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Pain, functional status, social function and conditions of habitation in elderly unilateraly lower limb amputees

Bol, funkcionalni status, socijalna funkcija i uslovi stanovanja kod starih osoba s amputacijama donjih ekstremiteta

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Abstract

Background/Aim. Few authors are involved in home rehabilitation of amputees or their reintegration into the community. It has been remarked that there is a discontinuity between the phases of the amputee rehabilitation in Serbia. The aim of the study was to establish pain characteristics and functional status of amputees two months after the amputation and to determine their social function and the conditions of their habitation. **Methods.** This prospective observation study involved 38 elderly amputees with unilateral lower limb amputations. The patients were tested at the hospital on discharge and at their homes two months after the amputation. Pain intensity and functional status were measured by a visual analogue scale (VAS) and by Functional Independence Measure (FIM). The patients' social function was assessed using the Social Dysfunction Rating Scale (SDRS) and conditions of their habitation by the self-created Scale of Conditions of Habitation (SCH). In statistic analysis we used the Student *t* test, χ^2 test and Analysis of variance (ANOVA). **Results.** The majority of patients (63%) underwent below knee amputation caused by diabetes (89%). A significant number of patients (84%, $\chi^2 = 17.78$; $p < 0.01$) was not visited by a physiotherapist nor an occupational therapist during two months at home. In this period, the majority of the amputees (68%) had phantom pain or residual limb pain (21%). Two months after amputation the pain intensity was significantly lower (VAS = 4.07±2.19; 2.34±1.41; $p < 0.001$), and the functional status significantly better than on discharge (FIM = 75.13±16.52; 87.87±16.48; $p < 0.001$). The amputees had the average level of social dysfunction (SDRS = 62.00±11.68) and conditions of habitation (SCH = 7.81±1.97). **Conclusion.** A total 38 elderly amputees with unilateral lower limb amputations achieved significant functional improvement and reduction of pain, in spite of their social dysfunction, the absence of socio-medical support and inadequacy of the conditions of habitation.

Key words:
lower extremity; amputation; rehabilitation; postoperative period; movement; pain; socieconomic factors.

Apstrakt

Uvod/Cilj. Malo je autora koji se bave kućnom rehabilitacijom osoba sa amputiranim ekstremitetom ili njihovom reintegracijom u društvo. Primećeno je da postoji diskontinuitet među fazama rehabilitacije osoba sa amputacijom u Srbiji. Cilj ovog rada bio je da se utvrde karakteristike bola i funkcionalni status osoba sa amputacijom dva meseca posle amputacije, kao i da se odredi njihova društvena uloga i uslovi njihovog stanovanja. **Metode.** Ovom prospektivnom studijom bilo je obuhvaćeno 38 starijih osoba sa amputiranim jednim donjim ekstremitetom. Bolesnici su testirani pri otpuštanju iz bolnice i dva meseca posle amputacije u kućnim uslovima. Jačina bola i funkcionalni status mereni su pomoću vizuelne analogne skale (VAS) i nezavisnog merenja funkcije (*Functional Independence Measure* – FIM). Društvena uloga bolesnika procenjena je skalom za merenje društvene disfunkcije (*Social Dysfunction Rating Scale* – SDRS), dok su uslovi njihovog stanovanja utvrđeni primenom auto-skale za rangiranje uslova stanovanja (*Self-Created Scale for Conditions of Habitation* – SCH). Statistička analiza podataka urađena je Studentovim *t* testom, χ^2 testom i analizom varijanse (ANOVA). **Rezultati.** Kod većine bolesnika (63%) bila je urađena potkolena amputacija zbog dijabetesa (89%). Značajan broj bolesnika (84%; $\chi^2 = 17,78$; $p < 0,01$) nije posećivao ni fizioterapeut, niti socijalni radnik tokom dva meseca kod kuće. Većina bolesnika sa amputacijom (68%) osećala je fantomski bol ili bol u preostalom delu uda (21%) tokom ovog perioda. Dva meseca posle amputacije jačina bola bila je značajno niža (VAS = 4,07±2,19 vs. 2,34±1,41; $p < 0,01$), a funkcionalni status znatno bolji nego pri otpuštanju (FIM = 75,13±16,52 vs. 87,87±16,48; $p < 0,001$). Osobe kod kojih je urađena amputacija pripadale su prosečnom nivou društvene disfunkcije (SDRS = 62,00±11,68) i prosečnom nivou uslova stanovanja (SCH = 7,81±1,97). **Zaključak.** Ukupno 38 starijih sa jednim amputiranim donjim ekstremitetom postiglo je značajno funkcionalno napredovanje i sniženje bola uprkos svojoj socijalnoj disfunkciji, nedostatku socio-medicinske pomoći i neodgovarajućim uslovima stanovanja.

