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Functional outcome of rehabilitated bilateral lower limb amputees

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Abstract

The functional outcome of rehabilitated bilateral lower limb amputees was studied. The study included 31 amputees who were admitted during 1980–1990 to a rehabilitation centre in the north of the Netherlands. The clinical notes made during the patients' admission were studied to obtain information about their characteristics, while mobility and prosthetic use were studied at discharge. The patients who were alive and willing to participate in the study were interviewed by a physician at their residence in November 1992, using among other things, the Sickness Impact Profile (SIP) and the Life Satisfaction questionnaire.

Some 25 of the 31 patients were amputated for vascular reasons, 1 patient primarily for traumatic reasons and secondarily for vascular reasons, 5 patients for traumatic reasons. Eight patients had a bilateral trans-femoral amputation, 18 patients a bilateral trans-tibial amputation, 2 patients a combination of trans-tibial and knee-disarticulation amputation, 3 patients a trans-femoral/trans-tibial amputation.

Mean age at second amputation was 66.3 years. Of the 31 amputees 21 were men and 10 women, 25 amputees were prosthetically rehabilitated during admission, 3 of them died during admission and 5 did not achieve mobility at discharge. In their activities of daily life 22 of the 28 patients alive at discharge were almost independent.

At the time of the follow-up evaluation 17 of the 31 patients had died. For several reasons only 8 patients could be included in the follow-up, 6 vascular amputees and 2 traumatic amputees. Six of the 8 patients were prosthetically rehabilitated at discharge, but only 2 of them used their prosthesis at the time of follow-up, 1 vascular and 1 traumatic amputee. The SIP showed high levels of impairment for ambulation, mobility, body care/movement, work and home management. In the Life Satisfaction questionnaire all patients reported to be rather satisfied to very satisfied with life.

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Introduction

The rehabilitation of bilateral lower limb amputees is generally more intensive than that of unilateral amputees and poses a great challenge to both the rehabilitation team and the amputees themselves.

The major cause of bilateral amputation of the lower limb is an obstructive arterial disease. Other causes mentioned in the literature are trauma, infections, tumours and frostbite (Evans *et al.*, 1987; Kerstein *et al.*, 1975; McCollough *et al.*, 1972).

The clinical situation of the amputee is often complicated by associated problems due to arteriosclerosis, such as hypertension, coronary heart disease and stroke. Diabetes mellitus often contributes to the amputation and may also cause other diseases, such as kidney failure and poor vision, which determine the functional level after amputation (Kerstein *et al.*, 1975; Volpicelli *et al.*, 1983).

Since the 1960s, the amputation has been performed at more distal levels for several

reasons. At the moment, 20 to 40% of the bilateral amputees have two trans-tibial amputations, while 25 to 35% have a combined trans-tibial/trans-femoral amputation (Sakuma *et al.*, 1974; Couch *et al.*, 1977; Hunter and Holliday, 1978; Evans *et al.*, 1987; Datta *et al.*, 1992).

After intensive inpatient physiotherapy the success rate in using the prosthesis is 60-90% for trans-tibial amputees (McCollough *et al.*, 1972; Sakuma *et al.*, 1974; Couch *et al.*, 1977; Hunter and Holliday, 1978; Thornhill *et al.*, 1986; Volpicelli *et al.*, 1983; Brodzka *et al.*, 1990; Datta *et al.*, 1992). For trans-femoral amputees the percentage of success is much lower: 0-40% (Sakuma *et al.*, 1974; Couch *et al.*, 1977; Hunter *et al.*, 1978; Volpicelli *et al.*, 1983; Datta *et al.*, 1992).

Some amputees use their prosthesis only occasionally, for cosmetic reasons (Brodzka *et al.*, 1990; Wolf *et al.*, 1989). The success rate of knee disarticulation amputees is unknown. Bilateral hip disarticulation is rare. Some young amputees with bilateral hip disarticulation learn to walk with prostheses (Brown, 1970).

Most amputees, especially the bilateral trans-femoral amputees, walk with crutches or canes (Brown, 1970; Hunter and Holliday, 1978; Sakuma *et al.*, 1974).

The clinical material presented in this study was derived from *Beatrixoord* a rehabilitation hospital in Haren in the north of the Netherlands. This hospital is a sub-regional referral centre for rehabilitation, covering a population of approximately 1.3 million people.

