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Clinical rehabilitation of the amputee: a retrospective study

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Abstract

The aim of this study was to determine the rehabilitation outcome of lower limb amputee patients after clinical rehabilitation. Altogether 183 amputee patients admitted for clinical rehabilitation in the years 1987-1991 were reviewed by retrospective analysis of medical record data. Three groups of amputee patients were identified by reason for amputation. The vascular group: (N = 132), mean age 67 years, mean admission time 119 days, 85% prosthetic fitting.

The oncology group (N = 15), mean age 55 years, mean admission time 77 days, 60% prosthetic fitting. The traumatic amputee group: (N = 14), mean age 41 years, mean stay 134 days and 100% prosthetic fitting. Some 22 patients were bilateral amputees and were assessed separately. The most important reasons for not fitting a prosthesis were oncological metastases, stump and wound healing problems.

After rehabilitation 86% of all patients could be discharged home. These results are more favourable than those seen in previous studies.

Introduction

In the Netherlands in 1992, 1,551,945 hospital admissions were registered by the Central Bureau of Statistics (10.2 per 100 inhabitants) (Dutch Heart Foundation, 1994). These admissions included 2000 lower limb amputations. The total number of lower limb amputations, from sacroiliac to transmetatarsal level, has not changed in the Netherlands over the last 5 years (National Medical Register, 1993). Some 88% of all amputations are at trans-tibial and trans-femoral level. Detailed information on these amputees is not available at the moment. For survival rates and causes of amputation in the population we have to depend on population statistics from neighbouring countries (Fowkes 1988; Ebskov, 1991; Stewart and Jain, 1993). In the population of amputee patients age is increasing (National Medical Register, 1993). The population of amputee patients is predominantly over 60 years of age and amputation is mostly due to vascular problems. After amputation surgery most patients are seen by a rehabilitation medicine physician and after consultation the need for clinical rehabilitation is specified. Most amputees are transferred home or to a nursing home before prosthetic fitting.

Only a small percentage (approximately 15%) of this group are admitted to a rehabilitation centre. There they are trained in Aid to Daily Living (ADL) activities. There is a postoperative phase during which the stump is forming, prosthetic training with an interim prosthesis and appliance and training with a lower limb prosthesis. Patients receive an individual programme in a multi-disciplinary approach with daily individual and group exercises. The local government is informed of any home adjustments which are required.

There are also educational classes for the patients and their spouses and psychological support is given to cope with their emotional problems due to the loss of a part of the leg. Information about the rehabilitation outcome of this group of amputee patients is scarce. This article is mainly written to analyse the population of the amputee patients in a rehabilitation centre and to determine the rehabilitation outcome for this group. The authors have therefore carried out a first retrospective analysis of data in the north of the Netherlands.

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Haren provides clinical rehabilitation facilities for a catchment area of 1,000,000 people in the north of the Netherlands. The centre offers a total rehabilitation programme for patients with major disabilities. Amputee patients are managed in a separate ward containing 32 beds. The rehabilitation team consists of medical staff responsible for the overall rehabilitation treatment, nursing staff, physiotherapist, occupational therapist, speech therapist, social worker, clinical psychologist, a dietician and a prosthetist. Prosthetic manufacturing is carried out in the nearby workshop for posthetics and orthotics.

Methods

Between 1987 and 1991 in the three northern provinces of the Netherlands 1037 patients had a lower limb amputation carried out at trans-femoral, knee disarticulation or trans-tibial level. (National Medical Register, 1993). Amputation surgery is performed in all hospitals in the northern region; one university and 16 general hospitals. In order to determine which group of patients were transferred to the rehabilitation centre in the above mentioned period, all admissions to the rehabilitation centre from 1987-1991 were reviewed. All patients admitted because of a lower limb amputation were selected by their International Classification of Disease (ICD) code. All medical records were studied in order to check if the patients were admitted after amputation surgery. The selection of records of lower limb amputee patients from the above mentioned five year period were studied in detail. Information was found in the discharge letter to the patient's general practitioner or information written down by the rehabilitation team members. All selected patients were admitted for prosthetic training and application of their first lower limb prosthesis, or revision of their currently used prosthetic device. Data obtained from the medical records included: age on admission, sex, referring hospital, amputation level and side, reason for amputation, need for re-amputation, date of amputation, date of admission, length of stay, use of lower limb prosthesis on discharge, date of discharge and discharge destination. All the results were made anonymous and were tabulated on a spreadsheet database for further analysis.

