İSTANBUL'DA OTOPSİSİ YAPILMIŞ DEMİRYOLU İLE İLİŞKİLİ ÖLÜMLERİN DEĞERLENDİRİLMESİ

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ÖZET

Amaç:

Bu çalışmada demiryolu ile ilişkili ölümlerde saptanan travmatik değişimlerin ağırlığı ile olayın orijini arasındaki ilişkinin değerlendirilerek demiryollarında meydana gelen ölümlere ait verilerin tartışılması amaçlanmıştır.

Yöntemler:

Demiryollarında intihar ve kaza orijinli ağır travma kaynaklı ölümlere adli otopsi serilerinde sık olmasa da rastlanmaktadır. İstanbul'da 2005-2011 yılları arasında yapılan adli otopsilerde saptanan 114 demiryolu ölümü retrospektif olarak incelenmiştir.

Bulgular:

Olgular toplam otopsilerin %0,39'unu oluşturmakta olup, olguların %85,1'i (n=97) erkek, %14,9'u (n=17) kadındır. Ortalama yaşın 38,32±19,35 yıl olduğu bu ölümlerde en sık orijin kaza (%80,7) olarak belirlenmiştir. Kaza orijinini %10,5 ile intihar orijini izlemektedir.

Elektrik akımı kaynaklı 2 olgu dışında diğer tüm olgularda ağır genel beden travması bulguları saptanmış olup, olguların %6,1'inde (n=7) izole üst, %11,4'ünde (n=13) izole alt, %5,3'ünde (n=6) kombine ampütasyon ve %5,4'ünde (n=5) ise dekapitasyon gözlenmiştir. Olguların %51,8'inde büyük damar yaralanması saptanmıştır.

Sonuç:

Travmatik bulguların dağılımı ile olayın niteliği arasındaki ilişki değerlendirildiğinde; trenden düşme sonucu meydana gelen ölümlerde beyin kanaması sıklığı önde gelen bulgu iken, intihar olgularında vücudun gövde kısmında ağır genel beden travması bulguları daha fazla görülmüştür.

Anahtar Kelimeler: adli tıp, adli otopsi, demiryolu, intihar, kaza, dekapitasyon

EVALUATION OF RAILWAY RELATED DEATHS FOR WHICH AUTOPSIES WERE PERFORMED IN ISTANBUL

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ABSTRACT

Objective:

In this study aiming to discuss the data of deaths occurring on the railways by evaluating the relationship between the severities of the traumatic changes and to determine the origin of the event according to the findings of trauma.

Methods:

Suicidal or accidental origin deaths on the railways caused by severe trauma are encountered in the forensic autopsy series even though they are not frequent. 114 railway deaths detected in the forensic autopsies performed in Istanbul between 2005 and 2011 were investigated retrospectively.

Results:

The cases comprised 0.39% of all autopsies, 85.1% (n=97) of the cases were males and 14.9% (n=17) of them were females. The mean age was 38.32±19.35 years in these deaths and the most common origin was determined to be accident (80.7%). The accidental origin is followed by suicidal origin with a rate of 10.5%. Multiple traumas to the body were determined in all of the cases except 2 cases with electrical current origin. Isolated amputation of upper extremity, isolated amputation of lower extremity, combined amputation and decapitation were observed in 6.1% (n=7), 11.4% (n=13), 5.3% (n=6) and 5.4% (n=5) of the cases, respectively. Great vessel injury was determined in 51.8% of the cases.

Conclusion:

When the relationship between the distribution of traumatic findings and the nature of the event was evaluated; while cerebral bleeding was the leading finding in the deaths due to fall from train, findings of multiple trauma to the body were observed much more in the suicide cases.

Key words: *forensic medicine, autopsy, railway, suicide, accident, decapitation*

INTRODUCTION

By 2011, total length of railways in Turkey is 12.000 km and conventional lines and high-speed rail lines comprise of 11.112 km and 888 km of 12.000 km, respectively. Total number of passengers carried by the railways in 2011 is 120 million (1). The railways are the least preferred mode of transportation for passenger transportation in our country. However, railways are on the second line following the highways regarding the number of casualties in the number of accidents and the accidents occurring according to the mode of transportation (2).