Ključne reči:
potkolenica; amputacija; rehabilitacija; postoperativni period; pokretljivost; bol; socijalni faktori.

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Introduction

Amputation caused by a vascular disease is a leading cause of morbidity in elderly population. It is estimated that the amputations in geriatric population in the United States will probably double from 28.000 to 58.000 per year by 2030 [1]. Geriatric patients with dysvascular lower/limb amputations have always had a few comorbid medical conditions [2]. They have a certain kind of social isolation, as well. With the developments in rehabilitation one might expect that more geriatric patients would be successfully fitted with prosthesis. The phases of amputee rehabilitation are: pre-prosthetic management, postoperative care, prosthetic training and a long term follow-up care [3]. Some studies report that most geriatric patients with lower limb amputations were discharged to home or to the nursing home [1, 4]. The process of their rehabilitation should be continual. This process is coordinated by the rehabilitation specialist – physiatrist. After postoperative care, it is carried out in the nursing home or in the patient's home, mainly by the physiotherapist, occupational therapist and prosthetist [1, 5, 6]. Pre-prosthetic training focuses on independence in mobility from the ambulatory or wheelchair level, avoidance of hip and knee contractures and residual limb management. Prosthetic training started when the limbs are ready and the prosthesis is fabricated. Occupational therapist identifies necessary equipment, establishing independence in self-care. He takes the training in homemaking activities [7, 8].

Many authors have investigated different problems in amputee rehabilitation [1, 4, 9–21]. A few of them have been engaged in home rehabilitation, in discharge destination of amputees, or in their reintegration into the community [11, 16, 4, 14]. Ephraim et al. [21], for example, have found that about 95% of 914 amputees, who were amputated three years before the study, had one or more types of amputation-related pain. Most of them had severe pain. What about amputation-related pain in the early period of follow up care? The earliest follow-up period in several studies was six to twelve months after amputation [11, 14]. Functional status is the most important outcome in the amputee rehabilitation. Some authors reported about informal nonstandardised discharge checklist for amputees in the assessment of their functional status [17]. What about the Functional Independence Measure, one of the most useful measurement tools? De Benedeto Monteiro et al. [19] speak about the metamorphosis of identity of amputees and its influence on their social status. But it is a review article, without a concrete clinical evidence [19]. There are standards of environmental adaptations for amputees and their training in homemaking activities [7, 22]. Meatherall et al. [11] have found that the bathroom modifications were common in the homes of their amputees. Concerning of this, what about the amputees from our milieu, who commonly live in the flats? There is a remark about discontinuity between some phases of the amputee rehabilitation for the geriatric population in Serbia. The questions are: do the geriatrics with lower limb amputations have any kind of rehabilitation at their homes; what kind of social dysfunction they have and do they have, any modalities of socio-medical support in the period of the prosthetic training? Serbs rehabilitation authorities do not mention any importance of home rehabilitation and environmental adaptations for the geriatric population with lower-limb amputations [23, 24]. The aim of our study was to establish pain characteristics and functional status of amputees two months after the lower-limb amputation and to determine their social function and the conditions of their habitation.