Bilateral lower limb amputees who were admitted in the period 1980-1990 were included in the study.

The clinical notes made during the patients' admission were studied to obtain information about their characteristics, while their mobility and prosthetic use were studied at discharge. The patients who were alive and willing to participate in the study were visited by a physician at their place of residence in November 1992.

A literature search failed to yield an acceptable questionnaire for the impairments, disability and handicaps. The authors therefore compiled a comprehensive questionnaire including a self-constructed questionnaire, the Sickness Impact Profile (SIP) and the Life Satisfaction questionnaire. The self-constructed questionnaire measured the disabilities and has been tested for reliability. The SIP is a behaviourally-based measure of health status containing 136 statements about health-related dysfunction in 12 areas of activity. The score on each area of activity is between zero (no impact) and one hundred percent (maximal impact). The reasons to use the SIP are its validity and reliability and the possibility of comparison with other patients. The Life Satisfaction questionnaire is a "Quality of Life" measure. This questionnaire, used by Viitanen *et al.* (1988) in stroke patients is simple to use. Patients are asked to rate life satisfaction on one global and six specific areas. using the response categories *1: very dissatisfied, 2: dissatisfied, 3: rather dissatisfied, 4: rather satisfied, 5: satisfied, 6: very satisfied.* The Life Satisfaction questionnaire has been validated. The compiled questionnaire was administered by one interviewer.

Results

Retrospective study

The study included 31 patients, 21 men (67.7%) and 10 women (32.3%). The characteristics of the patients are summarised in Table 1.

The average age at the second amputation was 66.3 years (women 60.5 and men 69.0 years) with a range of 22-96 years. The average age of the 26 patients with a vascular disease was 72.1. The average age of the 5 patients with a traumatic amputation was 33.8. One patient had a combined vascular and traumatic amputation at the age of 84. He was included in the vascular group.

Of the 31 patients, 8 patients (25.8%) had a bilateral trans-femoral (TF/TF) amputation, while 18 patients (58.1%) had a bilateral trans-tibial (TT/TT) amputation, 2 patients had a combination of trans-tibial and knee-disarticulation amputation, while 3 patients had a TF/TT amputation.

Of the 31 patients 25 (80.6%) were prosthetically rehabilitated during their hospital stay. Three of them died during their stay. For several reasons, such as stroke and depression during admission, 5 patients did not achieve mobility at discharge. All 6 patients without prostheses attained functional independence at wheelchair level though 2 of them used the prosthesis for cosmetic reasons.

Table 1: Characteristics of the amputee (n=31)

age at amputation of second limb (Yr)	mean range	66.3 22-96
sex	male female	21 10
level of amputation	trans-femoral/trans-femoral trans-tibial/trans-tibial trans-tibial/knee disarticulation trans-femoral/trans-tibial	8 18 2 3
aetiology	peripheral vascular disease (with diabetes mellitus) peripheral vascular disease and trauma trauma	25 (13) 1 5

Of the 17 patients who had been prosthetically rehabilitated at discharge, 16 required additional upper limb gait aids. There was one bilateral trans-tibial amputee who could walk without any assistive devices.

In their activities of daily life (ADL) 22 of the 28 patients alive at discharge became almost independent, while 6 remained dependent.

The mean rehabilitation period in the clinic was 8.9 months, with a range of 1-25 months.

Follow-up

The average period between discharge from the centre and follow-up was 3.8 years (range 0.5-8.5 years).

At the time of evaluation in November 1992, 17 of the 31 patients (54.8%) had died, 4 had moved to a different address and 2 patients were too ill to be interviewed. so 8 patients were included. The characteristics of these patients are summarised in Table 2. This group included 6 vascular and 2 traumatic amputees, 5 men and 3 women. The average age at the second amputation was 61.4 years (range 22-83 years). the amputation levels were one TF/TF and 7 TT/TT. Of the 8 patients 6 were prosthetically rehabilitated and were able to walk with assistive devices at discharge. The patients without prostheses became mobile with a wheelchair.

