

Evaluation of Epidemiological Factors of Radiological Imaging Methods in Thoracoabdominal Trauma Patients

© Figen Tunalı Türkdoğan¹, © Abuzer Coşkun²

¹Bahçelievler Physical Therapy and Rehabilitation Training and Research Hospital, İstanbul, Turkey

²Department of Emergency Medicine, University of Health Sciences Turkey, Bağcılar Training and Research Hospital, İstanbul, Turkey

Abstract

Aim: Traumas continue to be the leading cause of death in healthy adults presenting to emergency services worldwide. This study aimed to analyze the epidemiological causes of life-threatening thoracoabdominal traumas.

Materials and Methods: One thousand and one hundred and twenty-one patients older than 18 years of age who presented to the emergency service due to trauma between January 1st, 2017, and December 31st, 2019, were included in this retrospective study. Traumas were grouped as falls, traffic accidents and penetrating injuries. Five groups were also formed according to radiological imaging methods.

Results: Mean age was 35.80±16.15 years in in-vehicle accidents and 46.56±17.64 years in penetrating injuries (p=0.001). It was found that 847 (75.6%) of the cases were falls, 222 (19.8%) were traffic accidents, and 52 (4.6%) were penetrating injuries. Sixty-seven (6%) of the cases underwent ultrasonography in falls from higher than 2 m, 399 (35.6%) of the cases underwent direct X-ray in falls from lower than 2 m, 9 (0.8%) cases underwent abdominal computed tomography (CT), 19 (1.7%) cases underwent multiple imaging in non-vehicle traffic accidents, and 24 (2.1%) cases underwent thoracic CT in falls from higher than 2 m. In the analysis of trauma types with variables, positive low and moderate correlation was found in all variables except for age.

Conclusion: Mortality and morbidity rates can be reduced by an early multidisciplinary approach to trauma cases and early decision of radiological imaging procedures to be carried out.

Keywords: Emergency service, epidemiology, trauma, mortality, radiological imaging

Introduction

Traumatic injuries cause undesirable workforce loss and even deaths in young and productive age group (1,2). The first hour following trauma is the golden time and it has a critical importance in preventing morbidity and mortality in the first 24 hours (3). For an urgent and comprehensive intervention to injured individuals following trauma, a good organization is required in the area they are in and in the hospital. Trauma-related deaths occur in trauma area, hospital emergency service and intensive care (4).

Trauma clinic is very heterogeneous in terms of its underlying causes and it is characterized by injury types and severity. Uncertainty of prognosis is due to causes related with anatomical,

professional, economic, political and cultural variables of risk factors (5). Trauma management before and inside the hospital requires a well-disciplined approach. Knowing about epidemiological factors ensures correct application of necessary algorithm in the management of trauma emergency approach. According to the data of World Health Organization (WHO); 29% of traumas are causes by traffic accidents, while 12.6% are caused by falls and 9.16% are caused by individual accidents (6). These data may differ between countries and regions. In addition, the fact that traffic accidents are more common in men shows the difference in gender in trauma patients. In studies, one out of ten deaths is caused by trauma in both genders. Traumatic causes are the primary cause of death and disability in individuals under



Corresponding Author: Asst. Prof. Figen Tunalı Türkdoğan, M.D., Bahçelievler Physical Therapy and Rehabilitation Training and Research Hospital, İstanbul, Turkey
E-mail: turkdogandr@gmail.com ORCID ID: orcid.org/0000-0003-2075-1322

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35 years of age. While penetrating situations such as traffic accidents, violence and self-harm are the primary causes of trauma in individuals between the ages of 25 and 35, this rate decreases after the age of 45 and blunt trauma mechanisms such as home accidents and falls come to the fore after the age of 45 (7). While head trauma is observed in the first place in fall-related accidents, this is followed by extremity traumas and abdominal traumas. Head traumas cause more morbidity and mortality with their permanent sequelae. The rates may differ between countries or regions in terms of socioeconomic development. Economic development rates also affect morbidity and mortality. The leading causes of mortality are neurological damage and haemorrhage. The primary cause of death especially within the first hours is haemorrhage (4,8).