Results

All amputees

In the studied period from 1987-1991, 183 lower limb amputee patients were admitted to the rehabilitation centre.

The age distribution of all 183 amputees is illustrated in Figure 1, giving an overview of

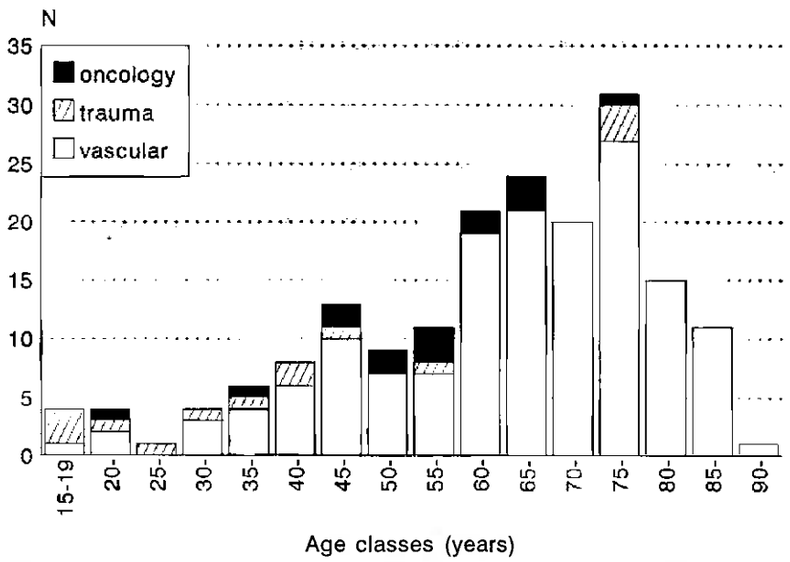

Fig. 1. Amputees admitted in 1987-1991 (N = 183). Distribution by cause of amputation and age.

Table 1. Amputation level of unilateral amputees (N = 161) with the related reason for amputation, age and sex

Amputation level	N	Reason for amputation (N)	Age (years) mean	Age (years) SD	Male (N)	Female (N)
Hemipelvectomy (HP)	3	oncology: 3	49	10	3	0
Hip disarticulation (HD)	4	oncology:3 vascular: 1	40.7 66	21 0	1 1	2 0
Trans-femoral (TF)	60	oncology: 7 trauma: 4 vascular: 49	59.1 52.2 67.2	8 17 14	6 4 34	1 0 15
Knee disarticulation (KD)	4	trauma: 2 vascular: 2	25.5 54.5	8 12	2 2	0 0
Trans-tibial (TT)	89	oncology: 2 trauma: 8 vascular: 79	68 39.6 66.6	13 25 14	2 4 41	0 4 38
Ankle disarticulation	1	vascular: 1	59	0	1	0
Total	161		63.3	16	101	60

the amputee population related to cause of amputation. The vast majority (82%) are due to vascular problems. The male : female ratio is 1.6:1. The mean age is 62.9 years (range 15-90), 68% of the patients are over 60 years of age.

The average admission time for all patients was 123 days (median 108 days; range 2-524 days).

Of these 183 patients 22 had a bilateral amputation. In the studied period 7 of these 22 were previously admitted as unilateral amputees.

Unilateral amputees

Table 1 gives an overview of all 161 unilateral amputees. It illustrates all amputation levels from hemipelvectomy to ankle disarticulation level. Altogether 154 amputations (95.7%) were performed at trans-femoral, knee disarticulation or trans-tibial level. The high level of hemipelvectomy and hip disarticulation amputation was in all but one case, due to oncological pathology. The vascular case was a re-amputation of a trans-femoral amputation due to wound complications. The vascular group includes most cases: 132/161 = 82.0% of all unilateral amputees. Their mean age was 66.6 years and the mean admission time in the centre was 119 days. In this group 85% of the amputees could successfully be fitted with a lower limb prosthesis.

