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Evaluation of the association between bilateral calcaneal fractures and suicide attempts: Findings from 4 different trauma centers in Turkey

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Abstract

In this study we aimed to determine the association between bilateral calcaneal fractures and suicide attempt and some socio-demographic characteristics. This study was conducted among patients admitted to the emergency departments of four trauma centers with bilateral calcaneal fractures between January 2014 and March 2017. The Sociodemographic Data Form, Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) and Axis I Disorders (SCID-I) were applied to participants. Comparisons about age and gender was made between suicidal and non-suicidal patients with bilateral calcaneal fractures. Twenty-three patients with bilateral calcaneus fractures were included in the study. Of the 23 patients with bilateral calcaneal fractures, 14 (61%) were evaluated as suicidal and nine (39%) were evaluated as not suicidal. The majority of suicidal jumpers were female (n = 11, 78.6%). Suicidal patients were younger compared with non-suicidal fallers. As a result of SCID I interview, nine (64.3%) of 14 suicidal jumpers were diagnosed with serious psychiatric diagnoses: One patient was diagnosed with first episode psychotic disorder, one with schizophrenia, one with Schizoaffective Disorder, one with Bipolar Disorder, two with Major Depressive Disorder and three with Adjustment Disorder. Based on our study results we determined that suicidal jumpers are frequently diagnosed with serious psychiatric disorders. Therefore, the psychiatric dimension should be taken into consideration in the treatment plan for patients with bilateral calcaneal fractures and the multidisciplinary approach should be taken.

Keywords: bilateral calcaneus fractures, suicide attempts, suicidal high falls, psychiatric disorders

1. Introduction

Suicide usually occurs as a result of feeling hopeless due to psychiatric disorder that has been diagnosed or has not yet been diagnosed before the attempt. It is estimated that 1 million people lose their lives every year due to suicide and this number is expected to reach 1.5 million by 2020 (Wasserman et al., 2012). Suicide is ranked 10th among the causes of death (American Foundation for Suicide Prevention (AFSP). Suicide statistics., 2018). Thus, prevention of suicide is an important public health problem (Weber et al., 2017).

A fall from a height is a significant cause of morbidity and mortality (Reynolds et al., 1971). The trauma that occurs as a result of a fall or jump from a height is a good example of high-energy blunt trauma, resulting in injuries that have been shown in various previous studies (Katz et al., 1988; Richter et al., 1996; Teh et al., 2003). The majority of falls from height are accidental, while others are the result of suicide (Katz et al., 1988). Jumping from a height constitutes 3 to 15% of the average 140000 suicide attempts per year in the United Kingdom (Gore-Jones and O'Callaghan 2012; Rocos et al., 2015).

The height of the jumping place, the properties of the floor, as well as the characteristics of the body area that falls on it, determine the severity and level of the fractures (Beale et al., 2000; Rocos et al., 2015; Wirbel et al., 1998). For example, the patients falling on their legs have more serious injuries than those of falling on their left or right sides (Katz et al., 1988). Also, limbs are the most vulnerable body areas to severe injuries because of jumping. Calcaneal fractures occur due to the axial loading associated with high-energy trauma, most often with a fall from a height onto the heels, and less often in traffic accidents within a vehicle (Daftary et al., 2005; Mcbride and Laing et al., 2005; Mitchell et al., 2009). A higher rate of calcaneal fractures has been reported in patients jumping from a height and intending to commit suicide compared with

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patients who have fallen from a height (The et al., 2003). In addition, the fractures of limbs tend to be more bilateral in patients who jump from height than those of fall from height (Rocos et al., 2015). Hahn et al. (1995) reported that the majority of limb fractures in jumping from height were calcaneus (65%) and ankle fractures (27%). Also, Li and Smialek (1994) revealed 28% rate of limb fracture in jumpers, while Katz et al. (1988) reported that lower extremity fractures were the most commonly reported skeletal injuries in suicidal jumpers. In another study, it was reported that tarsal, metatarsal and calcaneus fractures were detected in 18 of 30 suicidal jumpers (Wirbel et al., 1998).

