

## Nail Puncture Wound in Emergency Department

Acil Serviste Delici Çivi Yaralanmaları



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### ABSTRACT

**Introduction:** We examined the demographic and clinical characteristics of patients who presented to the emergency department with nail-related injury. We investigated the relationship between the risky occupation and work areas and the injury site.

**Method:** Our work was retrospective. The patients who admitted to the emergency department between 1 January 2018 and 31 December 2018 were screened. Demographic and clinical characteristics, occupations, the area where the injury occurred and the wound site of the patients were recorded from the patient files. The foot injury was divided into 3 anatomical regions. Descriptive statistics and chi-square test were used for the analysis of the data. P value <0.005 was considered significant.

**Results:** We examined 106 cases with the nail-related injury. The mean of ages was  $36.25 \pm 16.71$  and 79 (74.5%) of 106 patients were male. The area was mostly personal gardens (29.2%) and construction site (29.2%). The most common occupation was construction work (29.2%). The wound site was mostly on the foot (85.8%). Zone 1 injury was the most common foot injury (68%).

**Conclusion:** The nail-related injuries were mostly common in men, in the middle-age and on the foot. The foot injuries were common in Zone 1.

### ÖZET

**Amaç:** Acil servise delici çivi yaralanması ile başvuran hastaların demografik ve klinik özelliklerini incelendik. Riskli meslek grupları ve çalışma alanlarının yaralanma bölgesiyle olan ilişkisini araştırdık.

**Gereç ve Yöntem:** Çalışmamız retrospektifti. 1 Ocak 2018-31 Aralık 2018 tarihleri arasında acil servise başvuran hastaların demografik ve klinik özellikleri, meslekleri, yaralanmanın gerçekleştiği alan ve yara yeri hasta dosyalarından kaydedildi. Ayak tabanı yaralanması 3 anatomik bölgeye ayrıldı. Verilerin analizinde tanımlayıcı istatistik ve ki-kare testi kullanıldı. İstatistiksel anlamlılık  $p < 0.05$  olarak belirlendi.

**Bulgular:** Çivi yaralanması olan 106 hasta çalışmaya alındı. Hastaların 79 (%74.5) erkekti ve yaş ortalaması  $36,25 \pm 16,71$  idi. Yaralanmanın gerçekleştiği alanlar en fazla kişisel bahçeler (%29,2) ve inşaat alanları (%29,2) idi. En yaygın meslek inşaat işçiliği idi (%29,2). Yaralanma yeri en çok ayak idi (%85,8). Ayak yaralanması en çok Bölge 1'de görüldü (%68).

**Sonuç:** Çiviye bağlı yaralanmalar en sık erkeklerde, orta yaş grubunda ve ayak bölgesinde görüldü. Ayak yaralanmaları en sık Bölge 1 idi.

### Keywords:

Nail-related injury  
Emergency Department  
Foot injury

### Anahtar Kelimeler:

Çivi yaralanması  
Acil servis  
Ayak yaralanması

### INTRODUCTION

Nail puncture injuries were environmental injuries and usually occur in the upper and lower extremities, especially on the foot sole. Serious complications such as cellulitis, abscess, necrotizing soft tissue infections, and osteomyelitis may develop after nail puncture injury (1,2,3). In this case, the treatment and recovery process may be adversely affected to the patients. In addition, the extremity injuries cause loss of labor and affect negatively the quality of life as psychological and socio economic. Epidemiological data are important for preventive attempts to reduce such injuries. In our study, we examined the demographic and clinical characteristics of patients who admitted to the emergency department (ED) with nail

puncture wound. We evaluated the factors that may affect the patients' injuries and defined the risky patient group. Thus, we aimed to contribute to the literature.

### MATERIAL AND METHOD

Our study was designed retrospectively. Ethical approval dated 24.02.2022 and numbered 1804 was obtained from the local ethics committee.

Patients who admitted to the ED with the nail puncture wound between January 1, 2018 and December 31, 2018 were screened from the hospital automation system. 106 patients were included in the study. Patients' demographic and clinical characteristics, occupation, area where the injury occurred and wound site were recorded from patient files. The ages of the patients were divided into 5

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Table 1: Distrubition of patients' gender and age.

