



ORIGINAL PAPER

Characterization of SUS-treated amputees at the Itanhaém Municipal Rehabilitation Center from 2012 to 2020

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ABSTRACT

Introduction and aim. Analyzing the factors related to amputations and understanding which factors are changeable can assist in the development of public policies for the prevention and education of the population. Objective: To describe the main etiological characteristics and symptoms after amputation in the Unified Health System (Sistema Único de Saúde – SUS) patients in order to contribute to the information for treatment planning by the multiprofessional team for these patients.

Material and methods. Retrospective study from 2012 to 2020, evaluating data from all amputation cases seen at the Itanhaém Municipal Rehabilitation Service, SP.

Results. 76 cases were studied, mostly middle-aged men, Caucasian, smokers, hypertensive, type II diabetics, some with dyslipidemia, cardiopathies, and the main cause of amputation was infection after wound.

Conclusion. The population needs to be warned about the risk of amputation due to infected wounds in patients with difficulty in controlling their comorbidities. Patients who have undergone amputation, should be oriented towards an early utilization of rehabilitation services, and municipalities should prepare their medical and rehabilitation professionals for the treatment of characteristic symptoms that amputees report and prosthetization.

Keywords. amputation, phantom limb, physical therapy, rehabilitation, single health system

Introduction

Before the descriptions by Hippocrates in Ancient Greece, the surgical procedure of amputation was already described in the oldest document in Hindu literature, Rigveda, dated 1,200 B.C. With technological evolution, it is seen as one of the first steps toward rehabilitation and early return to activities of daily living. Among the main causes of amputation, peripheral vascular disease is the most common in people aged 50 to 75 years, and more than half have associated diabetes mellitus.^{1,2} Among young people and men, trauma is the most frequent cause, as it leads to lesions of soft tissues and vasculonervous structures that cannot be repaired, causing amputation. Besides the aforementioned causes, muscu-

loskeletal tumors, congenital causes, and infections are also listed as conditions that may require amputation.^{3–5}

The rehabilitation process for amputees takes into account the presence of symptoms such as pain, sensory alterations, phantom limb, functional evaluation, comorbidities, access to purchase and maintenance of the prosthesis by the municipality or privately by the patient, as well as considering the place where the patient lives and the possibility of periodic follow-up of the means of assistance, which generates the need for a multiprofessional team in their care.^{6–8} Moreover, one must consider the patient's expectations in relation to prosthetization, if his idea corresponds to reality in activities of daily life, leisure and even sports.^{3,9,10}

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It is estimated that in the year 2050, approximately 3.6 million North Americans will suffer a lower limb amputation. It was estimated that in 2020 Brazil would be the sixth largest elderly population in the world, with 20% being diabetic.¹¹ The analysis of factors related to amputations and the understanding of which ones are changeable, can result in the development of public policies for the prevention and education of the population considering that many are due to complications of diseases that can be avoided, controlled with a low level of complexity and cost.¹²

Aim

Therefore, the objective of this study is to explore data from the health service responsible for these patients in a city in the state of São Paulo, showing the main etiological and postamputation characteristics. To contribute with information for planning the reception, orientations, and preparation of the multiprofessional team for this contingent.

DATA: ____/____/____.

Centro Municipal de Reabilitação
CNES: 2087863

Nome: _____ DN: _____ Gênero: _____
 Raça: _____ Profissão: _____
 Fuma ou fumou por quanto tempo? _____
 Etiologia da amputação: _____
 Local da amputação: _____
 Tempo de amputação: _____ Tempo de internação: _____
 Cidade da amputação: _____ - _____
 HAS () Diabético I () II () Dislipidemia ()
 Outras doenças: _____
 Depois de quanto tempo procurou fisioterapia/protetização? _____
 Protetizado: Sim () quanto tempo? _____ Não ()
 Sensação de presença do membro amputado, dor ou coceira: _____

Dr. Derrick P. Artoli
Fisioterapeuta
CREFITO: 3/125578/F

TERMO DE CONSENTIMENTO
 Permite a utilização desses dados para finalidade de pesquisas e trabalhos científicos,
 sabendo que não poderei solicitar nenhuma remuneração por ceder estas
 informações.

