

The causes and levels of lower limb amputation in geriatric patients

 Sezai Ozkan,  Cihan Adanas

Department of Orthopedics and Traumatology, Faculty of Medicine, Van Yuzuncu Yil University, Van, Turkey

Copyright@Author(s) - Available online at www.annalsmedres.org

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



Abstract

Aim: Lower limb amputations (LLA) are considered as a serious psychosocial condition. The causes of amputation in young persons are generally trauma, work accidents, or tumors, while in geriatric patients, it is mostly vascular problems. The aim of this study is to determine the causes and levels of LLA of geriatric patients in a tertiary care center.

Materials and Methods: In order to conduct this study, information was obtained from the automation records of geriatric patients who underwent LLA in our clinic between the years 2014 and 2017. We divided our patients into three groups according to their ages. Group 1 consisted of those patients in the age group of 65-74 years, Group 2: 75-84 years, and Group 3: 84-95 years. We also classified our patients according to amputation causes and levels. We classified the patients as above-knee, transtibial, metatarsal, and toe amputation according to the level of lower extremity amputation.

Results: Of the 96 patients included in the study, 70 were male (72.9%), and 26 (27.1%) were female. Group 1 consisted of 45 patients, group 2 had 38 patients, and group 3 had 13 patients. It was observed that the most common cause of LLA was diabetic foot ulcers (65 patients), followed by ischemic foot as a cause of LLA in 25 patients. Moreover, 4 patients were amputated due to a tumor, while amputation was performed in 2 patients as a result of a crush injury. It was observed that metatarsal and toe amputation was the most common amputation type according to amputation levels. (26 patients)

Conclusion: As a result of our study, the most common cause of LLA in Geriatric patients was diabetic foot ulcers. Considering that lower extremity amputations cause severe morbidity and mortality in geriatric patients, it is crucial to identify these patients with preventive medicine practices.

Keywords: Amputation; diabetic foot; geriatric; level; lower limb

INTRODUCTION

Amputation can be defined as the removal of a body limb by surgery or trauma (1). Amputations are one of the most common acquired disabilities (2). It contributes to disability depending on the economic, social, and psychological effects on people as a result of the loss of any limb. Causes of limb loss are diverse and can be classified as related to congenital anomalies, trauma, infection, tumor, vascular disorders such as diabetes, and ischemia (3). Cardiovascular disease (CVD) and/or diabetes mellitus-induced dysvascularity are the leading cause of amputation in most developed countries, followed by trauma (4). In Western European countries, more than 90% of lower limb amputations (LLA) are due to peripheral artery disease (PAD) and diabetes mellitus (DM). LLA can be classified as major and minor amputations. Major amputations include those from the ankle to the more proximal of the limb. Compared with the major LLA and the small LLA, the rates of disability

and mortality were reported to be higher in major LLA. On average, the reported 1-year mortality ranged from 16-48%, while 47% of the patients were reported to have died in the first year after undergoing a major LLA (5-7). The causes and features of limb amputation should be thoroughly investigated. Knowing the distribution of these causes will be very helpful in planning future public health strategies in our country. The aim of this study is to identify the primary causes and characteristics of LLA of geriatric patients in a tertiary health center.

MATERIALS and METHODS

This study is about the causes and level of amputation, on the patients who underwent LLA, in our clinic between 2014 and 2017. We divided the geriatric patients into three groups according to their ages. Group 1 was between 65-75 years old; Group 2 was between 76-85 years old, and Group 3 was between 86-95 years old. The most common causes of LLA in the geriatric age group in our clinic were

Received: 19.05.2020 **Accepted:** 27.07.2020 **Available online:** 18.05.2021

Corresponding Author: Sezai Ozkan, Department of Orthopedics and Traumatology, Faculty of Medicine, Van Yuzuncu Yil University, Van, Turkey **E-mail:** doktorsezai@hotmail.com

diabetes, ischemia, crush injury, and tumor. The causes of amputation were recorded according to the age groups of the patients. In addition, considering the amputation levels of our patients, above-knee (transfemoral), transtibial, ankle, and metatarsal, or toe amputations were evaluated. Patients with a history of lower extremity amputation were not included in the study. Some of the patients that we performed LLA on did not participate in the follow-up examinations. These patients were also excluded from the study. This study was conducted with the approval of Van Yuzuncu Yil University non-interventional clinical research ethics committee dated 08.11.2019 / 16-02.

