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Clinical and demographic characteristics of patients with lower limb amputation

Alt ekstremite amputasyonu olan hastaların klinik ve demografik karakteristikleri

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Abstract

Aim: Lower limb loss affects an individual's ability to stand, transfer, and ambulate. The aim of this study is to assess clinical and demographic characteristics of patients with lower limb amputation.

Materials and Methods: Our study is a retrospective cohort study. 836 patients with lower limb amputation applied to our hospital between January 2012 and May 2013 were included in this study. Demographic and clinical characteristics of patients were reviewed and saved from patient's folder. Descriptive variables were shown as mean±standard deviation (min–max). And categorical variables were shown as the number of cases (n%). SPSS software Version 15.0 was used in the evaluation of the data.

Results: The mean age of total 836 lower limb amputees was 36.12±11.69 years (9-78). The percentage of unilateral amputation was 770 (92.3%) and bilateral lower limb amputation was 59(7.1%). According to the level of amputation, 456 (54.5%) of the patients had unilateral above-knee, 236 (28.3%) had unilateral below-knee amputation. For etiology, we found that 373 (44.6%) of them were traffic accidents, 103(12.5%) occupational accidents. The majority of patients 456 (54.5%) were ambulated microprocessor-controlled above-knee prosthesis and then below-knee prosthesis with active vacuum system 224 (26.7%).

Conclusion: Although trauma is recognized to be the most common cause of amputation among applying amputees, we think that those amputees do not reflect the general profile in our country but that it is instructive with regard to the features of amputees. This data is important for the community rehabilitation of amputees and the development of new prosthetics.

Keywords: Lower limb amputation, demographic characteristics, prostheses.

Öz

Amaç: *Alt ekstremitenin kaybı bireylerin ayakta durma, transfer yeteneklerini ve ambulasyonunu etkiler. Bu çalışmanın amacı, alt ekstremite amputasyonu olan ve hastanemize başvuran hastaların klinik ve demografik karakteristiklerini belirlemektir.*

Gereç ve Yöntem: *Çalışmamız retrospektif bir kohort çalışmasıdır. Çalışmaya Ocak 2012-Mayıs 2013 arasında hastanemize başvuran ve alt ekstremite amputasyonu olan hastalar dahil edildi. Hastaların dosyaları gözden geçirildi, demografik ve klinik karakteristikleri kaydedildi. Tanımlayıcı değişkenler ortalama ve standart sapma (min-max), kategorik değişkenler n (%) olarak verildi. Veriler SPSS 15.0 kullanılarak analiz edildi.*

Bulgular: *Toplam 836 alt ekstremite amputasyonu olan hastaya ait ortalama yaş 36,12±11,69 (9-78) idi. Hastaların 770'i (%92.3) ünilateral, 59'u (%7,1) bilateral ampute idi. Amputasyon seviyesine göre hastaların 456'sı (%54,5) unilateral diz üstü, 236'sı (%28,3) unilateral diz altı amputasyonu idi. Etiyoloji; 373 (%44,6) hastada trafik kazası, 103 (%12,5) hastada iş kazası idi. Hastaların çoğunluğu 456 (%54,5) mikroişlemci kontrollü dizüstü protezi ile, takiben 224'ü (%26.7) aktif vakum sistemli dizaltı protezi ile ambule idi.*

Sonuç: *Çalışmamızda amputasyonla başvuran hastalar arasında en yaygın sebebi travma olarak saptamamıza rağmen, bu amputelerin ülkemizdeki genel profilini yansıtmadığını düşünüyoruz. Ancak çalışmamız ampute hastaların demografik ve klinik özelliklerini belirlemek açısından yol gösterici olmuştur. Bu veriler ampute hastaların toplumsal rehabilitasyonu ve yeni protezlerin geliştirilmesi açısından önem arzetmektedir.*

Anahtar Sözcükler: *Alt ekstremite amputasyonu, demografik karakteristikler, protez.*

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Introduction

Although advances in industry, technology and medicine, amputation is still an important source of disability. Lower limb loss affects an individual's ability to stand, transfer, and ambulate. Rehabilitation programs and prosthesis options after amputation provide regaining functionality back and emotional recovery. Advances in technology, materials and prosthetic components have had a considerable positive impact on the quality of life of individuals with lower limb amputation. Recent advances in prosthesis technology area in the last decade have occurred mostly in prosthesis socket production and improved prosthesis components that replace the functional loss (1-4).