Penetrating trunk trauma is the second leading cause of death after head trauma (7,8). In developed countries, traffic accidents, falls and general blunt traumas are the most common injury mechanisms, while penetrating trauma including gunshot wounds and stab wounds are most common in developing countries due to ongoing violence and social unrest (9). Penetrating chest and abdominal trauma have high mortality rates when important structures such as the heart, great arteries and liver are involved at the scene (10,11).

Stabilization of the patient at the accident site prevents the patient's motor and sensory functions from getting worse. The leading cause of death is head traumas in-between the first and sixth days. Sepsis and multiple organ failure are longer term mortality causes of trauma (3,4,12). Knowing the dynamic and risk factors of trauma allows for emergency interventions for fatal or permanent disability due to injury.

The aim of this study is to show the relationship of damage observed in thoracic and abdominal regions in causes of trauma due to different mechanisms and to show trauma risks caused by trauma dynamics. In addition, the rate of use of imaging methods related with trauma dynamic was also found in the study. Therefore, in the light of epidemiologic data obtained, it will be possible to improve prevalence and incidence information in trauma patients and more coordinated and multidisciplinary approaches will be possible.

Materials and Methods

Study Design and Population

One thousand and one hundred twenty-one patients older than 18 years of age who presented to the emergency service due to trauma between January 1st, 2017 and December 31st, 2019 were included in this retrospective study. Minor home

and play accidents and cuts, isolated head-neck traumas and extremity traumas, patients who presented to the emergency service 48 hours after the trauma and those who did not undergo examination and imaging in the emergency service were excluded from the study. Trauma types and characteristics, radiological imaging, thoracic and minimal organ injuries of the patients were evaluated.

Traumas were divided into five general groups as falls [lower than 2 m (-2mF) and higher than 2 m (+2mF)], in-vehicle traffic accident (IVTA) and non-vehicle traffic accident (NVTA)], penetrating (piercing, cutting and firearm injuries) injuries (PI).

Five groups of thoracic traumas were formed as normal lung, right, left, bilateral and contusion. In addition, four groups were formed as absence of intra-abdominal organ injuries, spleen, liver and other (small and large intestine, kidney, ureter, etc.). The ribs were grouped in five as no fracture, single fracture, 2-3 fractures, flail chest and sternum fracture.

In the study, the patients with good and moderate general condition were evaluated in the trauma resuscitation room, those with poor coma score and consciousness level were evaluated in the emergency critic resuscitation room. Forensic forms were prepared for these patients, those who did not have tetanus vaccine had tetanus vaccine, those who required fluid and blood resuscitation were started fluid and blood resuscitation. All of the patients were recorded in the hospital automation and patient file records. Diagnoses, admission dates, communication information, demographic, clinical and laboratory data are in the registration system of our hospital.

Besides these, two groups were determined in terms of the presence or absence of thoracic vertebra, lumbal vertebra, hemothorax, pneumothorax, intraabdominal injury, artery injury and mortality.

Radiological Imaging

Patients who had good general condition, no thoracic and abdominal trauma, and who were thought to be bruised or have simple fractures and dislocations had direct X-rays. The patients who had stable general condition and vital signs underwent a thorough ultrasonography in the radiology unit. Patients with low coma score, poor general condition and instable vital signs underwent Focused Assessment Sonography for Trauma. The patients who were thought to have thoracic and/or lumbal vertebra fracture, thoracic injury, intraabdominal organ injury or haemorrhage and who could go to radiology unit underwent contrast and/or non-contrast computed tomography (CT). The patients who underwent multiple imaging were multiple trauma patients. These patients underwent imaging with the presence of a physician by taking

resuscitation measures. All ultrasonography (USG) and CTs were analyzed jointly with radiology, emergency and related branch specialists.

After the study was approved by Clinical Researches Ethics Committee of Cumhuriyet University (decision no: 2019-12/22, date: 11.12.2019), it was carried out in accordance with Helsinki declaration for human researches.

