ORIGINAL ARTICLE

Pain related to amputation and functionality of individuals with lower limb amputations

Therezinha Rosane Chamlian[1], Juliana Kliemke dos Santos[2], Cecília Caruggi de Faria[2], Maria Silvia Pirrelo[3], Caio Pereira Leal[4]

ABSTRACT

The presence of persistent pain, whether from the stump, phantom pain, or in the contralateral limb may negatively interfere with obtaining a gait with a prosthesis in an amputee patient. **Objective:** To investigate the presence of pain related to amputation in lower limb amputees during their rehabilitation treatment, to evaluate their functional status with and without a prosthesis, and to verify whether there is any association between the presence of pain and gait. **Method:** A transversal study with 60 unilateral lower limb amputees in treatment at a rehabilitation center in São Paulo to investigate: age, gender, time since amputation, level and etiology of amputation, number of comorbidities, presence of pain in the stump or phantom pain or in contralateral limb, and if so, the kind of pain, intensity, frequency, improvement or worsening factors, use of medication, prosthetization, type of gait with prosthesis (community, therapeutic or household), use of gait assistance and application of Functional Independence Measure (FIM). Data was analysed with absolute and relative values and parametric tests (ANOVA) and non-parametric tests (equality of two proportions), chi-square, and confidence interval of 95% and *P*-value < 0.05. **Results:** The group, which contained 73.4% men, one year since amputation at the transtibial level, vascular etiology, with two comorbidities composed the sample in a statistically significant way ($p < 0.001$). There was no difference between patients fitted and not fitted with prostheses for stump pain and phantom pain, but there was a difference for the contralateral limb, statistically significant in those patients not fitted with prostheses. Although there was a mean difference between patients with and without prostheses for the 3 FIM scores, it was not statistically significant. **Conclusion:** Most unilateral lower limb amputation patients in rehabilitation at the AACD - *Lar Escola* at the time of the study had a low incidence of pain related to amputation and it didn't interfere with their acquiring a gait with their prostheses.

Keywords: Chronic Pain, Amputation, Lower Extremity, Gait

[1] Physiatrics Physician, Associate Professor, Head of the Physiatrics Department at the Universidade Federal de São Paulo.
[2] Physiotherapist, Association for Assistance to Disabled Children (Associação de Assistência à Criança Deficiente) - AACD - Lar Escola.
[3] Occupational Therapist, Association for Assistance to Disabled Children (Associação de Assistência à Criança Deficiente) - AACD - Lar Escola.
[4] Physiotherapist, graduated from the Faculdade Metropolitanas Unidas.

Mailing address:
Associação de Assistência à Criança Deficiente - AACD - Lar Escola
Therezinha Rosane Chamlian
Rua dos Açores, 310
São Paulo - SP
CEP 04032-060
E-mail: rosane.chamlian@larescola.com.br

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INTRODUCTION

Worldwide, the number of lower limb amputees is high since the most affected population consists of older people with peripheral artery disease.[1,2] Amputation of the lower limb brings a functional decline that can affect the quality of the patient's life.[1,2]

The rehabilitation program for these patients seeks to recover their autonomy in locomotion, if possible with a prosthesis, without neglecting the cognitive, emotional and social aspects.[1,2] One challenge imposed upon the multidisciplinary team is the large number of associated diseases that the patients present such as *diabetes mellitus*, hypertension, and chronic renal insufficiency, among others, in addition to the pain related to the amputation.

The presence of persistent pain, whether from the remaining stump, from phantom pain, or from the contralateral limb, can interfere with the amputee obtaining a gait, as demonstrated in recent studies.[1-3]

This study finds justification in the data supplied in the literature that suggests a negative relationship between the pain related to amputation and the amputees' developing functional abilities.

OBJECTIVE

To investigate the presence of pain related to amputation among lower-limb amputees in rehabilitation, to evaluate their functional status, with and without protheses, and to verify whether there is any association between the presence of pain and their gait function.

METHOD

A cross-sectional study was made with 60 unilateral amputees of the lower limb in treatment at the Association for Assistance to Disabled Children (AACD) - *Lar Escola*, in November of 2012, by the application of questionnaires to investigate the presence of pain related to amputation and to describe functionality with and without prostheses.

After approval of the project by the Committee on Ethics in Research of UNIFESP and the signing of the free and informed consent forms, all the patients were evaluated as to age, gender, time since the amputation, level and etiology of amputation, number of comorbidities, the presence of stump pain, phantom pain, or contralateral pain, and, if applicable, the type, intensity, and frequency of pain, the factors that improve or worsen it, the use of medication, prosthetization, type of gait with prosthesis (community, therapeutic, or household), and the use of aids in walking.