Railway related accidents in USA cause casualty of 18.000 people and fatality of 1.200 people for each year. Frequency of railway related death was reported to be 60 per year per 100 million passengers in South Africa and 150 in India (3-5).

In a study evaluating the epidemiological aspects of railway related casualties in our country, the number of railway related deaths between January 1997 and December 2003 was reported to be 213.3 per year per 100 million passengers (6).

According the data of The State Railways of the Turkish Republic (TCDD), 177 train accidents occurred in our country in 2011 and total of 71 people died and 112 people were injured in these accidents. Thirty-six of 71 people died due to level-crossing accidents (LCA), 32 of them due to train-pedestrian accidents (TPA), 2 of them due to train crash and 1 of them due to falls from trains (1).

In this study, it was aimed to investigate the data of the cases of railway related deaths for which autopsies were performed in Istanbul and to determine the origin of the event according to the findings of trauma.

MATERIAL AND METHOD

In this study, railway related death cases (n=114) among the autopsies performed in Mortuary Department of Council of Forensic Medicine of Ministry of Justice (Istanbul-Turkiye) throughout a 7 year period between 2005 and 2011 were investigated retrospectively in 2012. The cases included in the study were investigated regarding the followings: demographic characteristics, time of accident (day, week, month, year), origin of the event (suicide, accident-crash, fall from train, electric shock on the railways), distribution of traumatic lesions determined (head-neck, thorax, abdomen, bone fracture, amputation, great vessel injury), results of histopathological and toxicological investigations, results of hospitalizations.

NCSS (Number Cruncher Statistical System) 2007&PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) program was used for the statistical analysis. During the evaluation of the study data, regarding the comparisons of descriptive statistical methods (Mean, Standard Deviation, Median, Rate, Minimum, and Maximum) as well as qualitative data, Fisher's Exact test and Fisher-Freeman-Halton Exact test was used. Significance was evaluated at the levels of $p<0.01$ and $p<0.05$.

RESULTS

In the study, 114 (0.39%) of 28.590 cases for which autopsies were performed in Istanbul throughout a 7 year period between 2005 and 2011 were determined to be railway related death cases. Eighty-five point one percent (n=97) of total 114 cases were males and 14.9% (n=17) of them were females. The ages of the cases ranged between 5 and 85 years and the mean age was 38.32±19.35 years. The ratio of train accident cases to total number of autopsies according to the years were shown in Table 1a and the distribution of time of the events were shown in Table 1b.

The ratio of train accident cases to total number of autopsies according to the years are as followings, respectively: 0.58% in 2008, 0.45% in 2007, 0.42% in 2005, 0.41% in 2006, 0.38% in 2010, 0.30% in 2011 and 0.25% in 2009.

While the events were seen at most in 2008 with a rate of 21.1% (n=24), it was determined that it was followed by 2007 with 16.7% (n=19), 2005 with 14.9% (n=17) and 2006 again with 14.9% (n=17) and cases were seen at least in 2009 with a rate of 8.8% (n=10).

Table 1a: The ratio of train accident cases to total number of autopsies according to the years

Year	Train accident cases n	Total number of autopsies n	Ratio %
2005	17	4067	%0.42
2006	17	4186	%0.41
2007	19	4199	%0.45
2008	24	4122	%0.58
2009	10	4059	%0.25
2010	15	3923	%0.38
2011	12	4034	%0.30
Total	114	28590	%0.39

According to the frequencies of the cases with respect to the months, it was observed that 12.3% of the cases (n=14) occurred in July, 11.4% of them (n=13) in December, 10.5% of them (n=12) in August, 9.6% of them (n=11) in April and May and at least in January with 4.4% (n=5), respectively.