Statistical Analysis

The data obtained from this study were analyzed with SPSS 20 (SPSS Inc., Chicago, IL, USA) program. Descriptive statistics were shown as mean \pm standard deviation or median (minimum-maximum) for continuous variables, while nominal variables were shown as number of cases and percentage (%). Mann-Whitney U test and Kruskal-Wallis test were used while examining the differences between the groups. Chi-square analysis was used while examining the relationship between groups of nominal variables. Pearson correlation analysis was used for the linear correlation between the variables. Boxplot graph analysis was made for mortality, trauma and radiological imaging with age. While interpreting the results, values under 0,05 significance level were considered as statistically significant.

Results

Mean age of the 1121 patients was 41.17 ± 16.65 years with an age distribution of 19-94 years and 379 (33.8%) were female. Of the trauma patients, 436 (38.9%) were 2mF, 411(36.7%) were +2mF,

36 (3.2%) were IVTA, 186 (16.6%) were NVTA and 52 (4.6%) were PI ($p=0.001$). Mortality was found in 23 (2.1%) of the patients ($p=0.916$, Table 1).

In terms of analysis according to trauma types, +2mF was the most frequent in both genders. Mortality was most frequent in +2mF with 11 (1%) cases and NVTA with 7 (0.6%) cases. Of the lung traumas, 105 (9.4%) were in the right, 91 (8.1%) were in the left and 18 (1.6%) were bilateral. Contusion was found in 30 (2.7%) of these cases. Twenty-five (2.2%) of the patients were found to have lumbar vertebra lesion, while 15 (1.3%) had thoracic vertebra lesion. Of all the cases, 28 (2.5%) were found to have pneumothorax injury, while 19 (1.7%) were found to have hemothorax injury and 45 (4%) were found to have abdominal injury. Of these abdominal injuries, 30 (2.7%) were found to have liver injury and 15 (1.3%) were found to have spleen injury. Of the thoracic injuries, 25 (2.2%) had single rib fracture, 7 (0.6%) had 2-3 ribs fracture, 7 (0.6%) had flail chest and 4 (0.4%) had sternum fracture. Vascular injury was found in 9 (0.8%) of the cases. One hundred and twenty-seven (11.3%) of the cases had USG, 869 (77.5%) had direct X-ray, 16 (1.4%) had abdominal CT, 56 (5%) had thoracic CT and 53 (4.7%) had multiple imaging (Table 2). Age analysis of trauma types can be seen in Figure 1.

Mortality occurred in 23 (2%) patients. Eighteen (1.6%) of these were male. In lung involvement, while right and left lungs were equal with 3 cases, mortality was accompanied bilaterally in two cases. No mortality occurred in patients with contusion. In lumbar vertebra injury, while there was one mortality, no mortality was

Table 1. Age distribution according to variables

Age distribution				
	All Patients	Min-max	Mean \pm SD	p-value
Gender				
Female	379	19-90	39.26 \pm 15.91	0.007
Male	742	19-94	42.14 \pm 16.95	
Trauma				
-2mF	436	19-94	39.14 \pm 15.36	0.001
+2mF	411	19-94	43.57 \pm 17.62	
IVTA	36	19-83	35.80 \pm 16.15	
NVTA	186	19-90	40.13 \pm 16.24	
PI	52	21-80	46.56 \pm 17.64	
Mortality				
No	1098	19-94	41.18 \pm 16.67	0.916
Yes	23	20-67	40.56 \pm 16.18	
Total	1121	19-94	41.17\pm16.15	
-2mF: Falling from a height of less than two meters, +2mF: Falling from a height of more than two meters, IVTA: In-vehicle traffic accident, NVTA: Non-vehicle traffic accident, PI: Penetrating injury, SD: Standard deviation				

seen in thoracic vertebra, hemothorax, pneumothorax and vascular injuries. Most frequent mortality was found in spleen injury and patients who had direct X-ray (Table 3).

In both genders, +2mF was the trauma in which imaging method was used the most. In contusions, thoracic CT was more frequent in thoracic traumas, while multiple imaging was more frequent in left and bilateral lung injuries. In thoracic traumas, thoracic CT was the most frequent imaging method. However multiple imaging was the most frequent in lumbal and thoracic vertebra, pneumothorax, hemothorax, abdominal and intraabdominal injuries and vascular injuries (Table 4). Figure 2 shows the graph of radiological imaging methods by age.

Correlation of trauma types was made with the variables. No correlation was found with age. However, weak or moderate positive correlation was found in all the other parameters (Table 5).

