Clinical and Prosthetic Features of Female Patients with Acquired Amputation

Edinilmiş Amputasyonu Olan Kadın Hastaların Klinik ve Prostetik Özellikleri

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ABSTRACT Objective: Limb loss frequently leads to permanent disability and the information on the characteristics of female amputees is inadequate. This paper the clinical and demographic features of female patients with limb loss to assist the preventive studies. **Material and Methods:** Patients admitted to the rehabilitation center for prosthesis are included to this retrospective study. A chart review was performed to identify clinical and prosthetic data including the age (current and at the time of injury), time since injury, etiology, amputation side and level and currently used prosthetics type. **Results:** Evaluation was made 55 female patients with loss of 62 limbs. Amputations was most frequently observed between 21-30 years (25.5%). The lower limb amputation was more than the upper limb amputation (43 vs 13). 41 of 62 amputations were at the transtibial or transfemoral levels (25 and 16 amputations, respectively). Amputations due to trauma was accounted for the vast majority (61.8%). The primary mechanisms of traumatic injury were pedestrian (29.1%) and road traffic accidents (18.2%). %). The leading cause of non-traumatic amputation was vascular disease (20%), followed by infection (10.9%). The modular transtibial prosthesis (35.4%) and the myoelectrically-controlled arm prosthesis (17.7%) were the most commonly used type among female patients. **Conclusion:** The majority of the amputations were caused by preventable conditions. Therefore, to reduce the prevalance of limb loss public education, increased awareness of potential causes and the enforcement of overall safety regulations must be public awareness about patential amputation should be increased and general safety regulations should be applied.

Key Words: Amputation; rehabilitation; artificial limbs; female

ÖZET Amaç: Ekstremite kaybı sıklıkla kalıcı dizabiliteye neden olur ve kadın amputelerin özellikleriyle ilgili veriler yetersizdir. Bu çalışmada bayan ampute hastaların klinik ve demografik özellikleri sunularak amputasyonu önleyici çalışmalara yardımcı olmak amaçlanmıştır. **Gereç ve Yöntemler:** Bu retrospektif çalışmaya rehabilitasyon merkezine protez için başvuran hastalar alınmıştır. Yaş (şimdiki ve olay zamanındaki), olay sonrası geçen süre, etyoloji, amputasyon tarafı ve seviyesi ile şu anda kullanmakta oldukları protez tipleri gibi klinik ve prostetik verilere ulaşabilmek için dosya taraması yapılmıştır. **Bulgular:** Toplam 55 hastanın 62 amputasyonu değerlendirmeye alındı. Amputasyonun en sık gözlendiği yaş grubu 21-30 yaş (%25,5) idi. Alt ekstremite amputasyonları üst ekstremiteden daha fazlaydı (43/13). 62 amputasyonun 41'inde seviye transtibial ve transfemoraldi (sırasıyla 25 ve 16 amputasyon). En sık amputasyon nedenlerini travma kaynaklı amputasyonlar oluşturmaktaydı (%61,8). Yaya (%29,1) ve araç kazaları (%18,2) travmatik nedenlerin önde gelen iki sebebiydi. Non-travmatik amputasyonların en sık görülen tipleri damar hastalıkları (%20) ve infeksiyondu (%10,9). Modüler diz altı protezi (%35,4) ve myoelektrik kontrollü üst ekstremite protezleri (%17,7) en sık kullanılan protez tipleriydi. **Sonuç:** Amputasyonların büyük çoğunluğu önlenebilir nedenlerden kaynaklanmaktaydı. Bu yüzden, ampute sıklığını azaltmak için eğitim ile potansiyel amputasyon nedenleri hakkında bilinçlilik arttırılmalı ve genel güvenlik düzenlemeleri uygulanmalıdır.

Anahtar Kelimeler: Ampütasyon; rehabilitasyon; yapay uzuvlar; kadın

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Acquired limb loss is a potentially devastating experience in a person's life and has an extensive impact, resulting in profound physical, psychological, and vocational consequences.[1] The incidence of amputation is about 20 per 100,000 and the number of amputations performed has been increasing worldwide.[2,3]

Limb amputation is not only a loss of physical integrity, but it also deeply affects an individual's mental and social well-being and is a significant problem, especially for the young and for the working population.[4] Democratic improvements, rapid social change and industrialization have given women more in social life than the home and this has also brought women to an indispensable economic position. Establishing the future trends of female patients with acquired amputation is important for health care planning, rational allocation of resources and preventive efforts.

The causes and features of limb amputation and distribution of the currently used prosthesis types in female amputees have not been extensively studied in Turkey. Due to the necessity of concentrating on the causes, results and implementation of preventive measures in order to avoid amputations, the primary aim of this study was to report the demographics and clinical features of acquired amputations in a female population admitted to a tertiary rehabilitation center. In addition, a further aim of the study was to report the currently used prosthesis types for women in order to assist future studies which will concentrate on prosthesis-related issues and prosthetic improvement.

