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Outcomes of lower limb amputees at Cotonou

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ABSTRACT

Background: Limb amputations are responsible for disability. We studied the outcomes of lower limb amputees in our daily practice.
Methods: This prospective analytical study over 7 years (January 2009–December 2015) included 70 amputees of lower limb. They were mainly male (73%), aged on average of 42.4 ± 18.8 years. The mean time of follow- up was 3.2 ± 1.9 years. We assessed disability on balance, walking, disability in daily life for patients with prosthesis, and the socio-economic impact of the amputation. Statistical analysis was performed with Chi² and Mann-Whitney tests; a p-value ≤ 0.05 was considered statistically significant.
Results: The average Timed Up and Go Test was 18.5 s. Class II of Pohjolainen subjects were the most recovered (37%). The mean Houghton score in the 17 fitted patients was 6.2 ± 2.0. Socially, 90% of the patients no longer practiced leisure activities, and 4/53 patients were no longer in a couple. At the economic level, 87% of patients had a decreased monthly income. Factors that bear direct correlation to functional outcome of patients were the level of amputation, and the prosthesis fitting.
Conclusion: Lower limbs amputations entail adverse consequences at the functional and socio-economic level. Our country must review its policy on prosthetic fittings for amputees, and vote laws that involve private firms and government in socio-economic reintegration, and empowerment of these subjects.

1. Introduction

A Limb amputation is a mutilating surgery and a public health problem.[1,2] Its history is intimately linked to that of disability. Perceived as a failure by the surgeon, it leads to an alteration of the body image, chronic pain, psycho-affective disorders which lead to marital conflicts.[2–4] Moreover, the possibilities of prosthetic fittings for amputees and their acceptance are often low in the low-income countries.[5] Although a lot of studies have been conducted on the epidemiology and characteristics of limb amputations.[5–8], very few have been interested in the outcomes of amputees in their daily life in Africa. The aim of this study was to evaluate the functional, social and economic outcomes of lower limb amputees and to find associated factors to functional outcomes.

2. Patients and methods

2.1. Study design and population

This was a prospective, analytical study from January 2009 to December 2015, on lower limb amputees in orthopedic-traumatology department of Cotonou National Teaching hospital. This hospital is the level-1 referral hospital of Benin, a low-income country in West Africa. The health system of this country is third-level pyramid: the peripheral level (District or Communal health centers, supported by a regional referral hospital), the departmental level (departmental hospitals) and the national level (Cotonou National Teaching hospital, and mother and child hospital). In this country, the guaranteed minimum wage is 61.0 Euros monthly and the rate of poverty was 36.2%. There is limited rate of social coverage. All care services must be prepaid by the victim's family outside the hospitalization fees. The cost of a daily hospitalization is 9.90 Euros for a common ward. The hospital has a rehabilitation department near the trauma unit, what facilitates rehabilitation of patients.

The inclusion criteria was patient aged of 15 years or most, with a lower limb amputation and a minimal follow-up of six months, who consent to participate to the study. For teenagers, their

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parents also gave their consent. Patients with a lower limb amputation before the period of the study and those with limb agenesis were excluded.

2.2. Variables

We appreciated the rate of prosthesis fitting, the functional, social and economic fate of the patients. Functionally, disability on balance was evaluated with the Timed 'Up and Go' Test (TUGT).[9] The disability on the walking was evaluate with the classification of Pohjolainen (Table 1).[10] Houghton's score was used to assess disability in daily life.[11] Patients were classified as patients with unsatisfactory rehabilitation (score <9) and patients with satisfactory rehabilitation (score ≥9).[11] The social impact was assessed on the resumption of driving and work, adjustment of post, leisure activities practice, divorce, and dismissal. On the economic level we appreciated the monthly income after amputation (decreased, normal or increased).

2.3. Ethical statement

This survey was conducted in compliance with the protocol Good Clinical Practices and Declaration of Helsinki principles. All included patients gave written informed consent to participate in the study after being informed about the purpose of study. We also received parental permission and the written consent of the parents about teenagers. Investigators guaranteed the total anonymity of the information derived from the research.