Methods

We performed a prospective observation study that included patients amputated from January to December 2005 at the Military Medical Academy, Belgrade. Inclusion criteria were unilateral foot, transtibial or transfemoral amputation because of peripheral vascular disease with or without diabetes mellitus; patients discharge to the home; no complications in postoperative care; preserved mental status; ability to read and write in Serbian language. Patients were excluded if they were unable to understand the test instructions, or were severely disabled before amputations for the reasons unrelated to peripheral vascular insufficiency. They were asked to participate by their rehabilitation specialist or physiotherapist. All the patients gave the written consent before participating in the study.

The patients who met the inclusion criteria were tested at the hospital on discharge and at their homes two months after the amputation. Pain intensity and functional status were measured using a 10 cm visual analogue scale (VAS) and by Functional Independence Measure (FIM) [25]. A type of amputation-related pain was also noted. Besides the sample characteristics, the study protocol recorded visiting of the patients by a physiotherapist, occupational therapist or social worker. The patients' social dysfunction was assessed using the Social Dysfunction Rating Scale (SDRS) [25]. The scale covered 21 terms divided into three main categories: self-system, interpersonal system and performance system. It included 21 symptoms of social and emotional problems, each judged on six-point severity scale. The maximal score, which describes the worse condition was 126. The condition of habitation patients' were assessed using a self-created Scale of Habitation Conditions (SCH). The scale contains 24 terms divided into five categories: entrance to a house (flat), movabiliy in the house (flat), activities in the bathroom, activities in the kitchen, activities in the bedroom. Each term was evaluated with 0, 1 and 2 points. The maximal score, which describes the best condition, was 16. The assessment was performed at the end of the second month after amputation by physiotherapist, occupational therapist and rehabilitation specialist.

Statistic analysis included Student t test, χ^2 test and Analysis of variance (ANOVA). Statistical significance was set at $p < 0.05$. Data was assessed by SPSS version 8, for Windows.

Results

A total of 55 patients were recruited by a rehabilitation specialist or physiotherapist. Out of them six refused to participate, three could not participate because of a severe cognitive impairment, four were withdrawn because of a lack of protocol compliance, three died in 2–6 weeks after the am-

putation and one refused to participate further after the first measurement. A total of 38 patients participated in the study.

The majority of patients (63%) had below the knee amputation because of diabetes (89%). They had more than one comorbid medical conditions: the majority of them (60%) had high blood pressure, while 82% of them had the military insurance and the 55% were married (Table 1).

A significant number of patients (n = 23 or 84%); χ^2 17,78, $p < 0,01$) were not visited by a physiotherapist nor by occupational therapist during a two-month period at home. Nobody of them had visited a social worker. There was no a significant difference in the number of patients within this period who received prosthesis and those who did not (Table 2).

All the patients had amputation-related pain on discharge: 22 (58%) had phantom pain, 4 (11%) had phantom sensation, 10 (27%) had residual limb pain, and 2 (5%) had low back pain. Two months later, 22 (58%) of them still had phantom pain, 4 (11%) had phantom sensation, 8 (21%) had residual limb pain and 4 (11%) had low back pain.

Two months after amputation the pain intensity was significantly lower, and the functional status was significantly better than on discharge (Table 3).

Table 1

General characteristics of patients (n = 38)

Characteristics	x̄±SD	n(%)
Mean age	69.2±12.8	
Sex		
male		27 (71)
female		11 (29)
Marriage status		
married		21 (55)
widow / widower		17 (45)
Insurance status		
military		31 (82)
civilian		7 (18)
Mean mental stage	25.9±2.9	
Amputation type		
below the knee		24 (63)
above the knee		11 (29)
foot		3 (8)
Cause of amputation		
diabetes mellitus		34 (89)
peripheral vascular disease		4 (11)
Number of comorbid medical conditions	1.26±0.62	
Comorbid medical conditions		
high blood pressure		23 (60)
coronary heart disease		6 (16)
congestive heart failure		4 (11)
chronic obstructive pulmonary disease		2 (5)
impaired vision		2 (5)
hip osteoarthritis		1 (3)
stroke		1 (3)
tumor		1 (3)

Table 2

Number of the patients with prosthesis and their visiting by some member of rehabilitation team two months after discharge (n = 38)

