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Evaluation of Foot and Ankle Trauma Registering to Emergency Department

Acil Servise Başvuran Ayak ve Ayak Bileği Travmalarının Değerlendirmesi

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ABSTRACT

In this study, we aimed to evaluate the demographic data and injured tissue of the patients who applied to the emergency department with foot and ankle injuries and to reveal the relationship between them. This study was conducted by retrospectively evaluating the data of the patients who applied to the emergency department of a tertiary hospital during the two months between 01.01.2019-28.02.2019. The fractured bones were grouped as tibia, fibula, talus, calcaneus, cuboid bone, navicular bone, cuneiform bone and 1st, 2nd, 3rd, 4th, 5th metatarsal bones, and proximal phalanx. Trauma mechanisms were grouped as falling from a height, falling from the same level, beating, sports injury, traffic accident and sprain. Of the 133 patients included in the study, 68 (51.1%) were female. The age ranged between 1 and 78 years, with a median of 28. The most common bone fracture was the fibula (42.9%). Patients with calcaneus fracture had a higher age than those without fractures (median: 44, inter quartile range (IQR): 42-58, versus median: 26, IQR: 13-41.5) and patients with fifth metatarsal bone had a higher age than those without fractures (median: 41, IQR: 22.5-63.5, versus median: 24.5, IQR: 13-41) but patients with first metatarsal bone had a lower age than those without fractures (median: 12, IQR: 6-14, versus median: 32, IQR: 14-44) (Mann-Whitney U test, for calcaneus, p=0.003, for first metatarsal bone, p<0.001 and for fifth metatarsal bone, p=0.005). Our study results emphasize the presence of different types of fractures among various age groups, highlighting that fibula fractures are the most prevalent foot and ankle injuries, primarily attributed to falls from the same level. To identify specific tissues affected in foot and ankle injuries and particularly define the epidemiology in our country, larger, multicenter studies are needed.

Keywords: Ankle, Foot, Injury, Trauma

ÖZET

Biz bu çalışmada ayak ve ayak bileği yaralanması ile acil servise başvuran hastaların demografik verilerini ve yaralanan dokuyu değerlendirmeyi ve bunlar arasındaki ilişkiyi ortaya koymayı amaçladık. Çalışmamız 01.01.2019-28.02.2019 tarihleri arasındaki iki aylık sürede üçüncü basamak bir hastanenin acil servisine başvuran hastaların verilerinin retrospektif olarak değerlendirilmesi ile yapılmıştır. Olgularda yaralanan kemik sayıları bir kemik kırığı ve birden fazla kemik kırığı olarak gruplandırıldı. Kırılan kemikler tibia, fibula, talus, kalkaneus, kuboideum, navikülare, kuneiform ve 1., 2., 3., 4., 5. metatars ve proksimal falanks olarak gruplandırıldı. Travma mekanizmaları yüksekten düşme, aynı seviyeden düşme, darp, spor yaralanması, trafik kazası ve burkulma olarak gruplandırıldı. Çalışmaya dâhil edilen 133 hastanın 68'i (%51.1) kadındı. Yaş 1 ve 78 arasında değişmekte olup ortancası 28 olarak saptandı. En sık kemik kırığı fibula (%42.9) idi. Kalkaneus kırığı olan hastaların yaşı kırığı olmayanlara göre daha yüksekti (ortanca: 44, çeyrekler arası aralık (ÇAA): 42-58, ortanca: 26, ÇAA: 13-41.5) ve beşinci metatars kemiğine sahip hastaların yaşı kırığı olmayanlara göre daha yüksekti (medyan: 41, ÇAA: 22,5-63,5, medyan: 24.5, ÇAA: 13-41) ancak birinci metatars kemiği olan hastaların yaşı kırığı olmayanlara göre daha düşüktü (medyan: 12, ÇAA: 6-14, medyan: 32, ÇAA: 14-44) (Mann-Whitney U testi, kalkaneus için, p= 0.003, birinci metatars kemiği için, p<0.001 ve beşinci metatars kemiği için, p=0.005). Çalışma sonuçlarımız, farklı yaş grupları arasında farklı kırık tiplerinin görüldüğünü vurgulayarak, fibula kırıklarının en yaygın ayak ve ayak bileği yaralanmaları olduğunu, bunun da aynı seviyeden düşmelerin başlıca nedeni olduğunu göstermektedir. Ayak ve ayak bileği yaralanmalarında etkilenen belirli dokuları belirlemek ve özellikle ülkemiz epidemiyolojisini tanımlamak için daha büyük, çok merkezli çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Ayak, Ayak bileği, Kırık, Yaralanma