2.4. Statistical analysis

Statistical analysis was performed with EPI Info 7.1.5.0. Qualitative variables are expressed as frequencies. Quantitative variables are expressed as means ± standard deviation. The Chi^2 of Pearson and the Mann-Whitney test were used to search correlation between the variables. A p-value ≤ 0.05 was considered statistically significant. The confidence interval was set at 95%.

3. Results

3.1. Sociodemographic and clinical characteristics

The study involved 70 patients, including 51 males and 19 females (male to female ratio = 2.7). They were mean aged of 42.4 ± 18.8 years (15–85 years). Laborers (40%) were most interested. The mean follow-up was 3.2 ± 1.9 years. The sociodemographic and clinical characteristics of these patients are summarized in Tables 2 and 3.

Table 1
Classification of Pohjolainen.

	Characteristics of the class
Class I	Ambulating with a prosthesis but without other walking aids.
Class II	Independent at home, ambulating with a prosthesis but requiring one walking stick or crutch for outdoor activities
Class III	Independent indoors, ambulating with a prosthesis and one stick or crutch, but requiring two crutches outdoors and occasionally a wheelchair.
Class IV	Walking indoors with a prosthesis and two crutches or a walker, but requiring a wheelchair for outdoor activities.
Class V	Walking indoors only short distances, ambulating mostly with a wheelchair.
Class VI	Walking with aids but without a prosthesis
Class VII	Non ambulatory except in a wheelchair

Table 2
Sociodemographic characteristics of the patients (N = 70).

	Number of cases	Percentage
Sex		
Male	51	73%
Female	19	27%
Age group		
[15–30 years [	29	42%
[30–45 years [	17	24%
[45–60 years [	10	14%
[60–75 years [	11	16%
[75–90 years [	3	4%
Matrimonial situation		
Married	53	76%
Single	17	24%
Profession		
Laborer	28	40%
Craftsman	14	20%
Civil servant	12	17%
Trader	8	12%
Student	3	4%
Farmer	2	3%
Driver of "Taxicab-Motorcycle"	2	3%
Housewife	1	1%

Table 3
Clinical characteristics of amputations (N = 70).

	Number of cases	Percentage
Cause of amputation		
Traumatic etiology	48	70%
Diabetic foot	15	21%
Peripheral vascular disease	4	5%
Malignant bone tumor	3	4%
Level of amputation		
Transfemoral amputation	35	50%
Transtibial amputation	30	43%
Chopart amputation	3	4%
Metatarsophalangeal disarticulation	2	3%

3.2. Prosthesis fitting and using of walking aids

Seventeen patients (24%) had a prosthesis fitting; they were 11 transfemoral amputees and 06 transtibial amputees. The mean delay between amputation and prosthesis fitting was 7.2 ± 2.1 months (4–12 months). Fifty two patients (70%) had a walking aids: 38 were using walking stick (54%), 11(16%), crutch and 3 (4%), wheelchair.

3.3. Functional outcomes

3.3.1. Disability on balance

The mean Timed 'Up and Go' Test (TUGT) was 18.5 ± 5.0 s (10–34 s). The lower the amputation level was, the lower the TUGT was (p-value = 0.0001). Similarly, subjects with prosthesis had a longer TUGT than those without prosthesis (p-value = 0.03). But, there was no statistically significant relationship between the TUGT and sex, age, cause of amputation (p-value respectively of 0.4, 0.6, and 0.9)

3.3.2. Disability on walking

Among the 70 patients, five were completely autonomous and 65 could be classified according to Pohjolainen. Subjects of class II followed by those of class VI, were most found (Fig. 1)

Male were predominantly class VI (21/47) while female were predominantly class II of Pohjolainen (8/18). But there was no significant relationship between theses variables (Chi^2 = 7.4; p-

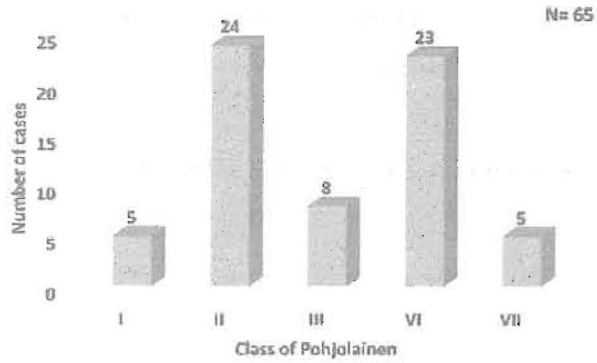

Fig. 1. Distribution of patients according to Class of Pohjolainen.