Parameters	YES n (%)	NO n (%)	χ^2	*p*
Patients with prosthesis	15 (39)	23 (61)	1.6	-
Visiting physiotherapist	6 (16)	32 (84)	17.78	< 0.01
Visiting occupational theparist	0 (0)	38 (100)	/	-
Visiting social worker	0 (0)	38 (100)	/	-

Table 3

Pain and functional status of patients on discharge and after two months (n = 38)

Parameters	Discharge x̄ ± SD	Two months later x̄ ± SD	n (%)	*p*
Pain (VAS)	4.07 ± 2.19	2.34 ± 1.41		< 0.001
Functional status (FIM)	75.13 ± 16.52	87.87 ± 16.48		< 0.001
Movement (discharge)				
without crutches			3 (8)	
with crutches			7 (18)	
wheel chair			21 (55)	
wheel chair and crutches			5 (13)	
unable for movement			2 (5)	

VAS – Visual Analogue Scale; FIM – Functional Independence Measure

The social dysfunction of the patients two months after the amputation was at the average level. The total SDRS score was 62.00 ±11.68. Comparing the results of the three main categories of SDRS, we established that disturbances into the performance system were the most significant reason for a patient social dysfunction. The conditions of habitation for our patients were average. The total SCH score was 7.81±1.97. Comparing the results of three main categories of SCH, it was determined that our patients had significantly worse conditions of habitation into their bathrooms (Table 4 and Figure 1).

Table 4

Comparation of parts of the Social Dysfunction Rating Scale (SDRS) and the Scale of Condition of Habitation (SCH) two months after the discharge (n = 38)

Scale	x̄	F	*p*
SDRS			
self system	13.34		
interpersonal system	14.28	91.81	< 0.001
performance system	26.36		
SCH			
bathroom	0.8		
kitchen	1.89	89	< 0.01
bedroom	1.18		

Fig. 1 – Low toilet bowels without adequate supporters

Discussion

This study showed that our amputees, the elderly population with lower-limb amputations, achieved functional improvement and pain reduction in their homes two months after the amputation, in spite of the absence of socio-medical support and inadequacy of habitation conditions. The majority of them were taking nonsteroid anti-inflammatory drugs (NSAIDs) and antidepressants. This was enough, it seemed, for a significant reduction of pain intensity. Thus, according to our results, it is not necessary to carry out any kind of physical therapy in the prosthetic phase of amputee rehabilitation. This is in contradiction to the professional attitudes about necessity of a physical therapy in the treatment of phantom pain and sensation [3]. Similar to the results of other authors regarding sample characteristics, our amputees were mostly males in 60's, with a preserved mental status, and with hypertension as the most frequent comorbid condition [4, 11, 18, 20]. The majority of them were married and lived in the own flats. Two months after the amputation the functional status of amputees was improved, inspite the fact that 61% of the participants could not receive prosthesis because of comorbidities. During stay at home, 84% of amputees had no visit by a physiotherapist. After all, toward the FIM, they had shown an improvement in the activities of a daily living, in the communication and social cognition, as well. These results suggest that physiotherapy support is not indispensable in the prosthetic training of amputee rehabilitation. This however should be a wrong conclusion! Concerning pain,

our findings are explained by the action of NSAIDs and with patient's good accommodation to new living conditions. This accommodation implies their gradual acceptance themselves as disabled people and psychological support of their families. It is known that positive emotions reduce the pain phenomenon [26]. Interestingly, some of amputees had dominantly low back pain, although there was no pathophysiologic connection with amputation of extremity. Improving in the functional status of amputees was ascribed to the fact that they were forced to make themselves move at home. This was a kind of training aerobic capacity [27]. Additionally, in their homes some of the patients exercised according to the instructions given at the hospital. Their total FIM score, at the end of second month, was probably improved due to improving self-care, transfers, communication and social cognition. Our findings confirmed a clinic remark of the interruption of some phases in the Serbs amputee rehabilitation. The preprosthetic training, it looks, was a main problem. The preprosthetic phase of management can typically lasts 6–10 weeks for individuals with lower-limb amputation because of peripheral vascular disease [3]. The patients should observe frequent exercise regime in this period. For example, Friedmann [28] advices that amputees should do exercises three times a day. After amputation, the most amputees in Serbia are discharged to their homes. According to our results, amputees are occasionally visited in their homes only by a prosthetist, but this is not enough. The family of a patient can only partially compensate a physiotherapist. It, for example, they cannot help in prosthetic gait training [3, 5]. On the other hand, physiotherapists are especially important for amputees who could not receive a prosthesis. These patients must be on the exercise keeping regime in order to improve breathing capacities, to maintain and improve a limb range of motion, and to improve a local and systemic circulation. The results of functional training of our amputees would have been better if these amputees had exercised at home with a physiotherapist.

