The Permanente Journal. 2016; 20(2): 14.*

22. *Arslan ED, Kaya E, Sonmez M, Kavalcı C, Solakoglu A, Yılmaz F et al. Assesment of Traumatic Deaths in a Level One Trauma Center in Ankara, Turkey. Eur J Trauma Emerg Surg. 2015; 41(3): 319-23.*

23. *Evans JA, Wessem KJP, McDougall D, Lee KA, Lyons T, Balogh ZJ. Epidemiology of Traumatic Deaths: Comprehensive Population- Based Assessment. World J Surg 2010; 34: 158-63.*

24. *Hamzeh B, Najafi F, Karamimatin B, Ahmadijouybari T, Salari A, Moradinazar M. Epidemiology of traffi c crash mortality in west of Iran in a 9 year period. Chinese J Traum 2016; 70-4*