value = 0.1). Similarly there wasn't any link between the class of Pohjolainen and age ($Chi^2 = 17.7$; p-value = 0.6), cause of the amputation ($Chi^2 = 3.3$; p-valu = 0.5) and level of amputation ($Chi^2 = 8.1$; p-value = 0.9). However, there was a statistically significant relationship between the fitting prosthesis and the disability on walking (p-value = 0.03; $Chi^2 = 10.8$): fitted prosthesis patients were more autonomous on walking than unfitted subjects

3.3.3. Disability in daily life for fitted prosthesis patients

The mean Houghton score was 6.2 ⊥ 2.0 (3–11). Rehabilitation was unsatisfactory in 14/17 patients. All those fitted after transfemoral amputation (11/11) had unsatisfactory rehabilitation; 3/6 fitted after a transtibial amputation had satisfactory rehabilitation. There was a statistically significant relationship between the amputation level and the Houghton score ($Chi^2 = 6.7$; p-value = 0.009): the higher the level of amputation was, the greater was the risk of unsatisfactory rehabilitation. Fitting prosthesis wasn't linked to the sex ($Chi^2 = 1.6$; p-valu = 0.2), the age ($Chi^2 = 1.7$; p-valu = 0.6), the cause of amputation ($Chi^2 = 1.2$; p-valu = 0.3)

3.3.4. Social impact

Lower limb amputations had a negative impact on patient's social life with disruption of all social parameters evaluated (Fig. 2).

3.3.5. Economic impact

The monthly income of 61 patients (87%) has decreased. Eight (12%) have a monthly income equal to that before the limb loss and one (1%) has an increasing this monthly income after a post adjustment.

4. Discussion

The monocentric characteristic of the study is a weakness. Furthermore, there is a bias in assessing the functional outcomes of patients due to the lack of functional evaluation scales validated in our local languages, while most of the population is out of school. However, the sample size obtained by comprehensive survey of all adult lower limb amputees in the national referral hospital of our country is sufficient to allow statistical analysis and conclusive results. It's therefore a beginning for another studies on this field in our country. This study is relevant because its provides data until then unavailable, about lower limb amputees outcomes in a sub-Saharan low-income country. It also permits us to compare our experience to those of other countries among the world, in order to improve our management of this kind of persons.

4.1. Fitting prosthesis

In this study, 17 patients (24%) had been fitted. This rate is above that of 9% reported by Tobomè et al. [6] in North Benin. Souna et al., and Tiandaza et al. reported respectively 6.97% and 20% of prosthesis fitting.[11,12] In developed countries, the prosthesis fitting is 100% covered by social security.[13,14] This explains that 60–80% of limb amputees are fitted.[13,14] In our context, prosthesis is still a luxury, reserved only for patients who can buy it either by their own, or after petty annoyances with insurance for those who are victims of road traffic accidents involving an insured car. Tibial prostheses cost 512.1–1250.7 Euros, which means 8.4–20.5 times the value of the guaranteed minimum wage in Benin (61.0 Euros). Femoral prostheses cost 709.3–1555.4 Euros, or 11.6–25.5 times, the guaranteed minimum wage in Benin. These prostheses are therefore not accessible to everyone, especially for our patients who were mainly laborers (40%). Moreover, the unavailability of prosthesis for all level of amputations in our practice obliges us to avoid some levels, especially around the knee (disarticulation or amputation of Gritti). To permit fitting prosthesis of most of amputees, some countries as India, made the choice of the "Jaipur leg" and "Jaipur foot", which are inexpensive to manufacture prostheses, and most suitable option for many patients in their experience. They also have social act, which helps amputees on their rehabilitation and socio-economic reintegration.[15] However,