Discussion

Knowing about the trauma epidemiology is an effective way of evaluating morbidity and mortality. This way, risk groups are determined, it is easier to apply clinical treatment and the coordination of trauma type becomes easier (13). Each country should know about their trauma epidemiological factors. In the light of the data obtained, regional algorithms can be developed for trauma control and prevention of accident risk

Table 2. Distribution of variables according to trauma types

Trauma types		-2mF n (%)	+2mF n (%)	IVTA n (%)	NVTA n (%)	PI n (%)	Total n (%)
Gender	Female	182 (16.2)	140 (12.5)	16 (1.4)	25 (2.2)	16 (1.4)	379 (33.8)
	Male	254 (22.7)	271 (24.2)	20 (1.8)	161 (14.4)	36 (3.2)	742 (66.2)
Mortality	No	436 (38.9)	400 (35.7)	35 (3.1)	179 (16)	48 (4.3)	1098 (97.9)
	Yes	0	11 (1)	1 (0.1)	7 (0.6)	4 (0.4)	23 (2.1)
Lung	No	420 (37.5)	295 (26.3)	19 (1.7)	117 (10.4)	26 (2.3)	877 (78.2)
	Right	6 (0.5)	48 (4.3)	5 (0.4)	34 (3)	12 (1.1)	105 (9.4)
	Left	7(0.6)	44(3.9)	9 (0.8)	23 (2.1)	8 (0.7)	91 (8.19)
	Bilateral	0	9 (0.8)	2 (0.2)	5 (0.4)	2 (0.2)	18 (1.6)
	Contusion	3 (0.3)	15 (1.3)	1 (0.1)	7 (0.6)	4 (0.4)	30 (2.7)
Intra-abdomina organ injury	No	433 (38.6)	392 (35)	33 (2.9)	166 (14.8)	42 (3.7)	1066 (95.1)
	Liver	2 (0.2)	14 (1.2)	0	8 (0.7)	6 (0.5)	30 (2.7)
	Spleen	0	3 (0.3)	2 (0.2)	8 (0.7)	2 (0.2)	15 (1.3)
	Other	1 (0.1)	2 (0.2)	1 (0.1)	4 (0.4)	2 (0.2)	10 (0.9)
Thorax Injury	No	433 (38.6)	395 (35.2)	34 (3)	172 (15.3)	44 (3.9)	1078 (96.2)
	Single RF	3 (0.3)	13 (1.2)	1 (0.1)	6 (0.5)	2 (0.2)	25 (2.2)
	2-3 RF	0	2 (0.2)	0	3 (0.3)	2 (0.2)	7 (0.6)
	Flail Chest	0	1 (0.1)	1 (0.1)	1 (0.1)	4 (0.4)	7 (0.6)
	Sternum F	0	0	0	4(0.4)	0	4(0.4)
Radiological Imaging	USG	29 (2.6)	67 (6)	5 (0.4)	20 (1.8)	6 (0.5)	127 (11.3)
	Direct graph	399 (35.6)	300 (26.8)	22 (2)	123 (11)	25 (2.2)	869 (77.5)
	Abdominal CT	0	2 (0.2)	3 (0.3)	9 (0.8)	2 (0.2)	16 (1.4)
	Thorax CT	5 (0.4)	24 (2.1)	2 (0.2)	15 (1.3)	10 (0.9)	56 (5)
	Multiple Imaging	3 (0.3)	18 (1.6)	4 (0.4)	19 (1.7)	9 (0.8)	53 (4.7)

-2mF: Falling from a height of less than two meters, +2mF: Falling from a height of more than two meters, IVTA: In-vehicle traffic accident, NVTA: Non-vehicle traffic accident, PI: Penetrating injury, R: Rip, F: Fracture, USG: Ultrasonography, CT: Computed Tomography, SD: Standard deviation, n: Number