Unlike other methods like poisoning, hanging or firearms, jumping from a height does not require any equipment and it can cause serious injuries and mortality in the survivors (Wirbel et al., 1998; Beale et al., 2000). Another important issue is that 19-97% of people who attempt suicide by jumping from height have a psychiatric diagnosis and that the most common diagnosis is schizophrenia. These patients usually have more serious mental health problems than those who attempted suicide by using other methods (Richter et al., 1996; de Moore and Robertson, 1999; Nielssen et al., 2010; Gore-Jones and O'Callaghan 2012; Rocos et al., 2015). This necessitates the cooperation with psychiatry in this patient group and multidisciplinary approach in the treatment and follow-up of patients.

Based on a scan of the literature, we did not find any research specifically about the relationship between bilateral calcaneal fractures and suicide attempt. Therefore, we aimed to investigate the relationship between bilateral calcaneal fractures and suicide attempt to identify the psychiatric diagnoses and to provide the appropriate psychiatric support during the early treatment period in these patients.

2. Materials and methods

This study was conducted on four hospitals functioning as trauma centers between January 2014 and March 2017 (Table 1). The study was approved by a local University Ethics Committee for Clinical Trials. A written informed consent was obtained from each patient. The study was conducted in accordance with the principles of the Declaration of Helsinki. Patients who died prior to admission were excluded. Blood toxicology reports were not sought in any cases as these are not routinely performed unless criminality is suspected.

This research included patients>16-year-old who presented to the emergency department with calcaneal fractures. The patients were first evaluated by the emergency department physicians with respect to their trauma localizations. The first step in the assessment was to obtain radiological findings and then if necessary, the relevant consultations were made.

After the patient was clinically stabilized prior the surgical treatment via analgesic and if necessary anesthetic drug, first evaluation for suicidal attempt or suicidal thought was made by an orthopedic surgeon through a semi-structured clinical interview. All the orthopedists in this study were trained about asking and managing about suicide in order to make the first evaluation of the patient by a psychiatrist experienced in psychological trauma. In this initial evaluation if it was learned that the fractures were as a result of suicidal jumping from height, psychiatric consultation was made before taking the patients to the orthopedics clinics. During the hospitalization in orthopedics clinics, a psychiatric consultation was requested again to provide the appropriate psychiatric support and treatment. When any psychiatric diagnosis was made, medical treatment was performed considering the interaction of analgesic and anesthetic drugs. Patients who are at risk of a second suicide attempt are frequently observed, carefully monitored, kept away from potentially dangerous means that can be used to self-harm, and detailed information has been provided to their relatives. Patients with a major psychiatric diagnosis and/or ongoing suicide attempt plan or thought were taken over to the psychiatry inpatient clinics.

2.1. Instruments

Sociodemographic data form: In this form, the participants were asked about personal information such as age, gender and any other fracures.

Structured clinical interview for diagnostic and statistical manual of mental disorders-fourth edition (DSM-IV) (SCID-I): This is a semi-structured clinical interview developed for use of mental health professionals (Bell, 1994). Apart from clinical diagnosis, family history, age of onset of disease, presence of stressful life events can be evaluated (Spitzer et al., 1996). The reliability and validity of the Turkish version is available (Çorapçıoğlu et al., 1999). The SCID-I allows to diagnose both present and life-time Axis I mental disorders. In this study, we used modules for depression and anxiety disorders only and focused on the current diagnoses.

2.2. Statistical Analysis

The data obtained in this study were recorded and analyzed using SPSS version 20.0 software for Windows. The numerical variables were stated as the mean ± standard deviation (SD) and the categorical variables were reported as a number (n) and percentage (%). A frequency analysis was also applied. A Welch's t test was used for the comparisons between the groups and a proportion test was used for the intragroup comparisons. A p value of < 0.05 was considered statistically significant.