Our study was carried out after obtaining the ethical committee approval of our university clinical research board (Ethics committee number: 08.11.2019 /16-02)

Statistical Analysis

The differences between the groups were compared using the normal distribution values of the Student's t-test. A Chi-square test was used to compare categorical variables. Results were presented as mean and range. P <0.05 value was considered to be statistically significant. All analyses were performed using SPSS 11.0 version software (SPSS Inc., Chicago, IL, USA).

RESULTS

Of the 96 patients included in our study, 70 (72.9%) were male, and 26 (27.1%) were female. There were 45 patients in Group 1, 38 patients in Group 2, and 13 patients in Group 3. The demographic data of our patients are given in Table 1.

	Group 1	Group 2	Group 3	Total	P value
Count (%)	45 (46.9)	38 (39.6)	13 (13.5)	96(100)	
Male/Female Count	34/11	27/11	9/4	70/26	0.854
Mean age	68.9 ± 3.79	78.8 ± 3.01	88.4 ± 3.21		<0.001
Rigt/left side	19/26	21/27	5/8	45/51	0.942

	Above knee amp. Count (%)	Transtibial amp. Count (%)	Ankle amp Count (%)	Metatar or finger amp. Count (%)	P value
Group 1 (n=45)	8 (17.8)	10 (22.2)	1 (2.2)	26 (57.8)	
Group 2 (n=38)	8 (21.1)	12 (31.5)	0(0)	18 (47.4)	0.015
Group 3 (n=13)	8 (64.1)	3(21.2)	0(0)	2(14.1)	

In our study, it was observed that male patients were more than female patients. As can be seen in Table 1, it was observed that the left LLA (53.1%) incidences were more common than the right limb amputations (47.9%). Although there was no statistically significant difference in our patients who underwent right or left LLA, it was observed that there were higher incidences of left LLA procedure. The distributions of our patients, according to amputation levels, are given in Table 2.

When Table 2 was examined, it was seen that metatarsal or toe amputations were the most common amputation level, followed by transtibial and transfemoral amputations, respectively. The distributions of our patients, according to amputation reasons, are given in Table 3.

As it can be observed in Table 3, it can be said that the most common cause of amputations between groups was the diabetic foot with 65 patients. The number of patients amputated due to ischemia was 25, 4 patients were amputated due to tumors, and 2 patients were amputated as a result of a crush injury.

	Diabetic food Count (%)	Ischemic food (%)	Crush injury (%)	Tumor (%)	P value
Group 1 (n=45)	36 (80.0)	5 (11.1)	2 (4.4)	2 (4.4)	
Group 2 (n=38)	24 (63.1)	12 (31.6)	0 (0)	2 (5.3)	0.019
Group 3 (n=13)	5 (38.4)	8 (61.6)	0 (0)	0 (0)	

DISCUSSION

According to our study, it can be said that the most common cause of amputations in geriatric patients is vascular problems. Vascular problems, which is a significant complication of diabetes, are the most common cause of diabetic foot ulcers and LLA. Another finding of our study is that LLA incidences are more common in men. The main reasons may be that men have more smoking habits, more mobilization, and thus more exposure to infections. The number of amputations in Group 3, which is the older age group, was lower than the other groups. The main reason for this is that there are additional comorbid diseases, the high mortality rates after anesthesia, as well as the fact that individuals and their relatives do not accept amputation due to the short life expectancy. The main reason for this is that our amputation experience at this level is insufficient, and the risk of anesthesia is minimized so that the patient is not re-operated. Major amputations increase mortality in these patients.