Table 2: Characteristics of the patients at follow-up (n=8)

age at amputation of second limb (Yr)	mean range	61.4 22-83
sex	male female	5 3
level of amputation	trans-femoral/trans-femoral trans-tibial/trans-tibial	1 7
aetiology	peripheral vascular disease trauma	6 2

Table 3: Mobility and prosthetic use of the 2 prosthesis users at follow-up

	traumatic amputee	vascular amputee
maximum period of standing	5-15 min	< 5 min
to sit and to rise from a chair	possible but difficult	possible but difficult
walking distance	500-2000 m	< 50 m
stump pain during walking	once a day	never
climb and descend stairs with handrail	possible but difficult	not possible
falling	never	sometimes
bicycling	not possible	not possible
gait aid	always	always
mean period of wearing	> 5 hours a day	a whole day
donning and doffing	possible without help	possible without help

At the time of the interview 5 lived in their own home with their spouses, one lived alone, one lived in a private residents home and one in a nursing home.

After discharge 3 of the 6 prosthesis users became non-users. Three years after the initial discharge and after several further admissions one patient still had not been fitted with adequate prostheses, and she was not using prostheses at the time of the interview.

The 2 prostheses users, one traumatic and one vascular amputee, were men with a TT/TT amputation. Their ambulation and mobility with the prostheses is shown in Table 3. The scores of the SIP (means and ranges) are presented for the vascular amputees and the traumatic amputees in Table 4. Table 5 also presents data on the SIP, for the purpose of comparison with other patient groups. Examining the means for the individual category scores high levels of impairments for work and home management can be seen. As was to be expected, relatively high levels of impairment were scored in ambulation, mobility and body care/movement. The high level of impairments in work and home management, combined with sleep/rest, recreation/pastime and eating makes the independent dimension the highest of the 3 dimensions. Low levels of impairments were reported in alertness, behaviour and eating. Relatively low levels of impairment were reported in social interaction, emotional behaviour and communication.

The scores of the Life Satisfaction questionnaire (mean and ranges) are presented in Table 6. Almost all patients reported to be rather satisfied to very satisfied with life.

Discussion

The average age of all or patients at the time of the second amputation was 66.3 years. The average age at the time of the second amputation for the vascular amputees was 72.1. Both were comparable with that in similar studies (Volpicelli *et al.*, 1983; O'Toole *et al.*, 1985; Steinberg *et al.*, 1985; Thornhill *et al.*, 1986; Datta *et al.*, 1992).

As in most other surveys a predominance of men (67.7%) were among the patients. Of the prosthetically rehabilitated vascular amputees (n=6) interviewed after discharge, only one was still walking with prostheses. The percentage prosthetically rehabilitated patients dropped from 83% to 17%. This is comparable with the results of Wolf (1989) but significantly lower than those of others, who reported success rates of 83.3% (Hunter and Holliday, 1978), 71.0% (Volpicelli *et al.*, 1983) and 56.7% (Datta *et al.*, 1992). However, the populations in these studies included more traumatic amputees. The mean inpatient rehabilitation time was 8.9 months, which is much longer than in the study

Table 4: SICKNESS IMPACT PROFILE of the patients at follow-up (n=8)

		vascular bilateral amputees n=6		traumatic bilateral amputees n=2	
Dimension	Category	Mean	Range	Mean	Range
Independent	Sleep and rest	24	22-34	5	0-10
	Eating	9	0-31	0	0
	Work	70	0	9	0-18
	Home management	50	31-54	3	0-7
	Recreation and pastime	23	0-50	24	0-47
total		35	26-45	8	0-16
Physical	Ambulation	33	0-66	9	0-17
	Mobility	32	13-40	24	13-34
	Body care/movement	19	8-49	11	10-11
total		25	15-51	13	12-14
Psychosocial	Social interaction	14	0-41	6	0-11
	Alertness behaviour	5	0-27	0	0
	Emotional behaviour	15	0-40	6	0-11
	Communication	16	0-86	0	0
total		13	4-40	3	0-7
SIP total		23	14-45	8	5-11

Table 5: Comparison of the SICKNESS IMPACT PROFILE of bilateral amputees with other patient groups