3. Results

From a total of 239 patients who were admitted to four hospitals with calcaneal fractures between January 2014 and March 2017, 216 cases of unilateral fractures were excluded. Overall, this study included a total of 23 patients with bilateral calcaneal fractures. Number of patients with calcaneal fractures according to each hospital are presented at Table 1.

Table 1. Distribution of patients according to four different trauma centers

Hospital	Number of patients with bilateral calcaneus fractures (n)	Number of patients with unilateral calcaneus fracture (n)	Number of total calcaneus fractures (n)
Hospital 1	7	55	62
Hospital 2	6	82	88
Hospital 3	5	51	56
Hospital 4	5	28	33
Total	23	216	239

In 14 (61%) of 23 patients with bilateral calcaneal fractures, it was learned that the fractures occurred as a result of suicidal jump from height, while in nine patients (39%) the fractures were as a result of non-suicidal falls. No statistically significant difference was found between the number of patients with non-suicidal falls and suicidal jumpers (p = 0.404). The suicidal patient group was comprised of 11 (78.6%) females and 3 (21.4%) males, and the gender difference was determined to be statistically significant (proportion test, p <0.001) (Table 2). Non-suicidal faller group was comprised of 1 (11.1%) female and 8 (88.9%) males. There was a statistically significant difference between gender of non-suicidal fallers (proportion test, p <0.001, Table 2).

Table 2. Gender distribution

			N (%)	p
Gender	Non-suicidal fall from height	Female	1(11.1)	p<0.001
		Male	8(88.9)	
	Suicidal jump from height	Female	11(78.6)	p<0.001
		Male	3(21.4)	
	Total	Female	11(47.8)	
		Male	12(522)	

proportion test; p significant at .05 level

The average age of the patient group with bilateral calcaneal fractures was 33.2 (range 17-52) years. The average age of the suicidal jumpers was 28.2 years (range 17-42) years while the average age of the non-suicidal fallers was 41 (range 27-52) years. There was a statistically significant difference between the age of suicidal jumpers and non-suicidal fallers (Welch's t test, p<0.001, Table 3).

No statistically significant difference was determined between the number of patients who stated that they were suicidal during the first interview by orthopedists in the emergency department (n=6, 42.9%) and those who denied attempting suicide during the first interview and admitted to it later during the psychiatric interview (n=8, 57.1%) (proportion test, p=0.418). When the male attempted suicide cases were examined, it was seen that during the first interview by orthopedic surgeons in the emergency department, all 3 had denied the suicidal attempt. The suicidal attempt was later revealed by psychiatric interviews. Of the 11 female patients, only 5 (45.5%) had denied the suicidal attempt during the first interview. There was a statistically significant difference between the genders in terms of denying (Welch's t test, p<0.001). The mean time to a request a psychiatric consultation for those patients who had not reported a suicide attempt during the first interview was 4 days with the range of 2 and 7 days.

Table 3. Data regarding mean age of patients with suicidal and non-suicidal patients

Age	Non-suicidal fall from height	Suicidal jump from height	Total	p
Mean age	41	28.2	33.2	<0.001
Range of age	27-52	17-42	17-52	<0.001

Welch's t test; p significant at .05 level

As a result of SCID I psychiatric interview, 9 (64.3%) of 14 suicidal jumpers were diagnosed with serious psychiatric diagnoses while five (35.7) were not diagnosed with any psychiatric diagnoses. Three of 14 suicidal patients were diagnosed with psychosis according to SCID-I interview. One of these three psychotic patients was diagnosed with first episode psychosis (FEP). The patient who was diagnosed with FEP during our study was also the male patient who denied the suicidal attempt during the first interview and attempted suicide second time during hospitalization. During the psychiatric SCID-I interview, it was learned that he had auditory hallucinations ordering him to jump from a height. One of these psychotic patients was a female patient with a diagnosis of Schizoaffective Disorder who was followed up with olanzapine 20 mg /day, risperidone 6 mg / day and valproate 1000 mg /day. Another patient was a schizophrenic male patient who was diagnosed 3 years ago.