Micro-processor controlled prostheses are high technologic prostheses. When these types of prostheses are examined; according to various amputation level, swing phase and/or stance phase may be micro-processor controlled jointed/mechanically controlled jointed/hydraulic controlled jointed/pneumatic controlled jointed. At the same time, many prostheses combined with systems such as active vacuum system / passive vacuum system / low distal vacuum system / silicon liners with lock system / silicon liners without lock system have been developed (5). And high technological prostheses continue to develop rapidly.

The aim of this study is to determine clinical and demographic characteristics of lower limb amputees who applied one of the largest national rehabilitation center.

Materials and Methods

Lower limb amputees applied to our hospital between January 2012 and May 2013 were included in this study. Data were collected from patient's folder.

We recorded patients' demographic characteristics (mean age, gender, time since amputation) and clinical features (amputation etiology, amputation level), types of prostheses, functional activity levels (K Level or Medicare Functional Classification Level) (6,7). In this classification;

K0: This patient does not have the ability or potential to ambulate or transfer safely with or without assistance, and a prosthesis does not enhance his/her quality of life or mobility.

K1: The patient has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of the limited and unlimited household ambulator.

K2: The patient has the ability or potential for ambulation with the ability to traverse low-level environmental barriers such as curbs, stairs, or uneven surfaces. Typical of the limited community ambulator

K3: The patient has the ability or potential for ambulation with variable cadence. Typical of the community ambulator who has the ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic utilization beyond simple locomotion.

K4: The patient has the ability or potential for prosthetic ambulation that exceeds basic ambulation skills, exhibiting high impact, stress, or energy levels. Typical of the prosthetic demands of the child, active adult, or athlete (2,6,7).

Furthermore, the patients are separated into four groups according to their ages as younger than 18 years old, between 19-44 years old, between 45-64 years old, and older than 65 years old. Amputation levels and amputation causes were also assessed in those groups. SPSS software Version 15.0 (SPSS Inc., Chicago, IL, USA) was used in the evaluation of the data. When analyzing the data, frequencies (number, percentage) have been obtained for the categorical variables and, descriptive statistics (mean± standard deviation, min-max) have been obtained for the numeric variables.

Results

A total of 836 lower limb amputees were included the study. Demographic findings, amputation sides, amputation levels are shown in Table-1.

Table-1. Clinical and Demographic Characteristics of the Lower Limb Amputees.

Mean age (min 9-max 78)	36.12±11.69
Time since amputation (days)	180.15±127.73
Gender	n%
Female	107 (12.8%)
Male	729 (87.2%)
Unilateral LL amputation	92.3%
Bilateral LL amputation	7.1%
Amputation side	
Right	372 (44.5%)
Left	388 (47.6%)
Bilateral	59 (7.1%)
Amputation level	
Unilateral above-knee	54.7%
Unilateral below-knee	28.3%
Unilateral knee disarticulation	10.1%
Unilateral hip disarticulation	2.8%
Bilateral below-knee	1.2%
Above-knee / knee disarticulation and contralateral below-knee	1.2%
Bilateral knee disarticulation	1%

Distribution of lower limb amputees according to etiologic factors is shown in Table-2.

Table-2. Distribution of lower limb amputees according to etiologic factors.

Amputation Etiology	n %
Traffic accidents	44.6
Occupational accidents	12.5
Malignancy	9.3
Congenital defects	8.7
Gunshot wounds	6.2
Electrical contact injury	3.4
Peripheral vascular disease	3.2
Explosion of mines	3.1
Infection	2.0
Earthquake	1.7
Diabetes mellitus	1.0

Figure-1 demonstrates distribution of the amputation levels with regard to ages.

Distribution of the amputation causes according to age groups are shown in Figure-2.

According the age groups, there were 50 (6%) patients under 18 years old, 576 (68.9%) patients in 19-44 years old, 193 (23.1%) patients in 45-64 years old and 7 (0.8%) patients over 65 years old. The etiologic factors of amputation according to age groups were as follows: congenital defects were the major cause for patients under 18 years old 19 (39.6%) and traffic accidents were the second most common cause 13 (27.1%). For patients between 19-44 years old, traffic accidents were the most common cause for amputation 253 (45.3%) and the second cause was occupational accidents 68 (12.1%). For patients between 45-64 years old, traffic accidents were the major cause of amputation 90(48.1%), and occupational accidents 33 (17.6%). For patients older than 65 years old, traffic accidents 3 (42.9%), DM 2 (28.6%) and infection 2 (28.6%) were the major causes of amputation respectively (Figure-2).