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INTRODUCTION

Trauma is one of the most common causes of mortality and morbidity in the world. It is the most common cause of mortality in young adult males. It ranks first in developing countries.[1] Worldwide, approximately 6 million people die every year due to trauma-related injuries, and trauma-related major vessel injuries, head trauma, and thoracic injuries are the most common causes of death. It is crucial to systematically organize the trauma patient's care into rapid assessment, triage, resuscitation, diagnosis, and therapeutic intervention.[1-3] Foot and ankle injuries have an important place among the reasons for applying to emergency departments. The ankle is the most frequently injured joint. The most common injuries of the foot and ankle are blunt trauma and sprain; these injuries can result in strain, sprain, or fracture.[4] Injuries can generally develop during daily activities such as sports, walking, and running. Ankle sprains account for 75% of all ankle injuries, 39.3% of lower extremity injuries and 25% of musculoskeletal injuries.[5-6] The foot and ankle are supported by strong ligaments. Due to the complexity of the anatomy of the region in foot and ankle injuries, anamnesis and physical examination are the cornerstones of the diagnosis.[7,8] However, radiological imaging is needed in most cases. In cases where conventional radiographs cannot provide adequate imaging - especially in the presence of fracture - advanced imaging methods such as computed tomography (CT) are used to plan treatment.[9,10] In this study, we aimed to evaluate the demographic data and broken bones of the patients who applied to the emergency department with foot and ankle injuries and to reveal the relationship between them.

MATERIAL AND METHODS

The current study was carried out by retrospectively evaluating the data of patients who applied to the emergency department of a tertiary hospital in two months between January 01, 2019, and February 28, 2019.

The study population consisted of patients with foot and ankle injuries who applied to the emergency department of our tertiary hospital. During the two-month period during which the data were scanned, 73339 emergency patient admissions were made. Files of patients with foot and ankle injuries were reviewed retrospectively using the hospital's computer-based data system.

To determine foot and ankle injuries, patients who had short leg splints were identified and included in the study using the hospital's computer-based data system. Patients whose data were recorded incompletely and could not be accessed were excluded from the study. Demographic data such as the age and gender of the patients included in the study were evaluated. The number of injured bones in the cases were grouped as one bone fracture and more than one bone fracture. The fractured bones were grouped as tibia, fibula, talus, calcaneus, cuboid bone, navicular bone, cuneiform bone and 1st, 2nd, 3rd, 4th, 5th metatarsal bones and proximal phalanx. Trauma mechanisms were grouped as falling from a height, falling from the same level, beating, sports injury, traffic accident and sprain.

The data obtained in the study were evaluated using the Jamovi statistical program (Jamovi 0.9.5.3). In the statistical evaluation of the data, descriptive analyses (n, percentage, median and the interquartile range (IQR)) and Kolmogorov-Smirnov test were used to evaluate the conformity of the parameters to the normal distribution. Mann-Whitney U test was preferred for intergroup comparison of continuous data that did not fit normal distribution. For the significant p-value, 0.05 was chosen as the cut-off value. Values below 0.05 were considered significant.

RESULTS

As the patients' files included in the study were examined, it was seen that the data of 4 (2.9%) patients were missing and excluded from the study. Of the 133 patients included in the study, 65 (48.9%) were male and 68 (51.1%) were female. The age ranged between 1 and 78 years, with a median of 28 (IQR: 14-44).