	Male (n) (%)	Female (n) (%)	Total patient number (%)
Age Groups			
0-6	0	1 (1)	1(1)
7-16	12 (11)	0	12 (11)
17-34	32 (30)	7 (7)	39 (37)
35-64	34 (32)	17 (16)	51 (48)
65+	1 (1)	2 (2)	3 (3)
Total patient number(%)	79 (75)	27 (25)	106 (100)

groups as 0-6, 7-16, 17-34, 35-64 and 65+ years. The areas where the injury occurred were divided into 2 as 'Low risk and High risk area'. The low risk areas were determined as domestic, indoor areas, personal gardens; the high risk areas were determined as roads, open workplace and agricultural areas. All patients included in the study were divided into 2 groups as 'High Risk Patient (HRP) and Low Risk Patient (LRP)'. Those working in the high risk area were included in the HRP group. Those working in the low risk area were included in the LRP group.

Wound site of patients was defined into 3 regions as hand-foot-leg. We also divided the foot injury into 3 anatomical regions:

**Zone 1:** The area from the neck of the metatarsals to the tip of the foot.

**Zone 2:** The area from the end of the calcaneus to the neck of the metatarsals.

**Zone 3:** Contains the tarsal bones and joints.

Patients with foot injuries were included in the HRP or LRP group according to the type of shoes they wore. Patients wearing steel-link work shoes or boots were in the LRP group. Other patients were in the HRP group.

SPSS for Windows version 16.0" (SPSS Inc. Chicago, IL, USA) was used for statistical analysis. In our study, the results were determined as numbers and percentages. Chi-square test was used to compare the data. For statistical significance,  $p < 0.05$  was determined.

## RESULTS

We included 106 cases with nail puncture wound. Of the patients, 79 (74.5%) were male and 27 (25.5%) were female. The minimum age of the patients was 6, the maximum was 80, and the mean age was  $36.25 \pm 16.71$  years. The patients were mostly seen in the 35-64 age group (48%). In Table 1, we summarized the age distribution of the patients and gender. We found a statistically significant difference between age groups and gender ( $p=0.014$ ).

The distribution of patients according to risk group is summarized in Table 2. Of the patients, 55 (51.9%) were in the HRP group, and 51 (48.1%) were in the LRP group. In the LRP group, the most injuries were in personal gardens (29.2%). In the HRP group, the most injuries were in the construction area (29.2%). The most common occupation was construction work (29.2%). We found a statistically significant difference between the risk groups of the patients and their gender ( $p=0.000$ ). The number of male patients was 52 (49%) in HRP and 27 (25.5%) in LRP group. 91 (86%) of the patients had foot injuries, 13 (12%) patients had hand injuries and 2 (2%) patients had leg injuries. Foot injury was more common in HRP

(51.6%). Foot injuries were most common in Zone 1 (68%). The number of patients in Zone 1 was equal in the HRP and LRP groups.

## DISCUSSION

Nail puncture wound are usually minor injuries and the complication rate of nail puncture wound is between 3-15% (4,5). Patients often present to the ED for wound dressing or tetanus prophylaxis. Early diagnosis and wound care are very important for patients (6,7). Some nail injuries, especially those caused by a nail gun, can cause more serious injuries such as head trauma in the literature (8,9). In our study, there was no injury with a nail gun. However, we collected data demographic characteristics and environmental factors in patients with nail related injury.

According to studies in the literature, most of the patients with nail related injuries were male (2,10,11). In our study, male gender was more common in the HRP group. High-risk patients were mostly construction workers. This result can be attributed to the fact that the men work more in high-risk areas that require heavy workload and strength. In the LRP group, the male-female ratio was almost equal. Low-risk areas were indoors and personal gardens. In these areas, people walk unprotected with thin rubber shoes, slippers and even bare feet. Therefore, the probability of injury increases in low-risk areas (Figure 1,2)

In our study, most of the patients were in the 35-65 age group. The number of pediatric patients (0-16 years) was low, but injuries were more common in boys. In our geography, boys see the garden and empty construction areas as playgrounds. It may be the answer to the question of why the number of boys is high. Creating social living spaces especially for children can play an important role in preventing such accidents.