MATERIAL AND METHODS

This study was designed as a retrospective case series to investigate the clinical and prosthetic features of the female population with limb loss. The cases for study were selected from a search of the computerized database of admissions to a single tertiary rehabilitation center in the period January 2011 to May 2015. Females with acquired amputation were included. Exclusion criteria were congenital limb deficiency, partial foot, hand or finger loss and any missing data from medical records.

The study protocol was approved by the Gülhane Training and Reseach Hospital Ethics Committee (170/2015). A chart review was performed by one of the authors (YD) to identify clinical and prosthetic data including the age (current and at the time of injury), time since injury, etiology, amputation side and level and currently used prosthesis.

Age at the time of amputation was divided into 6 groups: 0-10, 11-20, 21-30, 31-40, 41-50 and over 51 years. Upper limb amputations were classified as wrist, transradial (or below-elbow), through elbow, transhumeral (or above-elbow) and shoulder. Lower limb amputations were classified as syme, transtibial (or below-knee), through knee, transfemoral (or above-knee) and hip. Causes were detailed as pedestrian accident, road traffic accident, diabetes mellitus, other vascular conditions, infection/osteomyelitis, gunshot, industrial injury, railway accident, malignancy, crush-not industrial, adult Still's disease and stabbing and then evaluated in four main categories: traumatic, vascular, infection and other. Currently used prostheses were grouped into eight categories: Modular prosthesis (hip, transfemoral, knee, transtibial, transhumeral, transradial), microprocessor-controlled knee prosthesis and myoelectrically-controlled arm prostheses.

Statistical analysis was performed using SPSS v.15.0 for Windows (SPSS, Inc., Chicago, IL, USA). Categorical variables were shown as percentage and frequencies. Continuous variables were presented as mean ± standard deviation and range (min.-max.). Differences between groups were determined via the Mann-Whitney U test. For all statistical tests, a value of $p<0.05$ was considered statistically significant.

RESULTS

Evaluation was made of 55 female patients with a total loss of 62 limbs. The mean age at the time of amputation was 26.9±19.4 years (range, 4–84 years). Amputations were most frequent in the age group 21-30 years (25.5%). Patients aged below 31

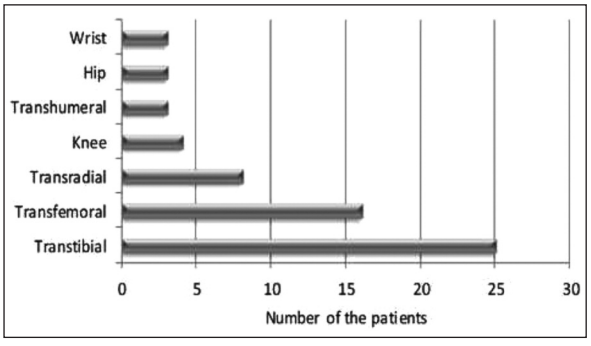

FIGURE 1: Amputation level of the patients.

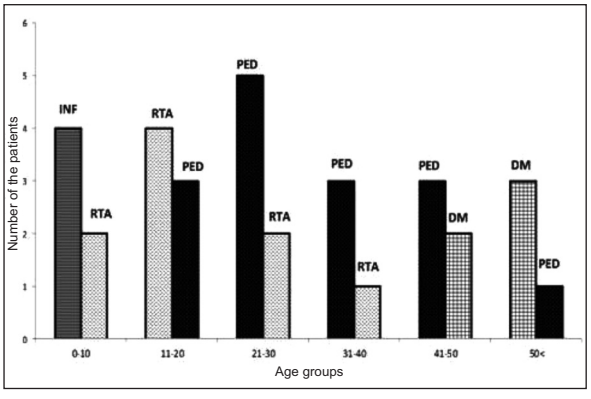

FIGURE 2: Etiological comparison by age groups.

years accounted for 67.3% of all amputations. Patients reported having limb loss for a mean duration of 123.5±149.1 weeks (range, 2 - 600 weeks).

The lower limb was amputated more than the upper limb (43 vs 13 amputations). Of patients with limb loss, 90.9% (50/55) had a single limb amputation and 9.1% had multiple limb amputations. 41 of 62 amputations were at the transtibial or transfemoral levels (25 and 16 amputations, respectively)(Figure1).

Amputations due to trauma accounted for the vast majority (61.8%). The primary mechanisms of traumatic injury were pedestrian (29.1%) and road traffic accidents (18.2%). The leading cause of amputation was trauma in all age groups except those aged 0-10 years and over 50 years (Figure 2). The most common cause of multiple amputations was road traffic accidents (40%). The leading cause of non-traumatic amputation was vascular disease (20%), followed by infection (10.9%) Cases of amputation caused by vascular disease tended to increase along with the increase in age (Figure 2). All causes of subsequent amputation are shown in Figure 3.

The mean age at the time of injury due to traumatic, vascular, infectious and other causes were 25.2±16.5, 47.1±22.4, 18.3±20.8 and 15.1±6.3 years, respectively. There was a statistically significant difference among these groups with respect to mean age at the time of injury ($p<0.05$).

The modular transtibial prosthesis was the most commonly used type among female patients (35.4%). The myoelectrically-controlled arm prosthesis was the leading type in female patients with upper extremity amputations (17.7%). All types currently used by female amputees are shown in Table 1.