Disabled persons with lower limb amputations have problems with communication and behavior, besides the problems with locomotion, reaching and stretching [29]. These problems, being the consequence of stress, can lead the patients to disagreements with the members of their families or the society. The majority of them live in private households [29]. In the developed countries, social support networks include a wide variety of sources [30]. Besides informal sources (family), there are semiformal sources (church, clubs, family doctors, local pharmacists) and formal sources (health-care system, social service agencies, insurance companies). In our milieu, there are open and closed models for the protection of older and disabled people. Also, there is an attitude that these people need to be in their homes, till they do want, and until they can satisfy their elementary necessities [31]. However, issues concerning family functioning with aging have been studied. Even when family members are seemingly available to assist older relatives, their support cannot always be expected, unless they also receive help. Because of that, the education role of a social worker is very important. There is the evidence that patients' families can benefit from educational interventions to help prevent weakening in this crucial source of patient support [30]. Sociophysical environment is one of the important parts of health-related quality of life in people with disability [32, 33]. An elderly person living alone may have difficulty managing independently, but may not feel that he or she is able to afford or need intermediate care [34]. Social worker tries to remove consequences of impossibility of learning or emotional distressing which may hinder lower limb prosthetic restoration in a geriatric amputee [35]. Our amputees had a average level of social dysfunction (SDRS score = 62.00±11.68). Higher score in the scale shows greater dysfunction. It is, somewhat, different regarding positive social findings measured by the FIM. The rating was grouped into three classes: self-image, interpersonal relationships and success and dissatisfaction in social situation [25]. A comparative analysis of the results from these classes showed that our amputees had the most significant problems with the success and dissatisfaction in social situation. Thus, disturbances in this performance system were the most atributed to their social dysfunction. They lacked in satisfying relationship with close persons, friends and collegues. They were dissatisfied with the participation in community activities and were scared by financial insecurity. The majority of them had military insurance and relatively low income. Considering that they had no visits of a social worker within the two months staying at home, these results were to be expected. They imply a conclusion that a support from wide society and all members of the rehabilitation team is indispensable in the amputee rehabilitation of our geriatric population.

The results we obtained particularly emphasize the problem of habitation amputees conditions. These conditions were average for the person with lower limb amputations (SCH score = 7,81±1,97). Lower score in the scale shows bad habitation conditions. Both the patients who received prosthesis and those who did not, had many problems, firstly, with being and moving in their bathrooms. Usually, bathrooms had bathtubes without a shower-cabin, and toilet bowels were low without supporters. Also, the doors were not wide enough to accommodate assistive devices. Fresh amputees cannot count much on their healthy leg. The central sensory adaptations occur after amputation. It has been proved that the opposite healthy leg is not more sensitive as a compensation for the loss of sensory input in the amputated leg [13]. There is a real risk for falls for the amputees. This risk could be reduced by an occupational therapist visiting a patient at home. The final aim of intervention by occupational therapist is to facilitate occupational performances identified as important by persons with limitations [8]. There are guidelines available for home safety. For example, it is suggested to use elevated toilet with grab bars placed on wall next to toilet [36]. Using an overhead trapeze bars to assist in scooting up or down bed is also recommended [37]. Bottomely [38] cited that the process of adapting to the environment is especially important in geriatric rehabilitation. He emphasized the need for home assessment checklists to prevent falls [22]. Adaptations of physical environment for amputees can facilitate their social visits to or from friends by minimizing physical

