

Epidemiology of lower limb amputees in Southern Finland in 1995 and trends since 1984

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Abstract

The purpose of this study was to look at the current epidemiological trends of lower limb amputees in 1995 and the trends since 1984 in the area of Southern Finland with 1.3 million inhabitants.

During the one-year period, the lower limb amputation was performed on 366 patients. The overall amputation rate has been unchanged since 1984 being 28.0 per 100,000 inhabitants in 1995. The mean age was 71.4 years. The overall amputation rate was 28.0 per 100,000 inhabitants. Of the 366 patients in the study 30% had arteriosclerosis without diabetes mellitus and 49% had diabetes. Diabetes mellitus has become the most common cause of amputation since 1985. Tumours were the cause in 2% and trauma in 4%. The most common unilateral amputations were trans-femoral amputations (29%) followed by trans-tibial amputations (28%) and toe amputations (24%). The unilateral trans-tibial/trans-femoral ratio was 0.54 in 1984 and 0.95 in 1995. The one-year mortality rate was 39% in 1984 and 40% in 1995.

The rate of amputation has been relatively constant over the last ten years. The age related incidence in the older age groups has also been unchanged over the last ten years. Better control of diabetes and prophylactic foot care of diabetics can have a positive contribution in prevention of lower limb amputations. The current rehabilitation and prosthetic services of the lower limb amputees can be planned in the south of Finland on the basis of the incidence of

28 per 100,000 inhabitants.

Introduction

Amputations resulting from end-stage peripheral vascular diseases are a common health problem. Amputations of the lower limb have been increasing in number not only because of the increasing number of elderly people in the population (Jones, 1990; Pohjolainen and Alaranta, 1988; Rommers *et al.*, 1997) but also because of factors such as diabetes, smoking, nutrition and lowered physical activity. Diabetes mellitus appears to accelerate both the progression and the initial development of occlusive peripheral arterial disease (Coffman, 1991; Lepäntalo and Lassila, 1991). Some studies have found that hypertension, high serum cholesterol and high triglyceride levels are associated with an increased risk of peripheral arterial disease (Fowkes, 1989; Siitonen *et al.*, 1993).

Despite the extensiveness of Finnish medical statistics compiled by the National Board of Health, no regular official reports are available on the number and types of amputation and size of the amputee population. There are no general official statistics on the number and type of prostheses prescribed in Finland. In Denmark (Ebskov, 1986) and in the Netherlands (Rommers *et al.*, 1997) there are amputation registers. These register data concerning all major lower limb amputations performed in the Danish and Dutch hospitals. In Finland, there is a specific requirement for lower limb amputee statistics for the planning of preventative, operative and rehabilitative activities and evaluation of future needs in personnel, facilities and funds. The aim of the study was to

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Table 1. The trends in the amputees in four surveys of the same area.

	1984-85	1989	1992	1995
Incidence per 100,000	32.5-28.1	22.0	27.4	28.2
TT/TF* ratio	0.54	0.57	0.78	0.95
Mortality during two post-operative months among unilateral amputees				
TF	32%	28%	32%	28%
TT	17%	16%	19%	17%
Mortality of all the amputees during the first postoperative year	39%	36%	37%	40%

*TT=trans-tibial

TF=trans-femoral

determine the incidence, causes and levels of lower limb amputations and the survival of amputees. Similar cross-sectional analyses have been performed earlier three times by the same research group for the years 1984-1985 (Pohjolainen and Alaranta, 1988), 1989 (Lääperi *et al.*, 1993) and 1992 (Alaranta *et al.*, 1995). Local and national data would be compared with these previously published studies about amputation surgery and rehabilitation of the lower limb amputees over the last 10 years.

Material and methods

To assess the epidemiological situation concerning amputees in Southern Finland the data on all limb amputations made in all the 13 operative units in the catchment area of the Helsinki University Central Hospital were collected for the period 1995. The data are based on the population of 1,305,550 inhabitants. The patients' hospital records were examined and data concerning demographic factors, diagnoses and amputation levels and postoperative complications were recorded. Mortality during

the one-year follow-up was investigated in collaboration with the national Social Insurance Institution.