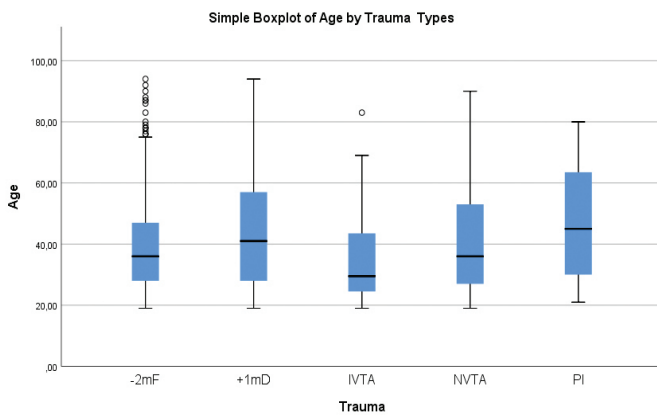


Figure 1. Distribution of age by trauma types

-2mF: Falling from a height of less than two meters, +2mF: Falling from a height of more than two meters, IVTA: In-vehicle traffic accident, NVTA: Non-vehicle traffic accident, PI: Penetrating injury

(behavioural changes, informative legal campaigns, firearms control, prevention of falls in the elderly, speed limits) and for post-traumatic approaches.

Knowing about the trauma mechanism is important in terms of determining the first intervention of the patient in accident scene and hospital. In developed countries, the most common injury mechanisms are traffic accidents, falls and general blunt traumas, while penetrating traumas including gunshot and stabbing injuries are more common in developing countries due to on-going violence and social unrest (7,10,11). Penetrating trunk trauma is the second leading cause of death after head trauma. Penetrating chest and abdominal trauma have high mortality rates when important structures such as the heart, great arteries and liver are involved at the scene (11-13). In a study, Larson stated that with the number of injured organs in

Mortality		No n (%)	Yes n (%)	Total n (%)
Gender	Female	374 (33.4)	5 (0.4)	379 (33.8)
	Male	724 (64.6)	18 (1.6)	742 (66.2)
Lung	No	862 (76.9)	15 (1.3)	877 (78.2)
	Right	102 (9.1)	3 (0.3)	105 (9.4)
	Left	88 (7.9)	3 (0.3)	91 (8.19)
	Bilateral	16 (1.4)	2 (0.2)	18 (1.6)
	Contusion	30 (2.7)	0	30 (2.7)
Lumbal vertebra	No	1074 (95.8)	22 (2)	1096 (97.8)
	Yes	24 (2.1)	1 (0.1)	25 (2.2)
Abdominal injury	No	1055 (94.1)	21 (2.1)	1076 (96)
	Yes	43 (3.8)	2 (0.2)	45 (4)
Intra-abdominal organ injury	No	1046 (93.3)	20 (1.8)	1066 (95.1)
	Liver	30 (2.7)	0	30 (2.7)
	Spleen	12 (1.1)	3 (0.3)	15 (1.3)
	Other	10 (0.9)	0	10 (0.9)
Thorax injury	No	1056 (94.2)	22 (2)	1078 (96.2)
	Single RF	25 (2.2)	0	25 (2.2)
	2-3 RF	7 (0.6)	0	7 (0.6)
	Flail chest	6 (0.5)	1 (0.1)	7 (0.6)
	Sternum F	4 (0.4)	0	4 (0.4)
Radiological imaging	USG	125 (11.2)	2 (0.2)	127 (11.3)
	Direct graph	855 (76.3)	14 (1.2)	869 (77.5)
	Abdominal CT	14 (1.2)	2 (0.2)	16 (1.4)
	Thorax CT	55 (4.9)	1 (0.1)	56 (5)
	Multiple imaging	49 (4.4)	4 (0.4)	53 (4.7)

R: Rib, F: Fracture, USG: Ultrasonography, CT: Computed Tomography, n: Number

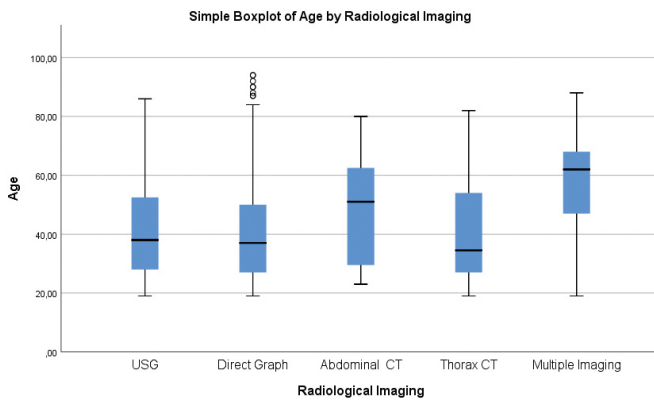


Figure 2. Distribution of age according to radiological imaging methods

USG: Ultrasonography, CT: Computed tomography

penetrating traumas, the rate of complications that may develop also increases (14).