Broken bones were detected as; 12 (9%) tibia, 57 (42.9%) fibula, 7 (5.3%) talus, 9 (6.8%) calcaneus, 15 (11.3%) cuboid bone, 3 (2%) navicular bone, 3 (2.3%) cuneiform bone, 2 (1.5%)1st metatarsal bones, 9 (6.8%) 2nd metatarsal bones, 1 (0.8%) 3rd metatarsal bone, 1 (0.8%) 4th metatarsal bone, 27 (20.3%) 5th metatarsal bones, and 1 (0.8%) proximal phalanx. The case with proximal phalanx fracture was the third finger proximal phalanx fracture. No other phalangeal fractures were found in the patients included in the study. As the cases were evaluated according to the

trauma mechanisms, falling from a height of 5 (3.8%), falling on the same level 79 (59.4%), beating 4 (3%), sports injury 3 (2.3%), traffic accident 2 (1.5%) and sprain was 40 (30.1%). As the number of broken bones are evaluated; there was one bone fracture in 118 (88.7%) cases, and two or more than two bone fractures in 15 (11.3%) cases (Table 1).

Table 1. Trauma mechanism, broken bones and distribution of number of broken bones

Trauma mechanism (n, %)	
Fall on the same level	79 (59.4%)
Sprain	40 (30.1%)
Beaten	4 (3 %)
Fall from height	5 (3.8%)
Sports injury	3 (2.3%)
Traffic accident	2 (1.5%)
Fractures (n, %)	
Tibia	12 (9%)
Fibula	57 (42.9%)
Talus	7 (5.3%)
Calcaneus	9 (6.8%)
Navicular bone	3 (2.3%)
Cuboid bone	15 (11.3%)
Cuneiform bone	9 (6.8%)
1st metatarsal bone	3 (2.3%)
2nd metatarsal bone	2 (1.5%)
3rd metatarsal bone	1 (0.8%)
4th metatarsal bone	1 (0.8%)
5th metatarsal bone	27 (20.3%)
3rd proximal phalanx	1 (0.8%)
Number of broken bones (n, %)	
One	118 (88.7%)
More than one	15 (11.3%)

It was observed that imaging was performed with conventional radiographs in all patients, and 63 (47.4%) patients were referred to CT, one of the advanced imaging methods. It was observed that no patients were admitted to the hospital from which all patients were discharged.

Patients with calcaneus fracture had a higher age than those without fractures (median: 44, IQR: 42-58, versus median: 26, IQR: 13-41.5) and patients with fifth metatarsal bone had a higher age than those without fractures (median: 41, IQR: 22.5-63.5, versus median: 24.5, IQR: 13-41) but patients with first metatarsal bone had a lower age than those without fractures (median: 12, IQR: 6-14, versus median: 32, IQR: 14-44) (Mann-Whitney U test, for calcaneus, p=0.003, for first metatarsal bone, p<0.001 and for fifth metatarsal bone, p=0.005) (Table 2).

Table 2. Age distribution of patients with and without fracture

	With fracture	**Without fracture**	**p**
Tibia	21.5 (10.8-42.3)	30 (14-44)	0.629
Fibula	28 (15-43)	30 (12-44)	0.899
Talus	18 (18-24.5)	31 (13.3-44)	0.59
Calcaneus	44 (42-58)	26 (13-41.5)	**0.003**
Cuboid bone	36 (23.5-46)	28 (13-43.8)	0.169
1st metatarsal bone	12 (6-14)	32 (14-44)	**<0.001**
5th metatarsal bone	41 (22.5-63.5)	24.5 (13-41)	**0.005**

When the number of broken bones and referral for advanced imaging (CT) were evaluated, it was observed that there was a statistically significant relationship between the number of broken bones and referral for advanced imaging (Mann-Whitney U test, p<0.001).

DISCUSSION

In our study, it was found that the most common mechanism causing foot and ankle trauma was falls at the same level (59.4%), more than one bone was broken in 11.3% of the patients, and the most common bone fracture was the fibula (42.9%). Our results showed that fractures of the 1st metatarsal bone were relatively higher in young people, and fractures of the 5th metatarsal bone and calcaneus were somewhat higher in the elderly.

