

## An audit of amputation levels in patients referred for prosthetic rehabilitation

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### Abstract

Most lower limb amputations in the United Kingdom (UK) are carried out within general surgical, orthopaedic and plastic surgical units of district hospitals. This study of patients referred for rehabilitation was undertaken to determine the number and speciality interests of surgeons referring amputees, the numbers referred by each and, as one of several possible measures of appropriateness for rehabilitation, the amputation levels in patients referred for the first time to one sub-regional Disablement Services (limb fitting) Centre (DSC) over a 14 month period. Thirty nine surgeons, referred 263 amputees. The majority (61%) of surgeons referred 5 or fewer: a nucleus of 11 vascular surgeons (28%) referred 64% of the patients. The underlying pathology, speciality interest of the surgeon or numbers referred by individual surgeons had no relation to final healed level which was below the knee in 55% of cases compared to national figures for all other DSC's ranging between 39% and 48% below-knee between 1981 and 1988.

Since current practice in the UK is to refer all but the frailest patients for consideration of prosthetic rehabilitation, this study suggests that, nationally, more patients could be suited for the functionally superior below-knee level of amputation than are currently benefiting from it.

### Introduction

In the aftermath of the McColl report (Department of Health and Social Security, 1986) and in the light of plans for the assumption of responsibility for amputee

rehabilitation by the UK Regional Health Authorities in 1991, there has been increased interest in amputation surgery generally and increased need for information on which to base future plans. This small study of amputations carried out within the catchment area of the Newcastle Disablement Services Centre (DSC) is aimed at determining the number of consultant surgeons referring amputees for rehabilitation, the numbers referred by each, the speciality interests of those surgeons and relating these to the final healed level of amputation — the latter being one of the most important determinants of rehabilitation outcome. The catchment area covers 8 health districts containing a population of 1.9 million. The study involves all amputees who were referred for *consideration* of prosthetic rehabilitation. Post-operative deaths or those who were considered too frail for referral for a prosthesis were excluded. The final decision in whether to proceed with prosthetic fitting was taken by the DSC rehabilitation team.

### Methods

The names of all patients first referred to the Newcastle DSC during the 14 month period up to July 1988 were retrieved from the centre's database. The case notes were perused noting name of surgeon, "cause" of amputation and level of final healing. Thus, a profile could be constructed giving numbers and levels for each surgeon over the period. The major speciality interest (Orthopaedic, General, etc) of each surgeon was noted and, for general surgeons, those with a declared sub-speciality interest in vascular surgery were identified.

### Results

Amputees were referred by 39 surgeons — 7 orthopaedic, 1 plastic and 31 general. Of the

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Table 1. Number of amputations referred by individual surgeons.

No. of amputations	No. of Surgeons	Total amputations
1-5	24	55
6-10	5	50
11-15	6	78
16-20	3	52
21-25	0	0
26-30	1	28
Total	39	263

general surgeons, 12 were identified as having a special interest in arterial surgery.

A total of 263 amputees were referred by surgeons of the following specialty distribution: — Orthopaedic 13, plastic 1, general 249. Some 87% of all amputations were for vascular disease (including diabetics). The numbers of amputees referred by individual surgeons are shown in Table 1. The majority (61%) referred five or fewer amputees during the study period. A group of 11 surgeons (28%) referred 10 or more each (one referred 28). Between them, these 11, all noted as having a vascular interest, referred 168 amputees (64% of the total).

The amputation levels achieved are given in Table 2. Some 242 (93%) were either above or below-knee amputations, the remainder around the knee (6%) or ankle/partial foot (2%). Since the critical factor for the success of prosthetic rehabilitation is the presence of the knee joint, the term "above-knee" (AK) in the remainder of this report will include through knee and Gritti Stokes amputations and "below-knee" (BK) will include Symes and partial foot amputations. The surgeons referring 10 or fewer amputees per year achieved 43 (45%) AK and 52 (55%) BK levels. The corresponding results for the 11 (vascular) surgeons who referred 10 or more amputees per year were 75 (44%) AK and 93 (56%) BK.