In our study, penetrating injury rates were found as 1.4% for women, 3.2% for men and as 4.5% in total. Mortality rates were found higher in penetrating injuries, similar to previous studies. The rates of life-threatening thoracic trauma cases such as flail chest were found to be higher in our study in penetrating injuries.

Traffic accidents make up 35% of trauma deaths worldwide. In addition, they are the most frequent cause of individual injuries after accident (15). While statistical rates increase in developing countries, they are lower in developed countries due to increased protective measures. Interestingly, while head traumas were found to be more common in young individuals in traffic accidents in low-income countries, they were found to

Radiological Imaging		USG n (%)	DG n (%)	ACT n (%)	TCT n (%)	MI n (%)	Total n (%)
Gender	Female	50 (4.5)	300 (26.8)	4 (0.4)	17 (1.5)	8 (0.7)	379 (33.8)
	Male	77 (6.9)	569 (50.8)	12 (1.1)	39 (3.5)	45 (4)	742 (66.2)
Lung	No	48 (4.3)	785 (70)	15 (1.3)	13 (1.2)	4 (0.4)	877 (78.2)
	Right	45 (4)	47 (4.2)	0	9 (0.8)	4 (0.4)	105 (9.4)
	Left	34 (3)	37 (3.3)	1 (0.1)	5 (0.4)	14 (1.2)	91 (8.19)
	Bilateral	0	0	0	6 (0.5)	12 (1.1)	18 (1.6)
	Contusion	0	0	0	23 (2.1)	7 (0.6)	30 (2.7)
Lumbal vertebra	No	127 (11.3)	869 (77.5)	14 (1.2)	53 (4.7)	33 (2.9)	1096 (97.8)
	Yes	0	0	2 (0.2)	3 (0.3)	20 (1.8)	25 (2.2)
Thoracic vertebra	No	127 (11.3)	869 (77.5)	16 (1.4)	56 (5)	38 (3.4)	1106 (98.7)
	Yes	0	0	0	0	15 (1.3)	15 (1.3)
Pneumothorax	No	125 (11.2)	867 (77.3)	16 (1.4)	50 (4.5)	35 (3.1)	1093 (97.5)
	Yes	2 (0.2)	2 (0.2)	0	6 (0.5)	18 (1.6)	28 (2.5)
Hemothorax	No	127 (11.3)	869 (77.5)	16 (1.4)	56 (5)	34 (3)	1102 (98.3)
	Yes	0	0	0	0	19 (1.7)	19 (1.7)
Abdominal injury	No	127 (11.3)	868 (77.4)	8 (0.7)	56 (5)	17 (1.5)	1076 (96)
	Yes	0	1 (0.1)	8 (0.7)	0	36 (3.2)	45 (4)
Intra-abdominal organ injury	No	127 (11.3)	868 (77.4)	7 (0.6)	55 (4.9)	9 (0.8)	1066 (95.1)
	Liver	0	1 (0.1)	2 (0.2)	0	27 (2.4)	30 (2.7)
	Spleen	0	0	6 (0.5)	1 (0.1)	8 (0.7)	15 (1.3)
	Other	0	0	1 (0.1)	0	9 (0.8)	10 (0.9)
Thorax injury	No	121 (10.8)	858 (76.5)	16 (1.4)	36 (3.2)	47 (4.2)	1078 (96.2)
	Single RF	6 (0.5)	10 (0.9)	0	8 (0.7)	1 (0.1)	25 (2.2)
	2-3 RF	0	0	0	6 (0.5)	1 (0.1)	7 (0.6)
	Flail Chest	0	0	0	6 (0.5)	1 (0.1)	7 (0.6)
	Sternum F	0	1 (0.1)	0	3 (0.3)	0	4 (0.4)
Vascular injury	No	126 (11.2)	868 (77.4)	16 (1.4)	53 (4.7)	49 (4.4)	1112 (99.2)
	Yes	1 (0.1)	1 (0.1)	0	3 (0.3)	4 (0.4)	9 (0.8)