When the amputees are evaluated according to the functional activity K level classification; 132 (15.8%) of total amputees had K3 activity levels. They were able to actively ambulate in the community and most of them had a job. 704 (84.2%) of total amputees had K4 activity levels. They were able to actively community ambulation and most of them had in a job and/or participated in some sporting activities.

When patients' previous prosthesis are evaluated; a) Mechanic modular prosthesis were the most common type of prosthesis 251 (72.1%), b) The second most common type was the modular prosthesis with silicone liner pin system 51 (14.7%) c) Mechanic prosthesis. When patients' current prosthesis are evaluated; a) The majority of the prosthesis were MPC above-knee prosthesis 456 (54.5%), b) 224 (26.7%) were below-knee prosthesis with active vacuum system, c) 60 (7.2%) were MPC knee disarticulation prosthesis, d) following those, hip disarticulation prosthesis with MPC knee joint 21 (2.5%), d) 71 (8.6%) were below-knee and/or knee disarticulation prosthesis with hydraulic controlled jointed/ pneumatic controlled jointed and/or passive vacuum system/ silicon liners with lock system, e) 4 (0.5%) were Syme prosthesies given to patients with foot/ankle disarticulation.

The major reason for a request of replacement of lower limb amputees was wearing out and expiration of the using period of prosthesis (62.9%). Then, 36.9% of the requests for replacement were becoming worn out before expiration period and insufficiency of the prosthesis in activities of the daily life.

Regarding to the evaluation performed with respect to Turkey's regions, it is determined that 420 (50.3%) of the amputee applied from the Inner Anatolian region in which our hospital resides, 138 (16.5%) applied from the Aegean region, 99 (11.9%) from the Mediterranean region, and 78 (9.3%) from the Marmara region, 46 (5.5%) from the Blacksea region, 33 (3.9%) from the Eastern Anatolian region and 22 (2.6%) from the Southeast Anatolian region.

Discussion

Although trauma is recognized to be the most common cause of amputation among applying amputees, we think that those amputees do not reflect the general profile in our country. It is known that the most common cause of lower extremity amputation is peripheral vascular diseases and/or diabetes mellitus (DM) (3).

Vaz et al. determined the mean age of the patients as 67.6±12.7 years (8). AlSofyani et al. (9) found the mean age as 63.3±17.4 years. In the study of Kauzlaric et al. (10) they determined that mean age was 62 years. Mean ages of these studies seem consistent. Mean age of our patients was 36.12±11.69 years, and it can be explained by the fact that our patients are younger, the demand of younger patients for new technology prosthesis, and the fact that the Social Security Institution pays the new technology prosthesis depending on many conditions such as age, no complications, active employee and student.

In a socio-demographic study with 1538 amputees by Pezzin et. al., 935 amputees between ages 18-86 years old were searched for prosthesis satisfaction (11). The mean age was 50 years in that study whereas in our study the mean age was 36. Note that our youngest patient's age was 9. Another reason for the discrepancy may be the maximum life span differences between the two countries.

Aydemir et al. (12) has assessed 147 amputees at Armed Force Rehabilitation Center in Turkey. They determined the mean age of the patients as 32.0±6.4 years. Yaşar et al. (13) determined that the mean age was 23.48±6.04 years. They had assessed 382 soldier and 17 civilian amputees. These studies are similar to ours as the age group is young. However, we think that

this is due to the fact that these two studies were carried out at Armed Forces Rehabilitation Center.

Vaz et al. (8) has assessed 39 amputees in Portugal in which there were, 7 (17.9%) female and 32 (82.1%) male patients. AlSofyani et al. (9) has assessed 121 patients in Saudi Arabia. There were 37 (30.6%) female and 86 (69.4%) male patients in this study. Raichle et al. (14) has evaluated 752 amputees and there were 210 (27.9%) female and 542 (72.1%) male patients. We determined 107 (12.8%) female and 729 (87.2%) male patients in our study. Our percentages are closer to the percentages of Vaz et al (8). We think that the rate of amputation in males is higher because of both traffic and work accidents are more frequent in males. In our opinion, due to the low level of economic independence and education in female, the rate of work accidents and traffic accidents is low and therefore amputation rate is low. However, we should keep in mind that these ratios may not reflect the general average of society.