## Discussion

Although surgical factors such as quality of the myoplasty and character of the scar are important influences on the stump/prosthetic socket interface, it is the level of amputation

which is the most important surgical determinant of rehabilitation outcome (Waters et al., 1976) and which has therefore been considered alone in this study. The overall BK rate of 56% in-patients referred by surgeons in the 8 health districts studied compares favourably with a reported national average among attenders at all DSC's of 41% between 1981 and 1985 (Ham et al., 1989) and 48% in 1988 (Department of Health, 1989). Whilst the study population was heterogeneous in terms of the nature, extent and location of pathology leading to the amputation, the uniformity of amputation levels across the whole group of surgeons was striking, no differences being observed in the BK rates of occasional amputators, frequent amputators or vascular surgeons. Surgical policies towards amputations resulted in a 55% BK rate for all amputees considered to be candidates for prosthetic rehabilitation regardless of the indication for the amputation, or whether or not performed by a surgeon with a specialist vascular interest.

It was not possible to access the impact of any prior vascular surgical management on level of amputations since the details of arterial reconstruction procedures were often incomplete at referral to the DSC. It has been suggested that a failed attempt at limb salvage by arterial reconstruction can lead to an amputation at a higher level than could otherwise have been achieved by primary amputation. (Szilagyi et al., 1979; Kazmers et al., 1980; Gregg, 1985; Sethia et al., 1986.) The author's results do not point to any such effect since the BK rate is the same in the "vascular surgical" group as in the remainder.

The annual referral rate of amputees in the Newcastle area as revealed by these results is 13.1 patients per 100,000 population compared with the national average of 8.9 per 100,000 (Department of Health, 1989). This difference probably reflects the known high incidence of smoking and of arterial disease in general in the North East. However a prospective study of amputees is now underway aimed at investigating the incidence of prior vascular

Table 2. Final levels of healing in 263 amputations.

Above-Knee	Below-Knee	Through Knee	Gritti Stokes	Symes	Forefoot
100 (38%)	142 (54%)	3 (1%)	14 (5%)	1 (1%)	3 (1%)

assessment and reconstruction and to access its relationship to the amputation rate in the area (McCullum, 1988).

There were 17 amputations through or close to the knee. Although there is some enthusiasm for "perigenicular" amputations amongst surgeons (Houghton et al., 1989), there is less so amongst rehabilitationists. In a group of patients referred specifically for prosthetic rehabilitation one would hope to see very few such amputations since they inevitably result in a protuberant uncosmetic knee joint even with modern modular prostheses. They are best avoided on patients who are likely to be candidates for prosthetic rehabilitation, but in patients who are destined for a wheelchair existence, the longer stump may be an advantage. These considerations underline the importance of a careful, combined surgical-prosthetic assessment preoperatively.

The case for the establishment of specialised amputation units (Department of Health and Social Security, 1986) is not proven by these results. The fact that a BK rate in patients referred for prosthetic rehabilitation well above the national average is achievable in one geographical area must be a reflection of surgical attitudes, and points up the potential for improvement in BK rates nationally simply by changing surgical policies. If amputation surgery units were to be established, any improvement in BK rates could be mis-attributed to the existence of such units in view of the increasing national trend towards more BK amputations which has already been observed during the present decade (Ham et al., 1989; Department of Health, 1989) and which would be accelerated by the more general adoption of updated amputation practices. Whether some authors' declared objective of a BK : AK ratio of 2.5:1 (Dormandy and Thomas, 1988) is realistic is likely to depend more on the use of special tests for level selection (Burgess et al., 1982; Yamanaka and Kwong, 1983; Dowd, 1986), than on the existence of amputation units. There are however undoubted benefits from the establishment of local, sub-regional, in-patient units for intensive *rehabilitation* of amputees (Jamieson, 1982; Ham, 1988). More amputee rehabilitation units should be set up — preferably in association with local vascular surgical units, in which increasing interest in

and refinement of amputation surgical objectives would naturally follow.

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