According to the frequencies of the cases with respect to the weeks; it was observed that 36% of the cases (n=41) occurred between 22nd and 31st days (4th week), 24.6% of them (n=28) between 1st and 7th days (1st week), 20,2% of them (n=23) between 15th and 21st days (2nd week) and 19.3% of them (n=22) between 8th and 14th days (3rd week), respectively.

According to the frequencies of the events with respect to the days; it was observed that 41.1% of the events (n=48) occurred between 21st and 31st days, 28.9% of them (n=33) between 1st and 10th days and again 28.9% of them (n=33) between 11th and 20th days, respectively.

Distributions of the type of the events were shown in Table 2.

While 10.5% of the cases (n=12) were suicide; it was observed that 80.7% of them (n=92) were due to accident-crash, 7.0% of them (n=8) were due to fall from train and 1.8% of them (n=2) were due to electric shock on the railways.

Distributions of the traumas were shown in Table 3.

While bone fracture was not observed in 1.8% of the cases (n=2); isolated skull fracture was encountered in 11.4% of the cases (n=13), isolated fracture of bones of trunk in 6.1% of them (n=7) and combined fractures in 80.7% of them (n=92).

While injury in the head-neck region was not encountered in 18.4% of the cases (n=21), cerebral bleeding was observed in 81.6% of them (n=93).

While injury in the thoracic region was not encountered in 36.8% of the cases (n=42), isolated organ injury was observed in 36.0% of the cases (n=41) and combined organ injury in 27.2% of them (n=31).

While injury in the abdominal region was not encountered in 41.2% of the cases (n=47), isolated organ injury was observed in 13.2% of the cases (n=15) and combined organ injury in 45.6% of them (n=52).

While amputation was not encountered in 72.8% of the cases (n=83); isolated upper extremity amputation, isolated lower extremity amputation and combined amputation were observed in 6.1% (n=7), 11.4% (n=13) and 5.3% (n=6) of the cases, respectively. Decapitation was observed in 4.4% of the cases (n=5). Great vessel injury was observed in 51.8% of the cases.

Distributions of histopathological and toxicological investigations and medical treatments of the cases were shown in Table 4.

Specimen for histopathological investigation was not obtained in 82.5% of the cases (n=94) and findings of cerebral bleeding, hyperemia and electric shock were observed in 11.4% (n=13), 4.4% (n=5) and 1.8% (n=2) of the specimens obtained, respectively.

While no substance intake was encountered in 78.9% of the cases (n=90); ethanol, oxazepam, morphine and ketamine intake were observed in 18.4% (n=21), 0.9% (n=1), 0.9% (n=1) and 0.9% (n=1) of the cases, respectively.

While no treatment was administered in 91.2% of the cases (n=104) after the accident, treatment was administered in 8.8% of the cases (n=10) after the accident. However, these cases were lost after different hospitalization periods.

Evaluations of trauma cases with accident-crash type of event were shown in Table 5.

In the cases with accident type of event;

A statistically significant difference was observed in distributions of bone fracture according to the type of accidents (p<0.05). The rate of combined bone fractures due to accident-crash and fall from train were observed to be 87.0% (n=80) and 50.0% (n=4), respectively. This difference between the distributions of combined bone fractures was observed to be statistically significant (p=0.021 p<0.05). Isolated skull fractures for the cases due to accident-crash and fall from train were observed to be 9.8% (n=9) and 37.5% (n=3), respectively. A statistically significant difference was not observed between the type of the events regarding the distributions of isolated skull fractures and isolated fractures of bones of trunk.