The admitted group of amputees after an oncological lower limb amputation was rather small: 15/161 = 9.3%. Their mean age of 55.2 years was less than that of the vascular group. The mean admission time in this group was 77 days. Sixty percent of these amputees were successfully fitted with a prosthesis.

The trauma group includes 14 patients (14/161 = 8.7%) and was youngest with a mean age of 41.2 years. Their mean period of admission of 134 days, was slightly less than that of the vascular group. In the trauma group all amputees were successfully fitted with a prosthesis.

Of all 161 unilateral amputee patients admitted 83.9% were successfully fitted with a prosthesis on discharge. As shown in Table 2; 26 of these unilateral amputee patients were discharged without a prosthesis. Twenty (20) of them were vascular patients and 6 of them were amputated due to oncological problems. Metastases, stump problems, and wound healing problems were reported in 57.7% of the cases. Five (5) of these 26 amputees were able to use a prosthesis after continuation of their training in outpatient rehabilitation treatment. After the clinical rehabilitation period and outpatient treatment 139/161 = 86.3% of the unilateral amputee patients could use their prosthesis in their own environment.

After clinical rehabilitation 151 of the 183 patients could be discharged home. Five (5) of the 12 patients living in a home for the elderly, were discharged back to their previous environment. Eight (8) patients were discharged to a nursing home. Eleven (11) amputees were

Table 2. The unilateral amputees discharged without a lower limb prosthesis (N = 26). Indication problems preventing use of a prosthesis with related average age, average admission time and discharge destination. (HP = Hemipelvectomy; HD = Hip disarticulation; TF = Trans-femoral; TT = Trans-tibial

Reason for not using a prosthesis	N	Age (years) (mean)	Level	Admission time (days) (mean)	Discharge destination	Prosthesis after discharge yes/no
metastases, oncology	5	61.6	HD 1	42.2	hospital	no
			HD 1		home	yes in out-treatment
			TT 3		hospital: 3	no
Stump problems	5	63.8	TF 4	112.2	hospital: 2	no
					h. elderly: 1	no
					home: 2	yes 1 in out-treatment
			TT1		hospital: 1	no
Wound healing problems	5	57.6	HP 1	78.6	hospital	no
			HD 1		home	yes in out-treatment
			TF 1		home: 1	no
			TT 2		hospital: 2	no
Fractures	2	58	TT 2	31.5	h. elderly: 1	no
					home: 1	no
Mental disorders	2	74.5	TF 1	148.5	nurs. hom-psych	no
			TT 1		nurs. home	no
Fear of walking	1	37	HP 1	72	home	no
Internal problems	1	60	TT 1	79	hospital	no
ADL problems	2	77.5	TF 1	37	home	no
			TT 1		home with family	no
Conditional problems	1	66	HD 1	91	home	yes in out-treatment
Dead	1	78	TT 1	32	home	no
Unknown	1	31	TT 1	28	home	yes in out-treatment
Total	26	61.8		73.1 (SD 61.88)		

discharged to a hospital due to complications after surgery or because of internal and oncological complications. After the rehabilitation treatment 86% of all patients could be discharged to their own environment.

The bilateral amputees

The 22 bilateral amputees were studied separately. This is because a bilateral amputee has specific problems during the rehabilitation process. Not only does the patient have to train with two prostheses but also the increased energy requirement needs special attention.

The 22 bilateral amputees, mean age: 59.5 years (range 17-83), were studied by amputation level.

All patients were admitted for prosthetic training. The average admission time was 170 days (range 15-524 days).

Table 3 illustrates the amputation level on

Table 3. Bilateral amputees (N = 22) with individual amputation level, age, sex, time between unilateral and bilateral amputation, and admission time (TF = Trans-femoral; KD = Knee disarticulation; TT = Trans-tibial).