Table 4. Comparison of patients in terms of concomitant fractures

Injury	Non-suicidal fall from height N (%)	Suicidal jump from height N (%)	p
Isolated bilateral calcaneal fracture	8(57)	1(11)	<0.001
Bilateral calcaneal and concomittant other fractures	6(43)	8(89)	<0.001

Welch's t test; p significant at .05 level

Three of 14 suicidal patients were diagnosed with Affective Disorder while one had Bipolar Disorder and two had Major Depressive Disorder (MDD). Also three of 14 suicidal patients were diagnosed with Adjustment Disorder because of serious stressors. While nine of 14 suicidal patients were diagnosed with any psychiatric disorder, five were not diagnosed with any psychiatric disorder. It was learned that 2 of 5 patients who had no major psychopathology were receiving pregabalin treatment for severe pain due to diabetic neuropathy for many years. A statistically significant difference was determined between the suicidal (42.8%) and non-suicidal (89%) groups with respect to the rate of fractures other than the bilateral calcaneal fractures (Welch's t test, p<0.001, Table 4).

4. Discussion

Searching the relevant studies investigating the relationship between jumping from height and suicide, we determined that almost all of the studies had been designed to investigate the patterns of injuries of the jumpers (Katz et al., 1988; Rocos and Chesser, 2016; Wirbel et al., 1998). We did not find any study investigating the prevalence of suicide in patients with a specific fracture such as bilateral calcaneal fractures.

In the current study, of the 23 patients with bilateral calcaneal fractures, 14 (61%) were found to be suicidal and 9 (39%) were not. Although no statistically significant difference was found, the rate of suicide attempt in patients with bilateral calcaneal fractures was found to be higher. Our results emphasize the importance of considering the suicide attempt as an important etiological factor in patients who are admitted to trauma centers with bilateral calcaneal fractures due to jumping from height. We also obtained important results in terms of underlining the necessity of multidisciplinary approach to patients with bilateral calcaneus fractures. Describing the sociodemographic characteristics of patients who attempted suicide by jumping from height has become of the subject of various studies (Li et al., 1994; Gore-Jones and O'Callaghan 2012; Rocos et al., 2015). Unfortunately, there have been conflicting results with regard to gender in this area (Li et al., 1994; Värnik et al., 2008; Värnik et al., 2009). The results of our study showed that majority (78.6%) of the suicidal jumpers were female. While this result is consistent with some studies (Värnik et al., 2008; Värnik et al., 2009; de Pourtalès et al., 2010), it is different from the findings of studies in which males are more present (Bennewith et al., 2007; Kontaxakis et al., 1988; Li et al., 1994). Similar with our results, in a study conducted by Katz et al. (1988) it was reported that 18 of 28 suicidal jumpers were female. In contrast to our results, in a study conducted by Kontaxakis et al. (1988) it was reported that suicide attempt by jumping from height was higher in males and in advanced ages. The difference between studies may be related to sociocultural and socioeconomical factors in the countries where the study has been conducted.

In our study we revealed that the suicidal jumpers were younger than the non-suicidal fallers. This is consistent with the results of many studies (Li et al., 1994; Gore-Jones and O'Callaghan 2012; Rocos et al., 2015). In some studies, conducted in USA and UK, this group was reported to be in the 25-30 age group (Li et al., 1994; Rocos et al., 2015). In a study conducted by Rocos et al. (2015) the medical records of the patients admitting to a regional trauma center due to jumping from height were evaluated retrospectively between 2012-2016 and the average age of the patients was found to be 32. Similar with our results Li and Smialek (1994) reported that the majority of those who attempted suicide by jumping from height were in the 20-30 age group. Our study emphasizes the necessity of questioning the suicidal attempt in patients with bilateral calcaneal fractures, especially in younger patients.