Table 1b: Distribution of times of the events

Year of event	n	%
2005	17	14.9
2006	17	14.9
2007	19	16.7
2008	24	21.1
2009	10	8.8
2010	15	13.2
2011	12	10.5
Month of event	**n**	**%**
January	5	4.4
February	8	7.0
March	10	8.8
April	11	9.6
May	11	9.6
June	6	5.3
July	14	12.3
August	12	10.5
September	9	7.9
October	7	6.1
November	8	7.0
December	13	11.4
Week of event	**n**	**%**
Between 1st and 7th days (1st week)	28	24.6
Between 8th and 14th days (2nd week)	22	19.3
Between 15th and 21st days (3rd week)	23	20.2
Between 22nd and 31st days (4th week)	41	36.0
Day of event	**n**	**%**
Between 1st and 10th days	33	28.9
Between 11th and 20th days	33	28.9
Between 21st and 31st days	48	42.1

A statistically significant difference was not observed regarding the distributions of head-neck traumas according to the type of the accidents (p>0.05). Cerebral bleedings due to accident-crash and fall from train were observed with a rate of 83.7% (n=77) and 75.0% (n=6), respectively.

A statistically significant difference was not observed regarding the distributions of traumas in the thoracic region according to the type of the accidents (p>0.05). Isolated organ injury due to accident-crash and fall from train were observed with a rate of 39.1% (n=36) and 25.0% (n=2), respectively. Combined organ injury for the cases due to accident-crash and fall from train were observed to be 29.3% (n=27) and 12.5% (n=1), respectively.

A statistically significant difference was observed between the distributions of traumas in the abdominal region according to the type of the accidents (p<0.05). It was determined that the ratio of the cases without traumas in the abdominal region due to fall from train was observed to be statistically significantly higher than the ratio of the cases without traumas in the abdominal region due to accident-crash (p=0.006 p<0.01). Isolated organ injury due to accident-crash was observed with a rate of 14.1% (n=13) but isolated organ injury due to fall from train was not observed. The ratios of combined organ injury for the cases due to accident-crash and fall from train were observed to be 50.0% (n=46) and 12.5% (n=1), respectively.

A statistically significant difference was not observed between the distributions of amputations according to the type of the accidents (p>0.05). While amputation was not observed in 72.8% of the cases (n=67) due to accident-crash, this rate was observed to be 62.5% (n=5) in the cases due to fall from train. Isolated lower extremity amputation is the most common type of amputation encountered in both groups with rates of 9.8% (n=9) and 37.5% (n=3), respectively.

A statistically significant difference was not observed regarding the incidence rates of great vessel injuries according to the type of the accidents (p>0.05).

A statistically significant difference was observed between the distributions of histopathological investigations according to the type of the accidents (p<0.01). The ratio of the unsampled cases in accident-crash group was observed to be statistically significantly higher compared to the fall from train group (p<0.01). The ratio of cerebral bleeding in the fall from train group was observed to be statistically significantly higher compared to accident-crash group (p<0.01). No significant difference was observed between both groups regarding the rates of hyperemia (p>0.05).

Comparisons of the type of event and gender and traumas of the cases were shown in Table 6.

A statistically significant difference was not observed between cases of suicide and accident according to the distributions of the gender (p>0.05).

A statistically significant difference was observed between the

distributions of bone fractures according to the cases of suicide and accident (p<0.05). It was determined that isolated fractures of bones of trunk were observed to be statistically significantly higher in the suicide group than in the accident group. It was observed that the other types of fractures showed no statistically significant difference between the groups (p>0.05).

A statistically significant difference was not observed between the distributions of the injuries in the head-neck region according to the cases of suicide and accident (p>0.05).

A statistically significant difference was not observed between the distributions of the injuries in the thoracic region according to the cases of suicide and accident (p>0.05).

A statistically significant difference was not observed between the distributions of the injuries in the abdominal region according to the cases of suicide and accident (p>0.05).

Comparisons of the toxicological investigation and the type of event were shown in Table 7.

A statistically significant difference was not observed between cases of suicide and accident according to the distributions of the results of toxicological investigation (p>0.05). While the ratio of the events occurring without substance intake was 83.3% (n=10) in the suicide group, it was observed to be 78.4% (n=80) in the accident group. While the ratio of the cases determined to be with ethanol intake was 16.7% (n=2) in the suicide group, it was observed to be 18.6% (n=19) in the accident group. While no substance intake was determined in the suicide group, substance intake was observed to be 3.0% (n=3) in the accident group.