In the study of Sui et al, construction site workers were found the most affected group in plantar puncture injury (10). In our study, nail puncture wound were more common at the construction sites too. The high incidence of nail-related injuries in high-risk areas indicates that safety precautions are not taken adequately. It should not be forgotten that such accidents can be prevented or reduced with the complete safety of the workplace and the use of appropriate equipment.

Nail puncture wound can occur in different parts of the body. According to the study of Patzakis et al, the most of injuries was on the foot and the most injured zone was Zone 1 in the hospitalized patients with the penetrating injury (2). On the other hand, in the study of Mark et al, they found that the most injured area was Zone 3 in children with

**Table 2:** Risk Distrubition of patients’.

Distrubition of patients		Total number of patients	High risk patient group (%)	Low risk patient group (%)
Gender	Male	79 (74,5)	52 (49)	27 (25.5)
	Female	27 (25,5)	3 (2.9)	24 (22.6)
Occupation	Construction worker	31(29.2)	31(29,2)	0
	Employee	24 (22,6)	14 (13,2)	10 (9,4)
	Unemployed	24 (22.6)	0	24 (22,6)
	Student	15 (14,2)	0	15(14,2)
	Agricultural worker	10 (9,4)	10 (9,4)	0
	Officer	2 (1.9)	0	2(1,9)
	Area where the injury occurred	Agricultural area	10 (9,4)	10 (9,4)
	Construction areas	31 (29,2)	31 (29,2)	0
	Workplaces	14 (13,2)	4 (3,7)	10 (9,4)
	Indoors area	10 (9,4)	0	10 (9,4)
	Roads	9 (8,6)	9 (8,6)	0
	Factories	1 (1)	1 (1)	0
	Personal gardens	31(29,2)	0	31 (29,2)
Foot Injury Zone	Zone 1 (%)	62 (68)	31 (34)	31 (34)
	Zone 2 (%)	20 (22)	12 (13,2)	8 (8,8)
	Zone 3 (%)	9 (10)	47 (51,6)	5 (5,6)
Total number of patients		106 (100)	55 (51,9)	51 (48,1)

plantar punctures injuries (1). In the study of Laughlin et al, Zone 1 was found the most injured area in the pediatric patients with infected foot wound (3). According to our study, the foot was the most injured area in both HRP and LRP groups. This reason might be in order that the foot sole was the most affected area by the scattered nails. The studies carried out that the complications of the foot injury were mostly common in Zone 1 (2). The incidence of injury in our study was the same as the region with the highest incidence of complications in the literature. Failure

to use personal protective equipment can result in deeper injury and increased serious complications, especially in foot sole injuries. Depending on body weight, the risk of complications may increase, since the penetrating effect is more in foot sole injuries. In the study of Patzakis et al, complications were found the highly in the patients who wore tennis shoes among hospitalized patients (2). In the study of Rubin et al., no significant difference was found in complications of patients wearing rubber-soled shoes (11). In the study of Siu et al., sole injuries were



**Figure 1:** A 7-year-old girl who admitted to our ED with a nail puncture injury



**Figure 2:** A 60-year-old female patient who admitted to our ED with nail puncture injury.

most common in patients who wore sport shoes and non-protective shoes (10). In our study, we could not obtain data on the follow-up of the patients. This is a limiting factor for our study.

**Limitations**

Our study was designed retrospectively. We could not follow up the wounds of the patients, and we could not reach data on this. Therefore, we could not obtain

information about the healing process and complications.

**CONCLUSION**

Nail puncture wound were most common in men, middle-aged and on the foot. Zone 1 injuries were the most common injuries of the foot. According to our study, HRP group did not use protective shoes and equipment at work, and low-risk patients did not comply with environmental and personal protection measures.

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