To evaluate functionality, the Functional Independence Measure (FIM) was applied, which evaluates 18 tasks according to the degree of independence which gives a score from one (total dependence) to seven (total independence), yielding a score from 18 to 126 points. The tasks are grouped in six dimensions: self-care, sphincter control, transferences, locomotion, communication, and social cognition. The total FIM score, also known as the FIM total, can be divided into two subscales: the FIM motor (encompassing the self-care dimensions, sphincter control, transferences, and locomotion), with scoring from 13 to 91 points, and the FIM cognitive (encompassing communication and social cognition), with scoring from 5 to 35 points.[4]

The patients were divided into two groups - those with and those without prostheses - and their variables were analysed and compared. The data was analysed using absolute as well as relative values and parametric statistical tests (ANOVA) as well as non-parametric tests (equality of two proportions), X^2, interval of confidence of 95%, and *P*-value < 0.05. The software used was SPSS v16 and Excel Office 2007.

RESULTS

The patient data regarding gender, year, level and etiology of amputation, comorbidities, and prosthetics is shown in Table 1.

Regarding pain, there were: 17 patients (28.3%) who reported pain in the stump ($p < 0.001$); 13 (21.7%) who reported contralateral pain ($p < 0.001$); and 36 (60%) who reported phantom pain ($p < 0.019$). The data regarding pain, separating the patients with and without prostheses is presented in Table 2.

The characteristics of the pain reported by the patients are described as follows. As to the type of pain: 16.7% in shock ($p = 0.183$), 30.5% sharp pain ($p = 0.802$), 5.5% weight ($p = 0.003$), 13.9% burning ($p = 0.053$), and 33.4% other types (reference).

The distribution of pain was given as: 13.9% severe ($p < 0.001$), 30.5% moderate ($p < 0.019$), 55.6% light (reference) while the frequency was: 39% sometimes ($p = 0.103$), 5.5% always ($p < 0.001$), and 55% rarely (reference).

The improvement factors cited were: bandaging (4.5%), exercising (22.7%), massage (50.0%), and medication (18.2%), while the worsening factors were: absence of bandage (9.1%), low temperatures (27.3%), prolonged standing with the stump hanging (36.4%), and having weight on the stump (18.2%).

Pain relief medications used were: 37.5% analgesics (dipyrone and paracetamol), 25% tricyclic antidepressants (amitriptyline), 25% anticonvulsives (carbamazepine), and 12.5% non-steroidal anti-inflammatories (diclofenac).

The patients with prostheses (12 trans-femoral and 24 transtibial) were classified as to the type of prosthetic gait: 18 (50%) community (reference) 4 (11.1%) household ($p < 0.001$), and 14 (38.9%) therapeutic ($p = 0.343$).

Of the 36 patients with prostheses, 6 with therapeutic gait and 1 with household gait used wheelchairs for medium and long distances; 3 patients did not use aids and had community gait; 7 patients used a walker, 2 of which had community gait, 2 had therapeutic gait, 3 had household gait, 6 used a cane and had community gait, 9 used axillary crutches, 5 of which had community gait, 4 had therapeutic gait, and 4 used lofstrand crutches, 2 of which had community gait and 2 had therapeutic gate. Of the 24 without prostheses, 9 used wheelchairs, 2 used a walker, 12 used axillary crutches, 1 used lofstrand crutches, and they were not classified as to their gaits.

The distribution of the use of locomotion aids among all the patients was as follows: 15% walker ($p = 0.012$), 10% cane ($p = 0.001$), 26.7% wheelchairs ($p = 0.434$), 8.3% lofstrand crutches ($p < 0.001$), 35% axillary crutches (reference), and 5.0% with no help ($p < 0.001$).

Table 3 presents the FIM results, subdivided into 2 subscales (motor and cognitive) and the total FIM among patients with and without prostheses.

DISCUSSION

The sample was predominantly male and had a vascular etiology, corroborating with epidemiological studies on lower-limb amputees.[5-11]

The average age was 56.9 years (between 20 and 81), which was low when compared with other populations of amputees[9,10] and similar to studies of the same work already published.[5-8,11] This data reveals our patients probably had more serious diseases with poorer clinical control, which would explain the amputations recommended at earlier ages.

The predominance of the transtibial level, at 61.7% of the sample, is something

Table 1. Clinical and epidemiological characterization of the sample (n = 60)