Table 2: Distribution of the type of the events

Type of the event	n	%
Suicide	12	10.5
Accident-Crash	92	80.7
Fall from train	8	7.0
Electric shock on the railways	2	1.8

DISCUSSION AND CONCLUSION

In this study, 114 (0.39%) of 28.590 cases for which autopsies were performed in Istanbul throughout a 7 year period between 2005 and 2011 were determined to be railway related death cases. The ratio of the autopsies of railway related death to all autopsies performed in the same period was found to be 0.39%. While this ratio was reported to be 0.79% in a study performed by Cansunar et al. in Istanbul in 1996, the ratio of rail transport system related deaths to the other cases was reported to be 1.6% in a study performed by Dogan et al. evaluating rail transport system related deaths occurred in Konya province (7,8). In a study performed in India where railway passenger transportation was used extensively, it was reported that autopsies due to railway traffic accidents comprised of 1.41% of all autopsies (4), again in another study performed in India, the ratio of railway related deaths was reported to be 9.1% (9).

In our study, 85.1 (n=97) of total 114 cases were males and 14.9% (n=17) of them were females. Determination of the ratio of the males markedly higher was found to be consistent with the literature (4,6,8-11). It was found that the ages of the cases varied within a wide range like 5 years and 85 years and the mean age was 38.32±19.35 years. In a study evaluating the subway related deaths in New York, it was reported that the ages of the cases ranged between 14 years and 85 years and the mean age was 44 years (12). When the cases in the similar studies in the literature were evaluated according to the age groups, it was reported that individuals working actively were predominant commonly.

According to the frequencies of the events with respect to the days; it was observed that 41.1% of the events (n=48) occurred between 21st and 31st days, 28.9% of them (n=33) between 1st and 10th days and again 28.9% of them (n=33) between 11th and 20th days, respectively.

According to the frequencies of the events with respect to the weeks; it was observed that 36% of the events (n=41) occurred between 22nd and 31st days (4th week), 24.6% of them (n=28) between 1st and 7th days (1st week), 20.2% of them (n=23) between 15th and 21st days (2nd week) and 19.3% of them (n=22) between 8th and 14th days (3rd week), respectively.

According to the frequencies of the events with respect to the months, it was observed that 12.3% of the cases (n=14) occurred in July, 11.4% of them (n=13) in December, 10.5% of them (n=12) in August, 9.6% of them (n=11) in April and again 9.6% of them (n=11) in May, respectively. In the study performed by Dogan et al., it was reported that maximum event occurred in September (8). In the study performed by Lin and Gill, it was reported that suicidal origin ones of the subway related deaths occurred most commonly in May and at least in September and accidental origin ones most commonly in March and December and at least in September (12).

As railway related deaths can occur due to train-train crash, derailment, train-motor vehicle collision, train-pedestrian collision and fall from train, it

Table 3: Distribution of the traumas

Bone fracture	n	%
Absent	2	1.8
Isolated skull	13	11.4
Isolated trunk	7	6.1
Combined	92	80.7
Head-Neck	**n**	**%**
Absent	21	18.4
Cerebral Bleeding	93	81.6
Thorax	**n**	**%**
Absent	42	36.8
Isolated organ	41	36.0
Combined	31	27.2
Abdomen	**n**	**%**
Absent	47	41.2
Isolated organ	15	13.2
Combined	52	45.6
Amputation	**n**	**%**
Absent	83	72.8
Isolated upper extremity	7	6.1
Isolated lower extremity	13	11.4
Combined	6	5.3
Decapitation	5	4.4
Great vessel ınjury	**n**	**%**
Absent	55	48.2
Present	59	51.8

Table 4: Distributions of Histopathological and Toxicological Investigations and Medical Treatments

Histopathology	n	%
Unsampled	94	82.5
Cerebral bleeding	13	11.4
Hyperemia	5	4.4
Electric	2	1.8
Toxicology	**n**	**%**
Negative	90	78.9
Ethanol	21	18.4
Oxazepam	1	0.9
Morphine	1	0.9
Ketamine	1	0.9
Medical treatment	**n**	**%**
Absent	104	91.2
Present	10	8.8

can also occur due to jumping in front of a train with suicidal purpose or intentionally sitting or lying on a railway track (10).