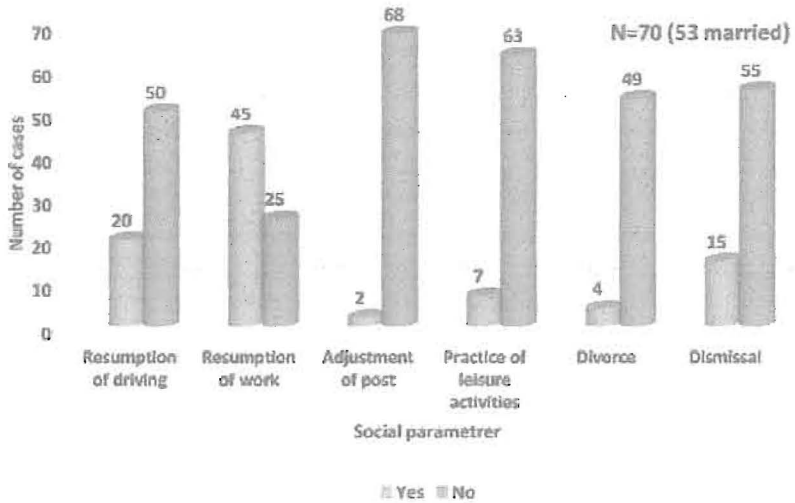

Fig. 2. Distribution of patients according to social parameters.

it should be emphasized, that prosthesis fitting is not systematic; its opportunity is discussed depending on the case, in particular according to the comorbidities of the patient, his clinical state after the amputation, the functional results that one can expect and the motivation of the patient.[16–20]

4.2. Functional outcome

The balance of the lower limb amputees was correlated with the level of amputation (p-value = 0.0001) and the existence of a prosthesis (p-value = 0.03). For the latter parameter, the fitted subjects had a lower capacity for equilibrium than the unfitted subjects. This could be explained by unsatisfactory rehabilitation prior the fitting. Indeed, most patients had an unsatisfactory rehabilitation according to the Houghton score. Furthermore, when one looks better at the patients, all those fitted after transfemoral amputation had unsatisfactory rehabilitation. While, half of fitted after a transtibial amputation had satisfactory rehabilitation. Burger et al. [18] noted with transfemoral amputations, lower TUGT performance and less walking distance in 9 min compared to transtibial amputations. Similarly, Sansam et al. [16] identified the level of amputation as a very significant predictive factor ($p < 0.001$) of the mobility level evaluated 6 months after the amputation. The level of amputation is therefore a major predictive factor of the functional abilities, which could be expected after prosthesis fitting.[16,17] Moreover, this level is directly related to the energetic cost of walking with the prosthesis. The use of the prosthesis will be easier and its comfort greater, because the level of amputation is low.[17] This is one of the reasons why some countries, such as the United States of America, have chosen to select patients requiring prosthetic fitting using the Medicare Functional Classification Levels.[19]

The class of Pohjolainen was statistically significantly related to the existence of prosthesis, with the fitted patients being more autonomous in their walking than the unfitted (p-value = 0.03). Above all, the prosthesis would allow an autonomy for the pelvic limb amputee, by facilitating his movements in a certain way.

The higher the level of amputation was, the greater the risk of unsatisfactory rehabilitation in case of prosthesis fitting was (p-value = 0.009). These results are in agreement with those of the literature and confirm the specificity of this simple clinical test for the evaluation of fitted patients after a lower limb amputation.[21]

4.3. Socio-economic impact

All the social parameters which were studied were disrupted, and most of the respondents had a decreased monthly income. According to the forensic assessment scale used in France and on which is based the insurance code used in Benin, permanent partial disability after lower limb amputation for unfitted patients varies from 8% to 70%.[22] In this study, the population was predominantly young. It can be seen that the functional capacities and productivity of the most active age groups are greatly reduced by these amputations. The lower limb amputation thus affects not only the autonomy of the subject, but also contributes to increasing impoverishment in the low-income countries by striking mainly the active subjects.

5. Conclusion

Lower limb amputations are characterized in our context by a low rate of prosthesis fitting, disability and significant handicap with negative consequences on the functional, and socio-economic outcomes of the patients. A better policy on prosthetic fittings choice, with laws voting to involve everyone in socio-economic reintegration, and empowerment of these amputees is necessary in our country. The prevention of the main causes of these amputations and the application of the rules of their realization when indicated must always be the objectives aimed by traumatologists.

Conflict of interest

None.

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