Assinatura

Fig. 1. Data collection form

Material and methods

This was an observational, retrospective study, evaluating the data of patients who were admitted to the Itanhaém Municipal Rehabilitation Center (CMR), which renders rehabilitation service via Unified Health System (Sistema Único de Saúde – SUS) for individuals who have suffered amputation, with approval by the Ethics

Committee of the Lusíadas University Center (Opinion 5.815.874). The data collected was for the period 2012–2022, due to the COVID-19 Pandemic which changed the routine of care and reduced the number of elective surgeries. We collected information from 76 patients, using a form (Fig. 1), which collected information on the etiology, timing, anatomical site and place of amputation, comorbidities and related symptoms.

Principal Component Analysis (PCA) was performed, with a correlation matrix, to analyze the main explanatory variables. This test was used to analyze interrelationships between a large number of variables and explain them in terms of their components. The correlation of these factors was then analyzed using Pearson's correlation, with a significance level of 5%, adopting the r variation pattern between 0–0.3 insignificant, 0.31–0.5 weak, 0.51–0.7 moderate, 0.71–0.9 strong, and above 0.91 very strong.¹³ The analyses were carried out using the Past 4.03 program (Oslo University, Norway).

Results

The mean age of patients was 57.6 years, most were men (58–76.4%), Caucasian (43–56.5%), smokers (60–78.9%) for 24.1 years on average, and the most common etiology was post-wound infection (37–48.6%) (Fig. 2). There were 41 (53.9%) with hypertension, 39 (51.3%) with type II diabetes, 29 (38.1%) with dyslipidemia and 12 (15.7%) with heart disease. The most common anatomical level of amputation was transtibial (30–39.4%), followed by transfemoral (28–36.8%) and to a lesser extent involving the ankle, foot, and phalanges (15–19.7%). Only 3 (3.9%) upper limb amputations were recorded. Most of the amputations were performed in the city of Praia Grande (28–36.8%), followed by São Paulo (19–25%) and only two (2.6%) in the city of origin, Itanhaém. The patients stayed in the hospital for an average of 40 days, but, on average, they sought help from the RCMP only 5 to 6 years after the amputation. However, they reported seeking physiotherapy for the first time, on average 20 months after the amputation. Just over half, 43 (56.5%) sought rehabilitation within the first 6 months. Of the total, only 12 (15.7%) had been prosthetized, and for an average time of 8.5 years. Of the amount analyzed, 50 (65.7%) had phantom limb sensation, 27 (35.5%) pain, 28 (36%) itching and other random symptoms such as burning, numbness, stabbing, shock, and tingling.

The PCA was performed, which is a multivariate analysis that transforms variables into the same dimension. When analyzing the figure, it was possible to observe inverse variables such as the time of prosthetization and hospitalization, with the etiology of the amputation, in addition to the site of amputation with pain (Fig. 3). For component 1, the variables that best explained the data were: time of amputation (0.33), hypertension (-0.37), diabetes (-0.37), use of prosthesis (0.40) and time of pros-

thetization (0.42). For component 2, the variables were: time of amputation (0.41), time to start physical therapy/protection (0.36), phantom limb (-0.35), and pain (-0.43). In other words, they are variables that are interrelated according to the component presented.

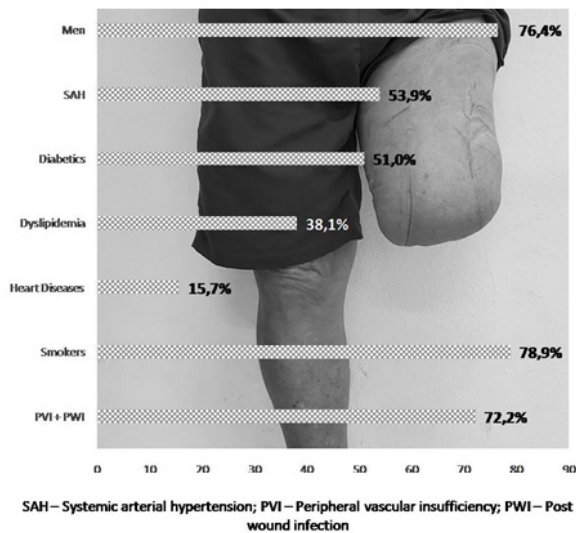


Fig. 2. Etiology of amputations

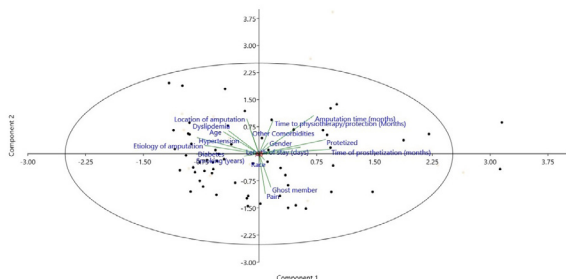


Fig. 3. Presentation of the PCA for the sample according to the analysis variables