Amputation level		N	Reason for amputation	Age (years)		Sex		Time between amputations (days)	Admission time (days)
L	R			mean	range	m	f		
TF	TF	3	Vascular	67.5	64-70	1	2	528	121.6
TF	TT	1	Vascular	79		1	0	2992	190
KD	TF	1	Vascular	42		0	1	103	209
KD	KD	1	Vascular	17		0	1	0	316
KD	TT	1	Vascular	68		1	0	2807	107
TT	TT	11	Vascular	67.5	32-83	8	3	462	155.5
TT	TT	4	Trauma	39.5	22-46	1	3	0	221.7
Total/mean				59.5	17-83	12	10	571	170

both sides of all bilateral amputees. Some 18.2% were due to traumatic causes, 81.8% of the bilateral amputations were caused by vascular problems.

The average time between first and second limb amputation was 571 days. All traumatic amputees underwent amputation on both sides in the same surgical session. The discharge destination of the bilateral amputees after clinical rehabilitation was as follows:–

Home: 18 (81.8%); Home for elderly: 2 (9.1%); Nursing home: 1 (4.5%); Hospital: 1 (4.5%). After rehabilitation 15/22 (68.2%) of the bilateral amputees were fitted with prostheses on both sides. The 4 bilateral trans-tibial traumatic amputees were able to walk without walking aids. They were all discharged home. Of the 18 vascular amputees 11 received a prosthesis on both sides; 7 patients were discharged without a lower limb prosthesis (Table 4). They were all vascular amputees with multiple medical problems. In most cases stump problems and general condition were the most important reason for not using a prosthesis.

Discussion

The group investigated is a selection of the total amputee population in the 3 northern provinces of the Netherlands. Of all unilateral amputees 85% were fitted with a lower limb prosthesis, which they used frequently. In this group the results are more favourable compared with other authors (Beekman and Axtel, 1987; Houghton *et al.*, 1992). Helm *et al.* (1986) found comparable results with the findings reported. In the rehabilitation group admitted to the rehabilitation centre 68% of the amputees were over 60 years of age. The reason for amputation in 82% of the cases was due to vascular problems. This correlates well with the results of Stewart and Jain (1993) in Dundee.

The proportion of oncology amputees in this study is larger than in other series (Ebskov, 1991). This may be due to the presence of the university hospital in the area, where there is access to special facilities for cancer treatment. Oncology amputations are more often proximal at hemipelvectomy and hip disarticulation level, and need special attention to prosthetic fitting. Using a prosthesis with this high level of amputation demands extra energy (Fowkes, 1988; Jaegers, 1993). The oncology group (mean age 55.27 years) was relatively young and 60% of these amputees were successfully fitted with a prosthesis. Amputation level selection in this field of amputation surgery depends primarily on the location and nature of the tumour.

The average admission time in this small group was 77.73 days. The traumatic group was the youngest (mean age 41.21 years). Amputation was mostly due to traffic accidents and accidents with agricultural farming machines. All traumatic amputees were fitted with a prosthesis. This group is in good general condition and is able to deliver the extra energy required for walking with a prosthesis. Six (6) patients had training for their first prosthesis. Others were admitted in order to revise their existing prosthesis. The relatively long admission time (134.15 days) can be explained by the need for stump revision and the prosthetic problems that had to be solved for adequate function. The patients admitted for renewal of their prosthesis had an admission time of 93 days. The age of vascular amputee

Table 4. Bilateral amputees discharged without a prosthesis (N = 7). Amputation level, age, reason for not fitting a prosthesis and discharge destination are displayed. (TF = Trans-femoral; KD = Knee disarticulation; TT = Trans-tibial).

Amputation level			Reason for not fitting		Discharge
L	R	Age	a prosthesis	Sex	destination
TF	TF	69	general condition	F	Home
TF	TF	64	stump problems, takes wheelchair	M	Home
TF	TF	70	general condition	F	Hospital
KD	TF	42	hand problems, dialysis	F	Home
TT	TT	75	stump problems, depression	M	Home for elderly
TT	TT	65	prefers wheelchair	F	Home with family care, advice nursing home
TT	TT	66	stump problems, in 1993 mobilisation with prosthesis	F	Home

patients is predominantly greater (mean age 66.77 years).