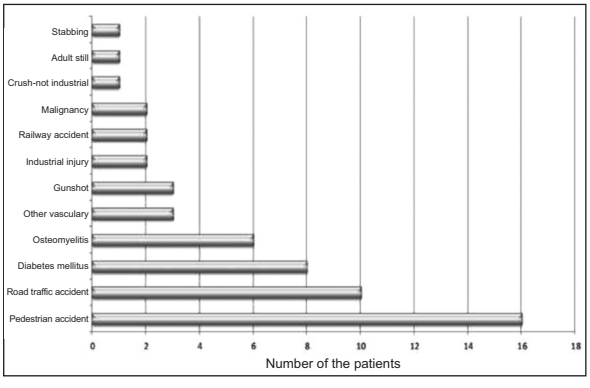

FIGURE 3: Distribution of the etiology.

TABLE 1: Types of currently used prosthesis in female patients.

	n (%)
Modular prosthesis-transtibial	22 (35.4)
Microprocessor-controlled knee prosthesis	13 (20.9)
Myoelectrically-controlled arm prostheses	11 (17.7)
Modular prosthesis-transfemoral	9 (14.5)
Modular prosthesis-hip	3 (9.7)
Modular prosthesis-transradial	2 (3.2)
Modular prosthesis-knee	1 (1.6)
Modular prosthesis-transhumeral	1 (1.6)
Total	62 (100)

DISCUSSION

This work was performed to provide a comprehensive view of basic clinical and prosthetic characteristics of female patients due to their essential role in the community. Most of the patients were adolescents and adults below the age of 31 years, a time of vigorous physical and social activity. The leading reason for amputation was motor vehicle accidents (pedestrian or road traffic accidents). Diabetes mellitus and infection were the most common causes of the non-traumatic amputations. Modular transtibial prosthesis and myoelectrically-controlled arm prosthesis were the most commonly used devices among female patients.

As the incidence of limb amputation in female patients is increasing and an amputation is still a major health issue, preventive efforts are of paramount importance.[5] There are multiple mechanisms of amputation such as diabetic or non-diabetic peripheral vascular diseases, trauma, infection and malignancy. The etiologies of amputation may vary in different countries and regions.[6] In developed countries, studies have shown that diabetic amputations were the most common etiology of amputation in female patients.[5,7,8] However, trauma, especially motor vehicle accident, was the leading etiological factor among female amputees in the current study. This is understandable when the high number of motor vehicle accidents in the country is considered. Public education, campaigns to increase awareness and enforcement of overall safety regulations have to be applied to achieve a decrease in the number of amputations related to motor vehicle accidents. Education programs should include first aid, the necessity of seat belts, the dangerous consequences of driving fast, selecting tires compatible with seasonal weather conditions. There also has to be an implementation of tighter controls on the obtaining of a driving license without bending the rules, improving and modification of road and streets prone to accidents and more severe laws and penalties for pedestrian accidents to reduce limb loss associated with motor vehicle accidents in Turkey.

More than 90% of amputations in developed countries are the result of vascular problems.[9] Increase in the incidence of amputations due to vascular diseases has been reported previously.[7] Some conditions such as diabetes, smoking, hypertension, and hypercholesterolemia have been documented as risk factors for amputation due to vascular diseases.[10,11] Approximately 64% of all amputations are a result of dysvascular disease in adults aged 65 years or older.[7] Moreover, it is estimated that the prevalence of diabetes in the United States will have doubled by the year 2030.[12] In the light of this information it could be concluded that the number of diabetic amputations will increase in the future unless preventive steps are taken. Unlike in developed countries, diabetic and non-diabetic vascular conditions were not the leading cause of acquired amputation among female patients in Turkey. In spite of these results, vascular diseases should not be underestimated. Preventive measures should be implemented including diabetes self-management education and targeted foot screening programs, which have been reported to be effective in reducing the risk of foot ulcers and related amputation since the majority of vascular lower limb amputations are initiated by a foot ulcer.[13-19]

It has been shown that women are less likely to be successfully fitted with a prosthetic limb than men.[8] It has also been reported that more women with amputation lived alone. It can be concluded therefore, that more women need social support and resources. Modular transtibial prosthesis and myoelectrically-controlled arm prostheses were the most commonly used devices among female patients in the current study. To know the currently used prostheses or trends in prosthetic device choice, may be helpful in determining and resolving prosthesis-related issues.

As this was a retrospective study, missing data is to be expected. If this were not the design, it might have been possible to demonstrate additional important details, such as newly-developed complications, prosthetic satisfaction and usage frequency, and the need for a new prosthesis.

CONCLUSION

Most of the female amputee patients were adolescents and adults below the age of 31 years, who were actively involved in the economic and production sectors of society. The majority of the amputations were caused by preventable conditions. Therefore, public education, an increased awareness of potential causes and the enforcement of overall safety regulations must be applied in order to reduce the prevalence of limb loss.

Conflict of interest

There are no conflicts of interest that authors are aware of.

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