Results

During the one-year period, lower limb amputation was performed on 366 patients. Of the 366 patients, 188 (51%) were female and 178 (49%) male. The mean age was 71.4 years. The overall amputation rate was 28.0 per 100,000 inhabitants (Table 1). Of the 366 patients in the study 30% had arteriosclerosis without diabetes mellitus and 49% had diabetes (Table 2). During the survey period 1984-1995 diabetes mellitus has become the most common reason for lower limb amputation. Vascular insufficiency resulting from embolic disease was the primary cause of amputation in 3%. Tumours were the cause in 2% and trauma in 4%.

The most common unilateral amputations were the trans-femoral amputations (29%) followed by trans-tibial amputations (28%) and toe amputations (24%) (Table 3). The ratio between the trans-tibial and trans-femoral

Table 2. The causes of amputations and the mean age of amputees in this study (1995) and in the same catchment area in 1984-1985, 1989, 1992 and 1995.

Cause of amputation	1984-1985 (%)	1989 (%)	1992 (%)	1995 (%)
Diabetes mellitus	40.7	42.5	47.7	49.2
Arteriosclerosis	43.1	36.2	30.7	30.1
Embolism	3.8	2.6	4.9	2.7
Tumour	2.4	2.2	1.2	1.9
Trauma	2.4	6.4	6.6	4.4
Frostbite	4.4	1.5	2.3	0.5
Miscellaneous	3.5	8.6	6.6	11.2
Total	100	100	100	100
Age (yrs)	71	70	70	71

Table 3. Distribution of amputations according to level of amputation in 1995.

Type of amputation	Number of amputations	Per cent
Hemipelvectomy	4	1
Trans-femoral	106	29
Trans-tibial	101	28
Ankle*	4	1
Tmt+toe amputation	89	24
Bilateral amputations	62	17
Total	366	100

*Includes Chopart, Pirogoff and Boyd amputations

amputations was 0.95. Among the 366 patients 40% died within the first postoperative year (Table 1). The mortality was higher in patients with the trans-femoral amputation than the trans-tibial amputation.

Discussion

Apart from the data in this study and the earlier studies of the same study group (Alaranta *et al.*, 1995; Lääperi *et al.*, 1993; Pohjolainen and Alaranta, 1988) only two studies (Jones, 1990; Rommers *et al.*, 1997) give an overview of all amputations of all hospitals of the defined area. In most other studies the data refers only to a single hospital or only the vascular groups are taken into account (Dawson *et al.*, 1995; Siitonen *et al.*, 1993; Tunis *et al.*, 1991; Wahlberg *et al.*, 1994) or bilateral amputees (Cumming *et al.*, 1987) and traumatic and tumorous amputations (Liedberg and Persson, 1983) and foot amputations (Ebskov *et al.*, 1994) are excluded.

The amputee rate was 15.2 per 100,000 inhabitants in 1972 in the same area (Solonen *et al.*, 1973). The rate of lower limb amputations has clearly increased in the studied area compared with 1972 (Solonen *et al.*, 1973). The age related incidence in the older age groups has been the same over the last ten years also (Table 4) and the rate of amputation has been relatively constant over the last ten years (Table 1). According to the predictions of the Central Statistical Office of Finland the overall age structure of the population will continue to shift upwards causing a twofold increase in the proportion over 60-year-olds in the next 25-30 years and an increase in the amputation rate may be expected in Finland within the next 30 years.

The incidences reported above are very close

to the figures reported by Liedberg and Persson (1983) 32.0 per 100,000 inhabitants in Sweden and Eickhoff (1993) 32.2 in 1983 and 25.0 in 1990 in Denmark and Tunis *et al.* (1991) 28-32 in 1979-1985 in the USA. Jones (1990) found lower incidences in three Australian states 23.6 in 1984 and Rommers *et al.*, (1997) 18-20 in 1982-1993 in the Netherlands.