Foot and ankle traumas have significant socioeconomic impacts and are a major cause of loss of workforce and morbidity. In the literature, it is seen that studies on foot and ankle traumas are mainly carried out on sports-related injuries (athletes, football players and ice hockey players, etc.) and on subgroups such as foot or ankle sprains or bone fractures. Studies have reported that the most common age range of patients presenting with ankle injury is between 32 and 37 years.[11-13] In a study from Turkey, it was stated that as a logical explanation for this, bone density decreases with age, and therefore the frequency of fractures may increase.[14] In a study conducted in Scotland, it was determined that even though the severity of the force causing the trauma was the same, the trauma severity scores of the elderly patients were higher than the young ones. The mention of the Scottish study can be taken as a second plausible

explanation.[15] It is seen that the frequency of falls increases due to environmental factors, gait or balance disorders, and muscle strength and coordination disorders in advanced ages, and injuries due to stepping on the lateral surface of the foot due to balance disorders.[16,17] In our study, the median age of the patients was 28 years, and the mean age of the patients with fractures was significantly higher. Similar to the studies, it is seen that the cases presenting with ankle injury in our study were young adults. We think that the main reason for this may be that individuals in this age group engage in more sports activities and have a more active life.

Considering the mechanism of foot and ankle trauma, the most common cause in our study was falling. An epidemiological study conducted in the USA examining 3,140,132 ankle sprains found that injury occurred during athletic activity in approximately half of the patients.[18] In an epidemiological study conducted in Denmark in which 766 patient data were analyzed, it was found that approximately half of the patients had injuries during sports activity.[19] In the study of Genç et al. from Turkey, the cause was reported as falling in approximately two-thirds of the cases.[20] Similar to the study of Genç et al., the reason for the low incidence of injuries during sports activities in our study may be related to the distance of our hospital from sports complexes, and the fact that athletes, especially professional athletes, apply to sports physicians more after trauma.

Ankle injury often occurs due to increased inversion and torsion stress during plantar flexion of the foot. The most common cause of ankle sprain is inversion injury. In a study evaluating the need for routine X-rays in patients with ankle trauma with Ottawa rules, it was reported that fractures often develop in supination-external rotation.[21] In the literature, it has been stated that the most common supination occurs in external rotation in lateral malleolar fractures.[22,23] The frequency of lateral malleolus and 5th metatarsal fractures with inversion, and medial malleolus and other foot and ankle fractures with eversion mechanism is high[24]. The balance of the body is provided on two legs, and we believe that the other leg partially restricts the eversion movement during the action. We think that inversion injuries cause fractures on the fibula, and eversion injuries cause fractures on the tibia due to increased tension. We attributed the 5th metatarsal to direct trauma in inversion injury, whereas it was attributed to load on other bones in eversion injuries. Depending on these mechanisms, fractures of the fifth metatarsal and calcaneus may be seen in the relatively elderly population.

Among the limitations of our study are that due to the study's retrospective design, contracting factors could not be evaluated, and the patient population could not reflect the whole population because it was a single-center study. Another limitation is that the follow-up data of the patients were not included in our study. Sequelae data of patients could not be evaluated in our study. A third limitation was the small size of our sample. The small size of our sample is a factor that limits the power of our study and the generalizability of our results. A final limitation was that the ligament damage of the patients could not be recorded. Our data on ligament and soft tissue injury are not sufficient.

In conclusion, according to the results of the current study, the most common foot and ankle fracture is fibula fracture, and the most common cause of foot and ankle injury is falling on the same level. Larger and multicenter studies are needed to define the affected tissues in foot and ankle injuries and to reveal the epidemiology, especially in our country.

Authorship contribution statement

Consept and desing: SO, IA, AA.
Acquisition of data: SO, IA, AA.
Analysis and interpretation of data: SO, IA, AA.
Drafting of the manuscript: SO, IA, AA.
Critical revision of the manuscript for important intellectual content: SO, IA, AA.
Statistical analysis: SO, IA, AA.

Declaration of competing interest

None of the authors have potential conflicts of interest to be disclosed.

Ethical approval

This study was approved by University of Health Sciences, İstanbul Ümraniye Health Research Centre, Scientific Research Ethics Committee with the date 05.10.2023 and the decision number 349.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

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