In train-pedestrian collisions, an enormous amount of energy is transferred by a moving train to the body of the individual proportional to the mass and velocity of the train. Transfer of this enormous amount of energy results in massive injuries and a high mortality rate (3,6,13).

In this study, while 10.5% of the cases (n=12) were suicide; it was observed that 80.7% of them (n=92) were due to accident-crash, 7.0% of them (n=8) were due to fall from train and 1.8% of them (n=2) were due to electric shock on the railways.

In a study performed by Ozdogan et al. evaluating the epidemiology of railway related deaths and injuries in our country, it was determined that the death occurred most commonly due to train-pedestrian collision and it was followed by level-crossing accidents and suicides. Despite suicides caused third leading cause of death, it was reported these had the most common mortality rate (82.5%) and it was followed by train-pedestrian collision with a rate of 60.5% (6).

In a study comprising of 211 cases and evaluating the subway related deaths in New York; it was reported that autopsy was performed in 175 of the cases, external examination was performed in 36 of the cases alone; origin of death was determined to be suicide in 111 cases, accident in 76 cases, murder in 4 cases and undetermined in 20 cases; cause of death was blunt trauma in 206 cases and electrocution in 5 cases (12).

A statistically significant difference was observed between the distributions of histopathological investigations according to the type of the accidents ($p<0.01$). The ratio of the unsampled cases in accident-crash group was observed to be statistically significantly higher compared to the fall from train group ($p<0.01$). The ratio of cerebral bleeding in the fall from train group was observed to be statistically significantly higher compared to accident-crash group ($p<0.01$). No significant difference was observed between both groups regarding the rates of hyperemia ($p>0.05$).

It was reported that traumatic amputations were much more commonly seen in train accidents compared to motor vehicle accidents and the most common amputation was lower extremity amputation (11).

Table 5: Evaluations of trauma cases with accident-crash type of event

	Accident-Crash (n=92)		Fall from train (n=8)		p
	n	%	n	%	
Bone fracture					
Absent	0	0	0	0	-
Isolated skull	9	9.8	3	37.5	0.053
Isolated trunk	3	3.3	1	12.5	0.287
Combined	80	87.0	4	50.0	0.021*
Head-Neck					
Absent	15	16.3	2	25.0	0.621
Cerebral bleeding	77	83.7	6	75.0	
Thorax					
Absent	29	31.5	5	62.5	0.117
Isolated organ	36	39.1	2	25.0	0.707
Combined	27	29.3	1	12.5	0.436
Abdomen					
Absent	33	35.9	7	87.5	0.006**
Isolated organ	13	14.1	0	0.0	0.592
Combined	46	50.0	1	12.5	0.063
Amputation					
Absent	67	72.8	5	62.5	0.683
Isolated upper extremity	5	5.4	0	0.0	1.000
Isolated lower extremity	9	9.8	3	37.5	0.053
Combined	6	6.5	0	0.0	1.000
Decapitation	5	5.4	0	0.0	1.000
Great Vessel Injury					

Absent	43	46.7	5	62.5	0.475
Present	49	53.3	3	37.5	
Histopathological Investigation					
Unsampled	81	88.0	3	37.5	0.002**
Cerebral bleeding	7	7.6	4	50.0	0.005**
Hyperemia	4	4.3	1	12.5	0.347
Electric	0	0.0	0	0.0	-

Fisher Exact test *p<0.05* **p<0.01*

In this study, while amputation was not encountered in 72.8% of the cases (n=83); isolated upper extremity amputation, isolated lower extremity amputation and combined amputation were observed in 6.1% (n=7), 11.4% (n=13) and 5.3% (n=6) of the cases, respectively. Decapitation was observed in 4.4% of the cases (n=5). Great vessel injury was observed in 51.8% of the cases.