Variables	Groups	Prosthesis		No Prosthesis		Total		*P*-value
	Categories	N	%	N	%	N	%	
Gender	Male	29	65.9	15	34.1	44	73.4	< 0.001
Year of amputation	2008	4	80	1	20	5	8.3	< 0.001
	2009	6	75	2	25	8	13.3	< 0.001
	2010	11	68.75	5	31.25	16	26.7	0.025
	2011	14	48.3	15	51.7	29	48.4	Ref.
	2012	1	50	1	50	2	3.3	< 0.001
Level	Transfemoral	12	52.2	11	47.8	23	38.3	0.011
	Transtibial	24	64.9	13	35.1	37	61.7	Ref.
Etiology	Bone Infection	3	75	1	25	4	6.7	<0.001
	Traumatic	6	60	4	40	10	16.7	< 0.001
	Tumoral	2	100	0	0	2	3.3	< 0.001
	Vascular	25	56.8	19	43.2	44	73.3	Ref.
Comorbidities	None	8	66.7	4	33.3	12	18.3	< 0.001
	One	9	52.9	8	47.1	17	30	0.041
	Two	18	64.3	10	35.7	28	46.7	Ref.
	Three	1	33.3	2	66.7	3	5	< 0.001
Average age (years)	(Min-Max)	56.91	(27-81)	56.97	(20-81)	56.91	(20-81)	

Min: Minimum; Max: Maximum

Table 2. Distribution of stump pain, contralateral pain, and phantom pain among patients with and without prostheses

Dor		No Prosthesis N = 24		With Prosthesis N = 36		*P*-value
		N	%	N	%	
Stump	No	17	70.8	26	72.2	0.985
	Yes	7	29.2	10	27.8	
Contralateral	No	14	58.4	33	91.7	0.003
	Yes	10	41.6	3	8.3	
Phantom	No	10	41.6	14	38.9	0.930
	Yes	14	58.4	22	61.1	

Table 3. Functional Independence Measure between those with and those without prostheses

		Mean	Median	Std. Dev.	CV	Min	Max	N	CI	*P*-value
MIF motor	No Prosth.	81.83	82	6.48	8%	65	94	24	2.54	0.391
	With Prosth.	81.92	83	4.39	5%	64	89	36	1.43	
MIF cognitive	No Prosth.	31.89	33	2.16	7%	26	35	24	0.85	0.368
	With Prosth.	32.07	33	1.92	6%	25	35	36	0.63	
MIF total	No Prosth.	113.21	115	7.07	6%	94	121	24	2.77	0.160
	With Prosth.	113.6	115	4.97	4%	95	122	36	1.62	

CV: coefficient of variation; Min: minimum; Max: maximum; N: number of patients; CI: confidence interval

noteworthy since the preservation of the knee joint leads to a better rehabilitation prognosis, including the acquisition of a gait with prosthesis. In other studies of the same work, there was always a predominance of the transfemoral level.[5-8]

In most of the cases, the amputation occurred as much as 2 years prior to the research. This data indirectly indicates that our rehabilitation work began late, for various reasons, from delays in forwarding on the part of the surgeon to waiting lines for treatments, difficulty in doing exams and getting appointments with specialists, difficulty in transportation, and other facets already pointed out in this same research work.[5-8,11]

Most of the patients had 2 associated diseases, and obviously the more the comorbidities, the more difficult will be the successful rehabilitation and prosthetization.[12-14]

Studies analysing the influence of stump pain and phantom pain in the acquisition of a prosthetic gait have been done by various authors[15-17] and, in spite of the high prevalences (65-72% phantom pain and 36-51% stump pain), the majority of patients (between 73 and 94.8%) used a prosthesis. The present study found similar results, with the prevalence of phantom pain greater than that of stump pain, there being no statistically significant difference between those with and without prostheses.

There was a difference between the groups as to the presence of pain in the contralateral limb and was more prevalent in a statistically significant way among those with no prosthesis. These results are not surprising, for it is well known that the overload on the contralateral limb is intense while walking with a walker or with crutches[18-20] and that the symmetrical distribution of weight between the contralateral limb and the prosthesis is one of the objectives of training with the prosthesis.

The results shown in this study on the characteristics of pain demonstrate that the majority of patients have light pain, rarely, that improved with simple measures such as exercises, massages, and the use of analgesics (dipyrone and paracetamol), which differs from several studies on the treatment of pain stemming from amputation.[21-24] The cited studies indicate very high prevalences of intense pain that is difficult to control and that hamper the patients' rehabilitation. A retrospective study done in the same rehabilitation center had already found a very low prevalence of phantom pain among amputees.[25]

Although there was a mean difference between the groups in the 3 FIM scores, these cannot be considered statistically significant. In another study done in the same institution,[26] the FIM was not shown to be sensitive in the evaluation of functional independence of lower-limb amputees when patients with and without prostheses were compared, regardless of the amputation level studied. On the other hand, it is known the the use of a prosthesis can contribute to the acquisition of independence in self-care, because what often limits the patient is their restriction of enough space at home, which jeopardizes the use and circulation with a wheelchair.[15-17]

Limitations of the study

Since the study was cross-sectional and used patients in rehabilitation, the 24 patients

without prostheses had not finished their treatments at the time of the interviews, therefore their statuses could change.

CONCLUSION

Most unilateral lower-limb amputees in rehabilitation at the AACD - *Lar Escola* at the time of this study had a low prevalence of pain related to the amputation, so this did not interfere with their acquisition of a prosthetic gait.

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