This group is comparable with other studies in this area (Boontje, 1980). The average admission time was 119 days which is shorter than for the traumatic amputee group. The vascular group consists of vascular and diabetic patients. In a lot of cases vascular surgery was performed prior to amputation as is advised by the European Consensus Group on Critical Limb Ischemia (Deerochanawong *et al.*, 1992).

The vascular amputees receive a personal training programme. Stair climbing and bicycle riding training will be provided if necessary. Even the amputees over 90 years of age can successfully be fitted with a prosthesis if their general condition is good. The overall quality of life of amputees is likely to be enhanced by focusing rehabilitation efforts on improving mobility (Pell *et al.*, 1993). The authors realise that approximately 15% of all lower limb amputees in the region are admitted to a rehabilitation centre to obtain a prosthetic device if possible. Little is known about the provision of lower limb prostheses in nursing homes and homes for the elderly. More study is needed in this field. Buyk and Stephan (1988) showed that most patients who were provided with a prosthetic device used it a long time after discharge from hospital. After clinical rehabilitation 86% of patients could be discharged home (5 of the 13 patients discharged to a home for the elderly lived there already before the amputation). This result is consistent with those of Ebskov (1991) who stated that 84% of patients returned to their homes. This only applied to trans-tibial amputees. It is not clear however if these patients were fitted with a prosthesis. Amputees were discharged to a hospital either to undergo a contralateral amputation or because of life threatening internal or oncological problems.

Long admission time is not only caused by poor rehabilitation progress but also by the delay in transfer to the discharge destination. Special attention needs to be given to those people who are discharged without a prosthesis. Their average admission time was 81 days. Even if a patient is not fitted due to stump, fitting or conditional problems he is trained in using walking aids, wheelchairs and making transfers and using bath and toilet facilities, in order to live independently at home. A small group of patients with mental disorders due to vascular problems were thought unsuitable for prosthetic training (Lavan, 1991; Pohjolainen and Alaranta, 1991; Pinzur *et al.*, 1992). In the group studied 2 patients could not sufficiently be trained in using a prosthesis. However, this is highly individual among patients with moderate mental disturbances (Stewart and Jain, 1993). In the authors' opinion in this group prosthetic training can always be very useful for living independently at home.

Bilateral amputees are a special group with specific problems. The average admission time was 170 days. All but four were vascular patients. The young traumatic amputees in the group were able to use their prosthesis without walking aids. Fifteen (15) patients, out of the group of 22, were successfully fitted with a prosthesis. According to Bodily and Burgess (1983) it is known that, after the first amputation, in 50% of the cases a contralateral amputation is necessary within 24 months. In the current study the mean time between unilateral and bilateral amputation was 19 months. Because of the growing group of older age amputees the bilateral lower limb amputee group will increase in the future.

Conclusion

In this article 183 lower limb amputees referred for clinical rehabilitation were evaluated. After clinical rehabilitation 86% of all amputee patients were successfully fitted with a lower limb prosthesis.

There were three different groups:

1. the elderly vascular group where 85% of the amputees were successfully fitted with a prosthesis.
2. the small oncology group with high amputation levels where 60% were fitted with a prosthesis.
3. the trauma group with the youngest amputees, where all unilateral and bilateral amputees were fitted with a prosthesis.

The average admission time for all groups was 119 days. Eighty-five percent (85%) of the patients could be discharged home, most of them functioning adequately with a prosthesis. The main reason for some amputees not being fitted with a prosthesis were oncology complications, poor wound healing, and problems with their general condition. Stump problems and fitting difficulties were also

encountered. It was found that after clinical rehabilitation even without a prosthesis the amputee was trained in using walking aids, wheelchairs and making transfers and using toilet and bath facilities, enabling them to live independently at home. A successful prosthetic fitting offers the amputee mobility and often the possibility to return home after a lower limb amputation.

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