In a study evaluating the cases presenting to the adult emergency service due to railway related accidents between 1998 and 2008; it was reported that total 19 amputations were determined in 14 of 44 cases with lower extremity amputations in 12 cases and upper extremity amputations in 2 cases (11). In the same study, it was reported that mortality rate was 7/44 (16%) and 2 of 7 cases death occurring presented in consequence of motor vehicle-train collision, 5 of them in consequence of train-pedestrian collision. Alcohol intake, performing cardiovascular resuscitation at the time of admittance to the emergency service, repeated suicide attempts, presence of psychiatric disease and low RTS (Revised Trauma Score) were found to be highly related to the death.

In our study, while bone fracture was not observed in 1.8% of the cases (n=2); isolated skull fracture was encountered in 11.4% of the cases (n=13), isolated fracture of bones of trunk in 6.1% of them (n=7) and combined fractures in 80.7% of them (n=92).

While injury of head-neck region was not encountered in 18.4% of the cases (n=21), cerebral bleeding was observed in 81.6% of them (n=93). While injury in the thoracic region was not encountered in 36.8% of the cases (n=42), isolated organ injury was observed in 36.0% of the cases (n=41) and combined organ injury in 27.2% of them (n=31). While injury in the abdominal region was not encountered in 41.2% of the cases (n=47), isolated organ injury was observed in 13.2% of the cases (n=15) and combined organ injury in 45.6% of them (n=52).

In the study performed by Dogan et al., it was reported that 39.7% of the cases died due to isolated head injury; there were head and extremity injury in 17.5% of the cases and head, extremity, chest and abdominal injury in 14.3% of the cases (8).

In the study performed in New York (n=211); it was reported that there were head, trunk and extremity injuries in 84%, 70% and 62% of the accidents, respectively; head, trunk and extremity injuries in 90%, 80% and 77% of the suicides, respectively; there were skull fractures in 53% of the accidents and 65% of the suicides; decapitation occurred in 1% of the accidents and 7% of the suicides and transection occurred in 3% of the accidents and in 8% of the suicides (12).

In the railway related deaths, it was reported that decapitation commonly occurred in the cases with suicidal origin but it might also occur in high-speed collisions (10). In the study performed by Mohanty MK et al., it was reported that decapitation was determined in 13 of 17 cases with suicidal origin. In the study performed by Lin and Gill, while decapitation was determined in 1% of the cases with accidental origin, it was determined in 7% of the cases with suicidal origin (9). In the study performed by Dogan et al., it was reported that partial decapitation was determined in only one of 7 cases with suicidal origin (8). Also in a study performed in Istanbul evaluating the cases with decapitation (n=19), it

Table 6: Comparisons of the type of event and gender and trauma

	Suicide (n=12)		Accident (n=102)		p
	n	%	n	%	
Gender					
Male	9	75.0	88	86.3	[a]0.384
Female	3	25.0	14	13.7	
Bone fracture					
Absent	0	0.0	2	2.0	[b]0.025*
Isolated skull	1	8.3	12	11.8	
Isolated trunk	3	25.0	4	3.9	
Combined	8	66.7	84	82.4	
Head-Neck					
Absent	2	16.6	19	18.6	[a]1.000
Cerebral bleeding	10	83.4	83	81.4	
Thorax					
Absent	6	50.0	36	35.3	[b]0.643
Isolated organ	3	25.0	38	37.3	
Combined	3	25.0	28	27.5	
Abdomen					
Absent	5	41.7	42	41.2	[b]0.915
Isolated organ	2	16.7	13	12.7	
Combined	5	41.7	47	46.1	

aFisher Exact test *bFisher-Freeman-Halton Exact test* *p<0.05*

Table 7: Comparisons of the toxicological investigation and the type of event

Toxicology	Type of the event			
	Suicide (n=12)		Accident (n=102)	
	n	%	n	%
Absent	10	83.3	80	78.4
Ethanol	2	16.7	19	18.6
Other Substance	0	0.0	3	3.0

Fisher-Freeman-Halton Exact test

was reported that 7 cases were decapitated due to train accident (14).