USG: Ultrasonography, DG: Direct graph, ACT: Abdominal Computed Tomography, TCT: Thorax Computed Tomography, Multiple Imaging, R: Rip, F: Fracture, n: Number

Correlation	Trauma types	
	r	p-value
Age	0.050	0.092
Gender	0.172	0.001
Radiological imaging	0.245	0.001
Mortality	0.126	0.001
Lung	0.278	0.001
Lumbal vertebra	0.144	0.001
Thoracic vertebra	0.059	0.048
Pneumothorax	0.172	0.001
Hemothorax	0.135	0.001
Abdominal injury	0.197	0.001
Intra-abdominal organ injury	0.208	0.001
Thorax injury	0.200	0.001
Vascular injury	0.114	0.001

be more common in elderly individuals in developed countries due to increased longevity rates and comorbidities of the elderly population (7,16). In our study, in-vehicle traffic accident rates were lower than non-vehicle traffic accidents and mortality rates were lower. In addition, lung injury was found as 16.6% in non-vehicle traffic accidents and as 4.65 in penetrating injuries. Pneumothorax, hemothorax, sternum and more than two costal fracture cases were found to be in higher rates in non-vehicle traffic accidents.

In a meta-analysis by Stein et al. (17), it was found that mortality rates decreased by 50% in the last 150 years, while traffic accident rates continued to increase. Effective interventions are provided in trauma diagnosis and treatment due to advanced imaging techniques like computed axial tomography (4-6). In our study, while direct X-ray use was higher in falls from lower than 1 m, CT and multiple imaging uses were higher respectively in non-vehicle traffic accidents, falls from higher than 1 m and penetrating injuries.

Falls from different levels constitute 44% of trauma cases (18). In our study, falls were evaluated in two groups. While rates of fall from lower than 1 m were 16.2% in women, 22.7% in men and 38.9% in total, the rates of fall from higher than 1 m were 12.5% in women, 24.2% in men and 36.7% in total. In previous studies, 33%-47% head traumas, 15%-26% extremity traumas and 8%-17% abdominal traumas were observed in fall-related accidents (19).

In their study on trauma mechanism, Magnone et al. (20) suggested that falling from the same level could be included in major trauma depending on the patient's age and clinical

state (20,21). It was shown that advanced age, hemodynamic imbalance, decreased consciousness and respiratory failure affected mortality regardless of trauma mechanism (22,23).

Spleen is one of the most frequently injured solid organs of the abdominal cavity. Coccolini et al. (24) examined a total of 124 patients with spleen injury and the most frequent injury mechanism was found as blunt trauma secondary to traffic accidents, followed by falls. Spleen is one of the most frequently injured organs in blunt abdominal trauma, while its incidence reaches only 7%-9% in penetrating traumas (25). In spleen injuries, early diagnosis may decrease trauma-related mortality (26). In our study, spleen injury rates were found to be higher in non-vehicle traffic accident injuries when compared with other traumas. Liver injuries were observed in higher rates in falls from higher than 1 m.

Study Limitations

One of the limitations of the study is the fact that the data were obtained from a single centre and retrospectively and the data intervals were limited in some patient groups. Another limitation was the fact that there may be loss in patient information and post-treatment follow-up.

Conclusion

The results obtained in our study will enable intervention without losing time in trauma area or in hospital in terms of triage and treatment of patients. Thus, it will be possible to prevent trauma-related mortality and morbidity in young and

productive age group of the society. We think that advances in radiological imaging can reduce both mortality and morbidity.

Ethics

Ethics Committee Approval: This study was approved by Clinical Researches Ethics Committee of Cumhuriyet University (decision no: 2019-12/22, date: 11.12.2019), it was carried out in accordance with Helsinki declaration for human researches.

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.T.T., Concept: F.T.T., A.C., Design: A.C., Data Collection or Processing: A.C., Analysis or Interpretation: F.T.T., A.C., Literature Search: F.T.T., Writing: F.T.T.

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