It is important to know the patterns of injury specific to jumps during the evaluation of these patients, although there is no diagnostic fracture for jumpers (Katz et al., 1988; Teh et al., 2003; Rocos et al., 2015). Rocos et al. (2015) revealed that 13 of 41 patients with the history of jumping from height, have been reported to have calcaneal fractures and the possibility of calcaneus fracture has been reported as 0.32. In another study, conducted to determine the pattern of injuries in 28 suicidal jumpres, researchers revealed calcaneal fractures in 12 of these patients (Katz et al., 1988). Teh et al. (2003) reported that calcaneal fractures were seen more frequently in suicidal jumpers (31%) compared to accidentally fallers (5%). Also, the rate of isolated injuries was found to be higher in suicidal jumpers compared with accidental fallers consistent with our results (Richter et al., 1996; Teh et al., 2003).

Patients attempting suicide by jumping from a height, were frequently diagnosed with serious psychiatric disorders like schizophrenia (Katz et al., 1988; Kontaxakis et al., 1988; Hahn et al., 1995; Rocos et al., 2015). Nine of four-teen patients in our study have been diagnosed with psychotic or affective disorder consistent with the literature (Katz et al., 1988; Rocos et al., 2015). In some case series it has been reported that psychotic disorders like schizophrenia, first episode psychosis are common in suicidal jumpers (Katz et al., 1988; Kontaxakis et al., 1988; Nielssen et al., 2010; Rocos et al., 2015). Although the diagnosis of psychosis can be made before or after the jump, psychosis is typically found to be associated with attempting to jump from height (Katz et al., 1988; Rocos et al., 2015). In addition, the first episode psychosis without having any psychiatric treatment was reported to be associated with suicide by jumping from height (Nielssen et al., 2010). In our study, one male patient was diagnosed with first episode psychosis and he did not have any history of psychiatric treatment. Also, this patient did not share his suicidal attempt in the first evaluation. The schizophrenic male patient denied the suicidal attempt during the first interview too. After the psychiatric interview, evaluating the medical records and interviewing with the relatives, it was learned that he was diagnosed with schizophrenia three years ago and he did not receive antipsychotics treatment because of delusions of persecution as thinking that doctors and his family were poisoning him with the drugs. The third female psychotic patient was diagnosed with Schizoaffective Disorder, one of the serious psychotic disorders. Although she did not deny the suicide attempt during the first interview, she had delusions of reference and severe depressive symptoms as a result of discontinuing the psychiatric treatment. These results emphasize the importance of collaboration with psychiatrists even if the patients deny the suicide. Thus, as a result of detailed psychiatric evaluation these patients should be identified and treated to allow the early mobilization of fractures and transfer to psychiatry department as soon as possible.

Also, in our study, one patient was diagnosed with bipolar disorder and two were diagnosed with MDD consistent with the literature (Kontaxakis et al., 1988). Although two patients were not diagnosed with major psychiatric diagnosis, these two patients had severe pain symptoms due to diabetic neuropathy and their pain could not be controlled despite the use of pregabalin. Kontaxakis et al. (1988) revealed that major psychiatric diagnoses, including psychotic depression and schizophrenia, and serious physical disorders were more frequent in the patients who attempted suicide by jumping from height compared with the patients who attempted suicide by taking overdose drugs.

Psychiatric symptoms are subjective distress for these patients and in some cases may impair or even prevent medical and surgical care. Psychiatric conditions, especially risk of suicide, should be evaluated and treated as early as possible during hospitalization. Treatment management requires both psychopharmacological and psychotherapeutic interventions. It should be directed towards symptomatic treatment and, if possible, remission of primary psychiatric disorder.

Psychiatric re-evaluation of the patients during orthopedic hospitalization is also important. Relevant studies reported that patients who had attempted suicide but did not share or denied it may tend to have second suicide attempt and this may end with death (Hawton and Fagg, 1988; Suokas et al., 2001). In our study, one of the patients who initially denied the suicide attempted suicide again during the hospitalization period. Small and Rosenbaum (1984) reported that suicide was more important problem among inpatients. In a study conducted in UK, jumping from height is defined as a more common method of suicide attempt among inpatients (Gunnell and Nowers, 1997). Also, this patient group is usually young, has long been social isolated with a history of traumatic events and suicide attempts (Gunnell et al., 1997; Suokas et al., 2001). Therefore, it is recommended that the history of suicide attempts and traumatic life events should be evaluated in detail in psychiatric interviews. In our study, the patient who had suicide attempt by a similar method, was diagnosed with first episode psychosis after psychiatric interview. In the detailed psychiatric re-evaluation of this patient, it was learned that he had auditory hallucinations telling him to kill himself and therefore, he had a social isolation over than one month.