In the toxicological investigations performed in our study, while no substance intake was encountered in 78.9% of the cases (n=90); ethanol, oxazepam, morphine and ketamine intake were observed in 18.4% (n=21), 0.9% (n=1), 0.9% (n=1) and 0.9% (n=1) of the cases, respectively. It was observed that ethanol rates determined were changing between 13 mg/dL and 654 mg/dL.

A statistically significant difference was not observed between cases of suicide and accident according to the distributions of the results of toxicological investigation (p>0.05). While the ratio of the events occurring without substance intake was 83.3% (n=10) in the suicide group, it was observed to be 78.4% (n=80) in the accident group. While the ratio of the cases determined to be with ethanol intake was 16.7% (n=2) in the suicide group, it was observed to be 18.6% (n=19) in the accident group. While no substance intake was determined in the suicide group, substance intake was observed to be 3.0% (n=3) in the accident group.

In the study performed by Lin, ethanol was determined in 42% of the accidents and 14% of the suicides. Cocaine and/or benzodiazepine derivative were found in 25% of the accidents and 3% of the suicides. Antidepressant drug was determined in 8% of the accidents and 21% of the suicides (12).

In the railway related deaths, clearly, death is usually due to multiple blunt traumas (10). According to the type of accidents; a statistically significant difference was observed in distributions of bone fracture (p<0.05). The rate of combined bone fractures due to accident-crash and fall from train were observed to be 87.0% (n=80) and 50.0% (n=4), respectively. This difference between the distributions of combined bone fractures was observed to be statistically significant (p=0.021 p<0.05). A statistically significant difference was observed between the distributions of bone fractures according to the cases of suicide and accident (p<0.05). It was determined that isolated fractures of bones of trunk were observed to be statistically significantly higher in the suicide group than in the accident group.

According to the type of the accidents; a statistically significant difference was observed between the distributions of traumas in the abdominal region (p<0.05). It was determined that the ratio of the cases without traumas in the abdominal region due to fall from train was observed to be statistically significantly higher than the ratio of the cases without traumas in the abdominal region due to accident-crash (p=0.006 p<0.01).

According to the type of the accidents; in the histopathological investigation, the ratio of cerebral bleeding in the fall from train group was observed to be statistically significantly higher compared to accident-crash group (p<0.01).

Main information that should be demonstrated by the autopsy with respect to judicial processes should be determination of the evidence which will be useful for enlightening the origin of the event. Because it should not be ignored that impairment in the physical integrity of the body occurring due to train crash which is a high energy trauma can be used in order to hide a murder. While postmortem assessment is performed, all conditions which can affect death should be excluded and it should not be allowed the sensitive findings/evidence which will enlighten the origin of the event are hidden by extensive injury occurred in the body.

In conclusion; taking into consideration the findings obtained in our study, although railway related deaths are expected to result from multiple organ-vessel injury due to severe trauma to the body, it should not be ignored that deaths may also occur due to electric shock. A statistically significant difference was observed between the distributions of bone fractures according to the cases of suicide and accident (p<0.05). It was determined that isolated fractures of bones of trunk were observed to be statistically significantly higher in the suicide group than in the accident group. This finding which was also found to be statistically significant were determined to be consistent with the information regarding the actions in important part of suicide actions occurring on the railways took place by lying on the rails. In this case, it is a fact that severe trauma findings will be expected to occur in trunk part of the body much more.

Although the ratio of cerebral bleeding in the fall from train group was observed to be statistically significantly higher compared to accident-crash group (p<0.01), it was determined to be statistically significantly lower compared to the cases of traumas in the abdominal region due to accident-crash (p=0.006 p<0.01). Although some exceptions are possible, this data which is found to be statistically significant supports the literature data regarding fatal trauma findings in the accidents occurring due to fall from train occur in head region much more.

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