Dimension	Category	Mean (S.D.) score for patients with vasc. bilat. amp (N=6)	Mean (S.D.) score for patients with CLBP (*) (N=107)	Mean (S.D.) score for patients with RA (**) (N=79)	Mean (S.D.) score for patients with a stroke (***) (N=111)	Mean (S.D.) score for controls >65 yrs (***) (N=232)
Independent	Sleep and Rest	24.3 (4.7)	28.4 (17.7)	17.6 (14.9)	17.6 (17.7)	7.5 (11.6)
	Eating	8.9 (11.5)	2.7 (4.5)	3.5 (5.5)	6.7 (10.4)	1.4 (3.8)
	Work	70.1 (0)	57.6 (24.7)	46.5 (31.4)	—	—
	Home Management	49.7 (20.1)	33.7 (18.9)	26.3 (21.0)	43.4 (27.1)	15.3 (20.4)
	Recreation and Pastime	22.6 (21.8)	35.9 (19.3)	26.7 (19.3)	38.6 (25.2)	8.9 (18.5)
total		35.1 (8.8)	30.2 (11.4)	22.8 (****)	—	—
Physical	Ambulation	32.8 (21.0)	20.5 (13.2)	21.0 (13.8)	22.9 (17.6)	8.0 (12.6)
	Mobility	32.3 (10.6)	20.2 (16.4)	10.4 (12.1)	26.0 (20.5)	10.5 (15.2)
	Bodycare/ Movement	19.4 (15.3)	15.8 (11.6)	12.7 (10.1)	19.9 (21.1)	5.4 (10.9)
total		25.2 (13.0)	17.7 (11.3)	14.0 (10.0)	21.8 (18.3)	7.0 (10.8)
Psychosocial	Social Interaction	14.4 (15.3)	31.0 (23.5)	11.7 (11.6)	12.0 (11.4)	4.4 (8.8)
	Alertness Behaviour	4.5 (11.1)	24.2 (28.2)	13.0 (17.8)	16.5 (24.7)	8.7 (16.3)
	Emotional Behaviour	15.0 (14.9)	30.6 (24.8)	13.2 (12.9)	11.6 (16.7)	3.1 (9.5)
	Communication	15.9 (34.5)	8.6 (15.5)	6.9 (8.5)	14.3 (19.4)	4.6 (10.0)
total		12.8 (14.2)	24.7 (18.8)	11.3 (9.6)	13.4 (12.6)	5.1 (7.8)
total SIP		23.3 (11.6)	23.8 (11.7)	15.6 (9.0)	20.1 (12.6)	6.8 (7.7)

* Follick *et al.* (1985)
** Deyo (1986)
*** Schuling *et al.* (1993)
**** Estimate derived from category scores.

by Datta *et al.* (1992). The literature gives an average period of rehabilitation between 12 and 30 weeks (Kerstein *et al.*, 1975; Sakuma *et al.* 1974; Van de Ven, 1981).

The mean Sickness Impact Profile scores of the bilateral lower limb amputees demonstrates that the consequences of amputation affect almost all aspects of daily life. The high level of impairments in work was to be expected, because patients had already retired, because of disability or old age. The relatively high level of impairment in home management is comparable with that of stroke patients (Schuling *et al.*, 1993) but much higher than that of patients with

Table 6: LIFE SATISFACTION of the amputees at follow-up (n=8)

	vascular amputees (N=6)		traumatic amputees (N=2)	
	Mean	Range	Mean	Range
Life in general	5	4-6	5	4-5
selfcare activities of daily living	5	4-6	6	–
leisure	5	4-6	5	4-5
togetherness with friends	5	3-6	6	5-6
togetherness with family	5	4-6	5	4-5
marriage	6	4-6	4	1-6
sexuality	5	4-6	3	1-5

1 = very dissatisfied
2 = dissatisfied
3 = rather dissatisfied
4 = rather satisfied
5 = satisfied
6 = very satisfied

rheumatoid arthritis or chronic low back pain (CLBP) (see Table 5). The individual scores on the physical dimension were high compared to those for rheumatoid arthritis and CLBP patients. In contrast to stroke, rheumatoid arthritis and CLBP patients, bilateral amputees showed fewer impairments in the recreation and pastime categories. The mean score on the psychosocial dimension is comparable to that of the rheumatoid arthritis and stroke patients. The mean score of the total SIP is comparable to that of CLBP and stroke patients.

In the "quality of life" measure patients were found to be rather satisfied to very satisfied with life. The social service system, which for example, enables home adjustments, as well as good family circumstances and the absence of cognitive disabilities were probably reasons which contributed to this result.

A lot of questions remained unanswered.

Further studies at different stages of rehabilitation and subsequent supportive care will be needed to shed more light on the functional outcome of bilateral lower limb amputees.

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