Lindholt *et al.* (1994) and Luther (1993) have concluded that vascular surgery can decrease lower limb amputations 25-65%. Some operative units in Southern Finland have developed their vascular laboratory service. Good results are reported for femorocrural vein bypass. The results are less good for prosthetic femorocrural bypass (The Vascular Surgical Society of Great Britain and Ireland, 1996). However, no reduction in amputation rate in association with an increase in the rate of bypass surgery has been shown in the USA (Tunis *et al.*, 1991). It was suggested that this observation contradicts the importance of improving and increasing vascular surgical services in prevention of amputations.

It was found in this study that 82% of the lower limb amputations were due to vascular and diabetic pathology. Diabetes mellitus has become the most common cause of amputation and the proportion of diabetes mellitus as the cause of amputation is increasing. Diabetes mellitus is a particularly important risk factor for severe ischaemia and amputation, since it is

Table 4. Annual incidence of amputations in different age groups in 1985 and 1995.

Age group	1985	1995
0-59 yrs		
Number of amputees	68	67
Population	985,963	1,103,001
Number per 100,000	6.9	6.1
60-70 yrs		
Number of amputees	70	78
Population	88,594	100,212
Number per 100,000	79.0	77.8
> 70 yrs		
Number of amputees	190	221
Population	90,060	102,337
Number per 100,000	211.0	216.0
All age groups		
Number of amputees	328	366
Population	1,164,617	1,305,550
Number per 100,000	28.2	28.0

frequently associated with distal disease less suitable for arterial reconstruction (Golledge, 1997). Better control of diabetes mellitus in diabetic patients, patient education regarding foot care, early recognition of foot lesions, local care of lesions and aggressive treatment of infection play important role in prevention of amputations and can decrease lower limb amputations. Smoking is the most important aetiological factor for peripheral arterial disease (Golledge, 1997). In Finland, smoking habits have changed and smoking is decreasing. These factors may be explanations of why the numbers of amputations have not increased although the numbers of people in older age groups have increased in the study area.

After the earlier epidemiological surveys there were increasing activities to inform medical and rehabilitation staff about amputee problems. The ratio between trans-tibial and trans-femoral amputations was 0.54 in 1984 and in this study 0.95 (Table 1). There is little positive trend concerning amputation levels.

Survival figures showed that 60% of the patients were alive after one year. The mortality rate during the first postoperative year has not changed (Table 1). Patients undergoing lower limb amputation for arterial occlusive disease have multisystem medical problems that complicate their care and contribute to mortality. There is a very high prevalence of disability associated with feet among persons aged 65 and over (Williamson *et al.*, 1987). Many foot problems and abnormalities are poorly reported to physicians, and there is also the possibility that some doctors have managed to convey an impression of low interest in these conditions and little optimism about their ability to help (Williamson *et al.*, 1987). Limb ischaemia may worsen and extensive necrosis, uncontrolled sepsis and other complications increase the postoperative mortality. Prophylactic foot care is encouraged and medical personnel are taught to give attention to arteriosclerotic and diabetic feet.

Conclusions

The study shows that the incidence of lower limb amputations has been relatively constant over the last ten years. The current rehabilitation and prosthetic services of lower limb amputees can be planned in the south of Finland on the basis of the incidence of 28 per 100,000

inhabitants.

The risk of becoming an amputee rises with increasing age. The age structure of the population should be taken into account with a view to planning the rehabilitation of lower limb amputees.

More efforts to activate both prevention of amputations and prosthetic rehabilitation should be continuously emphasised. Diabetes has become the most common cause of amputation. Better control of diabetes and prophylactic foot care of diabetics can make a positive contribution in prevention of lower limb amputations.

The low trans-tibial/trans-femoral ratio of 0.54 in 1984-1985 has improved but is not yet satisfactory. More emphasis must be put on the concept of preserving the knee joint and the importance of preoperative assessment of vascular patients.

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