The variables analyzed in the correlations, although significant, were weak for: age x hypertension ($p=0.005$, $r=0.32$), hypertension x etiology of amputation ($p<0.001$, $r=0.40$), diabetes x etiology of amputation ($p=0.002$, $r=0.35$), diabetes x time of amputation ($p<0.001$, $r=-0.38$), diabetes x hypertension ($p<0.001$, $r=0.47$), dyslipidemia x hypertension ($p<0.001$, $r=0.40$), time to physical therapy/protection x time of amputation ($p<0.001$, $r=0.50$), prosthetization x hospitalization time ($p<0.001$, $r=0.40$), prosthetization time x amputation time ($p<0.001$, $r=0.40$), prosthetization time x amputation etiology ($p<0.001$, $r=-0.31$), prosthetization time x diabetes ($p<0.001$, $r=-0.31$), pain x phantom limb ($p<0.001$, $r=0.36$).

In other comparisons, despite being significant, the correlation was considered negligible: age x smoking ($p=0.004$, $r=0.32$), smoking x time of amputation ($p=0.030$, $r=-0.25$), time x site of amputation ($p=0.048$,

$r=0.23$), length of hospitalization x time of amputation ($p=0.042$, $r=0.23$), diabetes x age ($p=0.003$, $r=0.25$), dyslipidemia x gender ($p=0.021$, $r=0.26$), other comorbidities x amputation site ($p=0.043$, $r=0.23$), other comorbidities x dyslipidemia ($p=0.013$, $r=0.28$), prosthetization x etiology of amputation ($p=0.036$, $r=-0.24$), prosthetization x time of amputation ($p<0.001$, $r=-0.11$), prosthetization x hypertension ($p=0.028$, $r=-0.25$), prosthetization x diabetes ($p=0.047$, $r=-0.22$), prosthetization time x gender ($p=0.035$, $r=0.24$), prosthetization time x hospitalization time ($p=0.031$, $r=0.25$), prosthetization time x hypertension ($p=0.021$, $r=-0.26$), pain x amputation site ($p=0.012$, $r=-0.19$).

Discussion

From 2012 to 2020 the patients admitted to the only rehabilitation SUS service in their municipality were middle-aged, mostly male, Caucasian and smokers for years, the main cause of amputation was infection after wound, more than half were hypertensive, type II diabetics and could still have related dyslipidemia and heart disease.

The data found are similar to those of Jesus-Silva et al. in which gender, age range and statements regarding the etiology of amputations are similar.¹⁴ They highlighted the presence of chronic peripheral arterial disease and diabetes as the main causal factors. In Brazil, due to the high prevalence of atherosclerotic disease, diabetes, and the difficulty in controlling these factors there is the likelihood of higher levels of lower limb amputations, such as transtibial and transfemoral amputations, corroborating the findings of this study.¹⁴ Local wound infections were the main factor found, being described as an important risk factor, thus, the immediate therapeutic approach in early skin lesions should be emphasized to minimize their progression and the resulting amputation. Infections after minimal wounds are more susceptible in diabetics and people with peripheral vascular insufficiencies due to the longer exposure time to external media due to the longer healing period required, increasing the risk of amputations.² Considering that most of the amputations were performed in other cities, similar findings pointed out in the study by Jesus-Silva et al., can be valid in which the reduced access to a physician and the poor socioeconomic level make it difficult to attempt revascularization and result in the impossibility of limb preservation and major amputations.¹⁴ Barnes et al. pointed out low socioeconomic level as one of the criteria that point to greater chances of amputations, which emphasizes the importance of the services in the city that perform the related care to be more publicized and especially to be prepared to receive these patients.²