Furthermore, the treatment of these patients in surgical services can be difficult because of the lack of experience of the nurses and health personnel in the management of these patients (Katz et al., 1988). The patient group included in our study was followed up with daily psychiatric evaluations during orthopedics hospitalization. An important role of psychiatric consultation is to help to manage the necessary orthopedic treatment and rehabilitation by increasing cooperation with the patients, reducing agitation and preventing anger outbursts.

Considering that this group of patients is frequently composed of working age groups in low- and middle-income countries, management of these patients is especially important because of the means of treating the social and economic results. In addition to determining the sociodemographic characteristics of these patients, it is also important to evaluate the type of injuries and psychiatric history and to question the previous suicide attempt and to provide appropriate psychiatric support in order to decrease the mental and social problems. Management of the patients with the history of suicide attempts by jumping from height can be achieved through multidisciplinary approaches (Rocos and Chesser, 2016). Further studies are needed to contribute to the literature in this area.

Conflict of interest

The author declares that there is no conflict of interest.

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References

1. American Foundation for Suicide Prevention (AFSP). Suicide statistics. [webpage], 2018. https://afsp.org/about-suicide/suicide-statistics/. Accepted at: 07.08.2018
2. Beale, J.P., Wyatt, J.P., Beard, D., Busuttil, A., Graham, C.A., 2000. A five-year study of high falls in Edinburgh. Injury. 31, 503-508.
3. Bell, C.C., 1994. DSM-IV: Diagnostic and Statistical Manual of Mental Disorders. JAMA. 272, 828–829.
4. Bennewith, O., Nowers, M., Gunnell, D., 2007. Effect of barriers on the Clifton suspension bridge, England, on local patterns of suicide: implications for prevention. Br. J. Psychiatry. 190, 266-267.
5. Çorapçıoğlu, A., Aydemir, Ö., Yıldız, M., Danacı, A.E., Köroğlu, E., 1999. DSM-IV Eksen-I Bozuklukları için Yapılandırılmış Klinik Görüşme. Ankara: Hekimler Yayın Birliği.
6. Daftary, A., Haims, A.H., Baumgaertner, M.R., 2005. Fractures of the calcaneus: a review with emphasis on CT. Radiographics. 25, 1215-1226.
7. De Moore, G.M., Robertson, A.R., 1999. Suicide attempts by firearms and by leaping from heights: a comparative study of survivors. Am. J. Psychiatry. 156, 1425-1431.
8. De Pourtalès, M.A., Hazen, C., Cottencin, O., Consoli, S.M., 2010. Adolescence, substance abuse and suicide attempt by jumping from a window. Presse Med. 39, 177-1786.
9. Gore-Jones, V., O'Callaghan, J., 2012. Suicide attempts by jumping from a height: a consultation liaison experience. Australas Psychiatry. 20, 309-312.
10. Gunnell, D., Nowers, M., 1997. Suicide by jumping. Acta Psychiatr. Scand. 96, 1-6.
11. Hahn, M.P., Richter, D., Ostermann, P.A., Muhr, G., 1995. Injury pattern after fall from great height. An analysis of 101 cases. Unfallchirurg. 98, 609-613.
12. Hawton, K., Fagg, J., 1988. Suicide and other causes of death, following attempted suicide. Br. J. Psychiatry. 152, 359-366.
13. Katz, K., Gonen, N., Goldberg, I., Mizrahi, J., Radwan, M., Yosipovitch, Z., 1988. Injuries in attempted suicide by jumping from a height. Injury. 19, 371-374.