Amputation is one of the most important problems in present society. A number of people have been amputated with one or two limbs, and this situation has increased worldwide (8). Individuals with amputations must adapt to various losses and changes in their lifestyle, social

interactions, and identities (9). It contributes to economic, social, and psychological disability as a result of the loss of any limb. The causes of limb loss are diverse and can be categorized in relation to congenital anomalies, trauma, infection, dysvascular, and tumor. Vascular-induced amputations typically occur after the development of diabetes or peripheral arterial disease (PVD). Dillingham et al. found that more than 74% of patients with dysvascular amputation were associated with diabetes. The co-existence of multiple comorbidities such as diabetes, peripheral vascular disease, and renal disease increases the risk of amputation. In Western European countries, more than 90% of the incidences of LLA are caused by peripheral artery disease and diabetes mellitus (10-12). According to the amputation cases data from the USA, 82% of them were reported to be associated with vascular causes, while 16% were related to traumatic causes. It has been reported that the majority of tumor-induced amputations occur in young adults under 30 years of age. Amputations caused by congenital anomalies are rare (13,14). The most common cause of amputation in our study is dysvascular and this finding is similar to the reports of the nationwide incidence from Taiwan (15). Peripheral vascular diseases (arteriosclerosis, thromboangiitis obliterans / Buerger, gangrene) are the most important causes of amputation in geriatric amputees, and most of them are accompanied by diabetes mellitus (16). Approximately 15% to 25% of diabetic patients develop foot ulcers throughout their lifetime, and diabetes is the most common cause of non-traumatic limb amputation in both developed and developing countries (17-19).

Loss of limb caused by cancer is less common than those of vascular and traumatic origin. Osteosarcoma and Ewing sarcoma are the most common bone malignancies that cause limb amputation. Cancer-related amputations usually occur in the lower extremities and occur in the form of below-knee or above-knee amputations (20,21).

The patients who were amputated after crush injury could not be reimplanted at the time of admission. If the MESS (Mangled extremity severity score) score is 7 and above, reimplantation is not recommended (22). Reimplantation could not be performed because the MESS scores of our patients were 10 points.

LIMITATIONS

Limitations of our study: The number of patients included in the study could have been higher. The fact that geriatric patients and their relatives do not accept amputation in our region may have partially affected our number of patients. It can also be questioned as to how many years the patients were diagnosed with diabetes mellitus. Thus, the relationship between the time of diagnosis of diabetes and the level of LLA could have been interpreted statistically.

LLA in geriatric patients is a significant psychosocial problem besides increasing morbidity and mortality. Early treatment and follow-up of diabetic foot wounds, which

are the most important cause of amputation in these patients, are extremely important. With the establishment of diabetic foot care centers in our country, we believe that these patients will significantly reduce lower extremity limb losses.

CONCLUSION

Our patients with diabetic foot wounds or ischemic foot try many treatment methods and spend time for treatment. When patients apply to our hospital, which is a tertiary care center for diabetes or ischemic foot wound care, there is necrosis in the toes or along the foot. (Wagner 4-5). Patients are evaluated according to the Wagner classification after foot examinations and wound cultures are taken. At this stage, the vascular blood supply of the lower extremities is evaluated by imaging methods such as MR (Magnetic Resonance), CT (Computed Tomography) angiography. Interventional radiological procedures are planned if there are obstruction and calcification in the femoral, popliteal, tibial arteries, or branches. If these procedures are not successful, the amputation of necrotic tissues is performed. The majority of the patients we included in the study were at the level of the toes or metatarsals according to the amputation levels. It can be said that we reduced our amputation levels thanks to the measures taken with diabetic food diet and chronic wound care. Having an experienced team in our clinic and a multidisciplinary approach to patients is partially important in obtaining these results.

Acknowledgment: We thank Dr. Hamit Hakan ALP for his statistical support and Dr. Remzi Erten for the article design.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: This study was conducted with the approval of Van Yuzuncu Yil University non-interventional clinical research ethics committee dated 08.11.2019 / 16-02.