barriers [30, 39]. Training in homemaking activities implies actual home evaluation which is carried out by a physician or occupational therapist that collaborates with social worker [7]. The International Society for Rehabilitation of Disabled has got the recommendations for habitation conditions for disabled people. It is exactly known what are the width of walkways and halls, the width of doorways, the height of wall outlets, tables, sinks, beds and toilets [7]. In this context, it is very strange that our rehabilitation authorities did not mention adaptations of physical environment and the training in homemaking activities for disabled persons [23, 24]. By all appearances, this theoretical omission had its practical implication: during two months after the amputation our amputees had no visit by both occupational therapist and social worker.

It is difficult to compare our results directly with those of other studies because of differences in methodology. Two months after the amputation, the majority of our amputees had mild-intensity phantom pain or residual limb pain. These results correspond to the results of some authors [15, 16, 21], in terms of the type and site of amputation-related pain. However, there is a distinction in pain intensity. In the study of Ephraim et al [21], for example, the amputees had severe pain in the period of four weeks previously. It is known that some patients suffer intense pain and others experience little pain from the same injury or condition. This may be explained by the wide individual differences in the amount of activity induced in various brain structures by calibrated noxious stimuli [26]. Beside this, in the study of Ephraim et al [21] pain was measured by 10-point numeric rating scale and 62.8% amputees were amputated because of tumor or cancer. Similarly to us, Hanley et al. [16] have found that 53% of 183 amputees had never been treated for phantom limb pain. Of the treated patients the majority had taken NSAIDs. Schoppen et al. [9] emphasized that elderly patients with lower limb amputations had weak functional capabilities a year after the amputation. They have found that 70% of 46 elderly amputees in that period lived independently at home. Yet, Wan-Nar Wong [14], who observed amputees of the mean age of 74 years, one year, has found 29.9% patients who were able to ambulate 12 month after the amputation. That is the way we explain a relatively low proportion (39%) of our amputees who successfully received prosthesis and who could walk independently two months after the amputation. In terms of functional status and physical environment, our results partially correspond with the results of Schoppen et al. [10]. Namely, these authors established that physical obstacles in the environment of 144 amputees had influenced their vocational satisfaction. Our choice of the FIM for the clinical measurement tool was good, because the findings of some authors say that it is most common clinical instrument in amputee rehabilitation [17]. Finally, our study is the most comparable with the study of Meatherall et al. [11], who investigated, among the other things, environmental adaptations and socio-cultural support in Canadian Aboriginal and Non-Aboriginal amputees. From the social point of view, their participants were in the most cases comfortable with their postamputation life. Contrary to us, the majority of their subjects received prosthesis. In terms of physical environments, their subjects had problems with the bathrooms, alike to our amputees, but these bathrooms had suitable adaptations. Family members were the most common source of housework assistants but, contrary to our, the Canadian amputees had professional help by a visiting nurse or other members of the rehabilitation team.

There are several limitations of this study related to the methodology. This is a relatively small sample size that may have limited the interpretation of some observations. We could have probably better estimate pain intensity, if we had used another pain scale along with the VAS. Additionally, we estimated intensity of the so- called "common pain" of our amputees. We did not evaluate pain intensity, separately, in all post-amputation pain categories. This question is important, because these post-amputation pain categories have different pathophysiologic pain mechanisms. It will be also interesting to analyze the clinical effects of NSAIDs and antidepressants, separately, in elderly patients with lower limb amputation. The SDRS was based on considerable conceptual work on the theme of social adjustment among the elderly. There is a little evidence of its validity. Additionally, it is not clear whether a total score or subscores offer the best way to summarize the results [25]. Finally, the SCH is a self-created scale outlined for the assessment conditions of habitation. It is used the first time. There is the need for checking reliability and validity of this and scale. In this sense, there is the need for plan for a large study about elderly amputees and the conditions of their habitation.

Conclusion

A total of 38 elderly amputees with unilateral lower limb amputations achieved significant functional improvement and diminish of pain two months after the amputation, in spite of their social dysfunction, the absence of socio-medical support and inadequacy of the conditions of their habitation.

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