Aydemir et al. (12) determined that 2 (1.4%) female and 145 (98.6%) male patients in their study. There were 1 (0.3%) female and 398 (99.75) male patients in the study of Yaşar et al (13). We think that the number of female is very small due to the fact that these two studies were carried out in military hospitals.

Vaz et al. (8) examined the amputation etiology and determined that there were 92.3% vascular disease, 5.1% bone tumor, 2.6% enfection. When AlSofyani et al. (9) evaluated the patients' etiology, they found that 63.6% DM, 16.5% periferal vascular disease, 7.4% trauma, 7.4% lower extremity cancer, 1.7% cronic osteomyelitis, 1.7% skin breakdown, 0.8% sistemic sepsis, 0.8% local important enfection (9). Kauzlaric et al. (10) detected that there were 48.9% DM, 27.1% periferal vascular disease, 11.3% trauma, 7.3% DM + periferal vascular disease, 3.2% osteomyelitis, 2.3% tumor in etiology, respectively. Raichle et al. (14) determined that 4.3% tumor, 16.1% DM, 22.3% vascular disease (non-DM), 53.5% injury, 3.1% congenital, 20.9% gangrene (14). We found that the etiology 44.6% traffic accidents, 12.2% occupational accidents, 9.1% malignancy, 8.5% congenital defects, 6.1% gunshot wounds, 3.3% electrical contact injury, 3.1% peripheral vascular disease, 3.0% explosion of mines, 1.9% Infection, 1.7% earthquake, 1.0% DM, 1.7% falling, gas explosion 0.7%. In our study, the percentage of DM and peripheral vascular disease was found to be very low in the etiology. However, traffic accidents and occupational accidents constitute the greatest percentage of amputation etiology in our study. This suggests that occupational safety and traffic safety system is not sufficient, but it is not a prevalence study related to occupational accident and traffic accidents. We believe that multicentre prevalence study should be conducted in this regard and that necessary precautions should be taken.

Aydemir et al. (12) they determined that 68% mine, 19% gunshot, 4.1% rocket, 4.1% road traffic accident, 2.7% electrical injury, 1.4% pedestrian vs. car accident, 0.7% railway accident in the amputation etiology. Yaşar et al. (13) found that 92.7% mine, 4.5% trafik accident, 1.5% electrical burn, 0.8% freezing, 0.5% earthquake. As the rate of mine explosion is high, the results of the two studies are similar. And we think it's about having military hospital data.

Aydemir et al. (12) found 91.2% unilateral and 8.8% bilateral amputees (12). Yaşar et al. (13) determined 86.7% unilateral, 13.0% bilateral amputees (13). We encountered 92.3% unilateral and 7.1% bilateral amputees, and our findings seem consistent.

In the study of Vaz et al. (8), the amputation levels of the patients were 59% above-knee, 25.6% below-knee and 15.4% foot amputation. Alsofyani et al. (9) determined the amputation level as 49.6% above-knee, 50.4% below-knee. Aydemir et al. (12) found that 21.8% above-knee, 59.3% below-knee, 9.3% knee, 5.6% hip, 3.7% ankle(syme) amputation (12). Yaşar et al. (13) detected amputation level as 14.6% above-knee, 50.77% below knee, 11.25% chopart amputation, 4.6% syme, 4.4% knee disarticulation, 1.1% hip disarticulation, 0.2% hemipelviectomy. Our findings are 54.5% unilateral above-knee, 28.3% unilateral below-knee, 10.0% unilateral knee disarticulation, 2.8% unilateral hip disarticulation, 1.2% bilateral below-knee, 1.7% above-knee/knee disarticulation and contralateral below-knee, 1% bilateral knee disarticulation and foot/ankle disarticulation 0.5%. Our findings seem similar with the study of Vaz et al. (8).