REFERENCES

1. Wald J, Alvaro R. Psychological factors in work-related amputation: considerations for rehabilitation counselors. *J Rehabil* 2004;70:6-15.
2. Rybarczyk B, Edwards R, Behel J. Diversity in adjustment to a leg amputation: case illustrations of common themes. *Disabil Rehabil* 2004;26:944-53.
3. Dillingham TR, Pezzin LE, Mackenzie EJ. Racial differences in the incidence of limb loss secondary to peripheral vascular disease: a population-based study. *Arch Phys Med Rehabil* 2002;83:1252-7.
4. Perkins ZB, Yet B, Glasgow S, et al. Meta-analysis of prognostic factors for amputation following surgical repair of lower extremity vascular trauma. *Br J Surg* 2015;102:436-50.
5. Stern JR, Wong CK, Yerovinkina M, et al. A meta-analysis of long-term mortality and associated risk factors following lower extremity amputation. *Ann Vasc Surg* 2017;42:322-7.

6. Moxey PW, Gogalniceanu P, Hinchliffe RJ, et al. Lower extremity amputations – a review of global variability in incidence. *Diabet Med* 2011;28:1144-53.
7. vanNetten JJ, Fortington LV, Hinchliffe RJ, et al. Early post-operative mortality after major lower limb amputation: a systematic review of population and regional based studies. *Eur J Vasc Endovasc Surg* 2016;51:248-57.
8. Davie-Smith F, Paul L, Nicholls N, et al. The impact of gender, level of amputation and diabetes on prosthetic fit rates following major lower extremity amputation. *Prosthet OrthotInt* 2017;41:19-25.
9. Horgan O, MacLachlan M. Psychosocial adjustment to lower-limb amputation: a review. *Disabil Rehabil* 2004;26:837-50.
10. Unwin N. Epidemiology of lower extremity amputation in centres in Europe, North America and East Asia. *Br J Surg* 2000;87:328-37.
11. Moxey PW, Gogalniceanu P, Hinchliffe RJ, et al. Lower extremity amputations--a review of global variability in incidence. *Diabet Med* 2011;28:1144-53.
12. Lazlo G, Belicza E, Kullmann L. Lower limb amputations during 3 years in Hungary. *Arch Orthop Trauma Surg* 1999;119:94-7
13. Gailey R, Allen K, Castles J, et al. Review of secondary physical conditions associated with lower-limb amputation and long-term prosthesis use. *J Rehabil Res Dev* 2008;45:15-30.
14. Ephraim PL, Dillingham TR, Sector M, et al. Epidemiology of limb loss and congenital limb deficiency: a review of the literature. *Arch Phys Med Rehabil* 2003;84:747-61.
15. Chen SY, Chie WC, Lan C, et al. Rates and characteristics of lower limb amputations in Taiwan, 1997. *ProsthetOrthotInt* 2002;26:7-14
16. Esquenazi A. Geriatric amputee rehabilitation. *ClinGeriatr Med* 1993;9:731-43.
17. Boulton AJ. The diabetic foot: a global view. *Diabetes Metab Res Rev* 2000;16:2-5
18. Armstrong DG, Boulton AJM, Bus SA. Diabetic Foot Ulcers and Their Recurrence. *N Engl J Med* 2017;376:2367-75.
19. Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, et al. The global burden of diabetic foot disease. *Lancet (London, England)* 2005;366:1719-24.
20. Varma P, Stineman MG, Dillingham TR. Epidemiology of limb loss. *Phys Med RehabilClin N Am* 2014;25:1-8.
21. Nagarajan R, Neglia JP, Clohisy DR, et al. Limb salvage and amputation in survivors of pediatric lower-extremity bone tumors: what are the long-term implications? *J ClinOncol* 2002;20:4493-501.
22. Gormeli G, Gormeli CA, Karakaplan M, et al. The Amputation Indicated Extremity Can Be Recovered by Multidisciplinary Treatment: A Case Report and Review of Literature. *Medicine Science* 2015;4:2281-8.