14. Kontaxakis, V., Markidis, M., Vaslamatzis, G., Ioannidis, H., Stefanis, C., 1988. Attempted suicide by jumping: clinical and social features. Acta Psychiatr. Scand. 77, 435-437.

15. Li, L., Smialek, J.E., 1994. The investigation of fatal falls and jumps from heights in Maryland (1987-1992). Am. J. Forensic. Med. Pathol. 15, 295-299.

16. Mcbride, D.J. R.C., Laing, P., 2005. The hindfoot: calcaneal and talar fractures and dislocations-Part I: Fractures of the calcaneum. Curr. Orthop. 19, 94-100.

17. Mitchell, M.J., McKinley, J.C., Robinson, C.M., 2009. The epidemiology of calcaneal fractures. Foot (Edinb). 19, 197-200.

18. Nielssen, O., Glozier, N., Babidge, N., Reutens, S., Andrews, D., Gerard, A., et al., 2010. Suicide attempts by jumping and psychotic illness. Aust. N. Z. J. Psychiatry. 44, 568-573.

19. Reynolds, B.M., Balsano, N.A., Reynolds, F.X., 1971. Falls from heights: a surgical experience of 200 consecutive cases. Ann. Surg. 174, 304-308.

20. Richter, D., Hahn, M.P., Ostermann, P.A., Ekkernkamp, A., Muhr, G., 1996. Vertical deceleration injuries: a comparative study of the injury patterns of 101 patients after accidental and intentional high falls. Injury. 27, 655-659.

21. Rocos, B., Acharya, M., Chesser, T.J., 2015. The Pattern of Injury and Workload Associated with Managing Patients After Suicide Attempt by Jumping from a Height. Open Orthop J. 9, 395-398.

22. Rocos, B., Chesser, T.J., 2016. Injuries in jumpers - are there any patterns? World J. Orthop. 7, 182-187.

23. Small, G.W., Rosenbaum, J.F., 1984. Nine psychiatric inpatients who leaped from a height. Can. J. Psychiatry. 29, 129-131

24. Spitzer, R.L., Williams, J.B., Gibbon, M., First, M.B., 1996. The Structured Clinical Interview for DSM-IV Axis I Disorders, Clinician Version (SCID-CV). Washington: American Psychiatric Press Inc.

25. Suokas, J., Suominen, K., İsometsa, E., Ostamo, A., Lonnqvist, J., 2001. Long-term risk factors for suicide mortality after attempted suicide findings of a 14-year follow-up study. Acta Psychiatr. Scand. 104, 117-121.

26. Teh, J., Fırth, M., Sharma, A., Wilson, A., Reznek, R., Chan, O., 2003. Jumpers and fallers: a comparison of the distribution of skeletal injury. Clin. Radiol. 58, 482-486.

27. Värnik, A., Kõlves, K., Allik, J., Arensman, E., Aromaa, E., Van Audenhove, C., et al., 2009. Gender issues in suicide rates, trends and methods among youths aged 15-24 in 15 European countries. J. Affect. Disord. 113, 216-226.

28. Värnik, A., Kõlves, K., van der Feltz-Cornelis, C.M., Marusic, A., Oskarsson, H., Palmer, A., et al., 2008. Suicide methods in Europe: a gender-specific analysis of countries participating in the "European Alliance Against Depression". J. Epidemiol. Community Health. 62, 545-551.

29. Wasserman, D., Rihmer, Z., Rujescu, D., Sarchiapone, M., Sokolowski, M., Titelman, D., et al., 2012. The European Psychiatric Association (EPA) guidance on suicide treatment and prevention. Eur. Psychiatry. 27, 129–141.

30. Weber, A.N., Michail, M., Thompson, A., Fiedorowicz, J.G., 2017. Psychiatric Emergencies: Assessing and Managing Suicidal Ideation. Med. Clin. North Am. 101, 553–571.

31. Wirbel, R.J., Olinger, A., Karst, M., Mutschler, W.E., 1998. Treatment of severe injuries caused by attempted suicide: pattern of injury and influence of the psychiatric disorder on the postoperative course. Eur. J. Surg. 164, 109–113.