Approximately half of amputee patients sought physiotherapy in the first six months, the presence of a phantom limb was common and there were reports of pain, itching, numbness, burning, stabbing, shock, and tin-

gling. Mallik et al. described a 60–80% incidence of phantom pain and classified any other report in addition to pain as phantom sensation.¹⁵ This sensation includes the other symptoms mentioned above by the patients in this study. The phantom sensation was more frequent (65.7%) than pain itself (35.5%); however, studies indicate that phantom pain can last from 2–30 years and that sometimes it is difficult for the patient to distinguish between local pain and phantom pain or sensation.^{6,7,15,16} Aternali and Katz mention a high prevalence of phantom pain (50–80%), with high levels of pain and the difficulty with its chronicity, affecting quality of life.¹⁶ These authors reported that the pain is typically of neuropathic origin, usually starts in the first week after amputation and decreases in severity and frequency over time. However, when investigating treatment methods such as mirror therapy, transcranial magnetic stimulation, virtual reality, desensitization therapy, and even surgery, there is neither a consensus nor superiority among these alternatives to justify their choices.¹⁶ Neither the pathophysiology of phantom pain has been completely established, it is known that there is involvement of peripheral and central mechanisms, from the limb's encephalic representational zones to the pathways to the amputation site, but it still requires the establishment of relationships.^{6,7} That is, in view of the complexity of phantom pain, initial orientations are important and the rehabilitation program must be emphasized during hospitalization and soon after amputation.

If we add the values of vascular insufficiency etiologies (23.6%) with those of infection after wounds (48.6%), which can be directly related, we get 72.2% of amputee patients analyzed. This value is 3.2 times higher than the traumatic cause (22.3%), without correlating it with the high incidence of comorbidities, which according to Varma et al. increases the risk of amputations.⁵ Taking into account the estimate of approximately 69 million (32.3%) hypertensive patients and 20 million (9.4%) diabetics in Brazil, it sounds pertinent to prepare basic and specialized care in each city to educate and care for this population to prevent amputations from occurring.^{17,18}

Given the data analyzed, the focus should remain on strategies that educate the population to stay away from risk factors, minimizing the number of complications and consequently amputation. The decrease in the number of amputations is related to better diabetes control, better governmental public health strategies, such as the implementation of a multidisciplinary team for the treatment of the diabetic foot with efficient coverage in the geographic area of care.¹⁴ Investing in education and preventive means of care by SUS is necessary, as these initial expenses directly refer to the occurrence of an amputation, which, in addition to being costly for the patient, costs the public purses from the surgery to the end of the rehabilitation process. More than the value of a prosthesis, the municipi-

ties must have a multidisciplinary team, composed of an orthopedist, a vascular surgeon, a psychologist, a physiotherapist, a prosthesis and orthosis technician, among other professionals, which is not the reality in most municipalities, making the prognosis of these patients more difficult. Thus, as Gailey et al. state, only a small percentage performs physical therapy after an amputation, either due to lack of guidance, interest, knowledge of treatment sites, or inadequate structures, which results in the impossibility to achieve maximum functionality.¹⁹ Therefore, it is expected that the knowledge of the variables analyzed in this study will serve to plead for educational programs to inform patients and control their comorbidities, in addition to being the basis for the organization of public managers, together with health professionals, for the preparation of prevention programs and efficient treatment for those who have undergone an amputation.^{6,16} A limitation is that the data was taken from a relatively small population sample, from just one city in the interior of the state of São Paulo – Brazil, and that studies with different populations are important for comparing other realities.

Conclusion

The population needs to be alerted to the risk of amputation due to inadequate control of their comorbidities. In case of amputation, patients should be oriented toward the early search for rehabilitation services, and municipalities must prepare their professionals for the treatment of common symptoms and prosthetization. Additionally, the process of purchasing the prosthesis and follow-up of the patient should be well structured, so that the prognosis of functionality and return to daily life, professional and leisure activities can be maximized.

Declarations

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Author contributions

Conceptualization, D.P.A. and G.R.F.B.; Methodology, D.P.A. and G.R.F.B.; Software, G.R.F.B.; Validation, D.P.A. and G.R.F.B.; Formal Analysis, D.P.A.; Investigation, D.P.A.; Resources, D.P.A. and G.R.F.B.; Data Curation, G.R.F.B.; Writing – Original Draft Preparation, D.P.A.; Writing – Review & Editing, G.R.F.B.; Visualization, D.P.A. and G.R.F.B.; Project Administration, D.P.A.

Conflicts of interest

The authors have no conflicts of interest to declare.

Data availability

The data is in the possession of the authors and can be presented if necessary.

Ethics approval

Ethics Committee of the Lusíadas University Center (Opinion 5.815.874).

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