In comparison with the studies of Aydemir et al. (12) and Yaşar et al. (13) in our country; the high rate of below-knee and foot/ankle amputees in their study may still be related to military hospital characteristics. Mine explosion injuries in soldiers cause more below-knee and foot/ankle amputation. The high rate of above-knee amputees in our study may be related to the development of high technology micro-processor controlled knee jointed prosthesis and the fact that our patients are mostly younger and active patients and therefore more likely to have applied for this prosthesis. Our hospital is a national rehabilitation center and the referee hospital status where the prosthesis approval. We think that the prosthesis with micro-processor controlled knee joint of patients who are coming our hospital for approval explain to the percentage of patients with above-knee amputation and knee disarticulation is high.

The incidence of lower limb amputation depends partially on age distribution and geography. In a prospective

study from Netherlands including 191 lower limb amputees by Pernot et al. (15), they found that 13.1% of the amputee patients were above 65 years old and the major cause of amputation was vascular diseases. The transtibial level was the most common injury level. In another study with one-year follow up with amputees by Kauzlaric et al. (10), the mean age of the patients was 62, DM and obstructive vascular diseases were the most common causes of amputation, trauma was the second cause. In our study, traffic accidents were the main cause of amputation for patients above 65 years and disvascular causes like DM were the next cause. Besides, we also found that transtibial amputation was the most common injury level in this age group, which was in concordance with the study by Pernot et al. (15) (Figure-1).

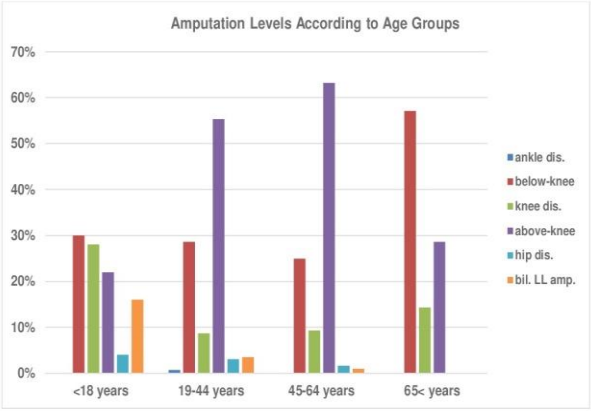

Figure-1. Distribution of amputation levels according to age groups.

In the study of Pezzin et al. (11), the etiologic factors of amputation according to ages were as follows: Malighnancy for patients younger than 18 years old, trauma for patients between ages 19-44, vascular problems for patients between ages 45-64, and also for patients above 65 years old (11). In our study, congenital defects were the major cause for patients under 18 years (39.6%) and traffic accidents were the second most common cause. For patients between 19-44 years old, traffic accidents were the most common cause for amputation (45.3%) and secondly occupational accidents (12.1%). For patients between 45-64 years old, traffic accidents were the major cause of amputation (48.1%), and then occupational accidents (17.6%). For patients older than 65 years old, traffic accidents (42.9%), DM (28.6%) and infection (28.6%) were the major causes of amputation respectively (Figure-2). In our study, traffic accidents were the most common etiology except patients under the age of 18 years old. Therefore, development of the traffic and road safety system is extremely important in our country.

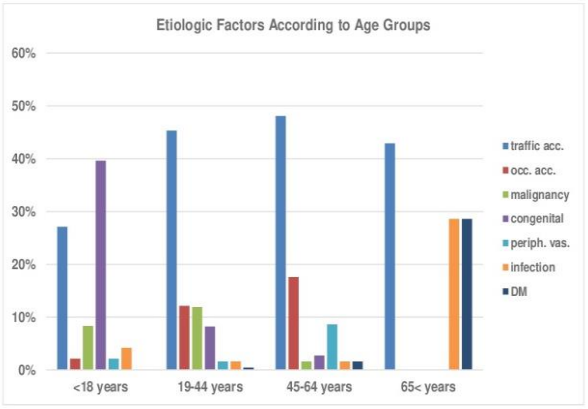

Figure-2. Distribution of etiologic factors of Lower Limb amputations according to age groups.

Conclusion

Although this study does not include all of the amputees in the country, the number of patients we have included is not small and we think that it is instructive with regard to the features of amputees. We think that comprehensive medical record systems concerning amputees need to be established. In that way, comprehensive epidemiologic studies can be performed. Rehabilitation programs to be implemented considering these characteristics, development of new technology prosthesis and community rehabilitation after amputation provide regaining functionality back and psychosocial recovery.

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Conflict of interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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