

## A survey of amputations at Dodoma Regional Hospital, Tanzania

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### Abstract

A survey of 143 amputations performed at Dodoma Regional Hospital, Tanzania between 1983 and 1988 is presented. Consideration is given to indications for amputation, amputation levels, stump revision and supply of prostheses.

### Introduction

Tanzania, with a population of some 23.5 million people, has only ten orthopaedic surgeons, some 50 physiotherapists, and less than 20 orthopaedic technologists using five orthopaedic workshops. The two orthopaedic technologists in Dodoma Orthopaedic Workshop were trained locally at the TATCOT school in Moshi.

Dodoma Regional Hospital, with 400 beds, covers the main specialities and cares for a population of about 1.2 million people of Dodoma Region of Tanzania. The Orthopaedic Department cares for approximately 3 million people in the central zone of Tanzania, and is one of the three orthopaedic centres in the country.

Most of the patients are drawn from the rural areas, where agriculture and livestock raising are principal activities. Proper health care and health consciousness is not universal. Some "services" are offered by traditional healers and that combined with the lack of reliable and universal transport plays a role in delaying proper treatment in many cases.

Between 1983 and 1988, 1,759 major orthopaedic operations were carried out at the hospital, and of these, 143 were major amputations of the limbs (8%). Table 1 indicates the prevalence of the amputations compared with other surgical conditions. It can be seen that the percentage of amputations has remained static over the period of five years. Table 2 indicates the levels of amputation. The causes of amputation will reveal the reason for the prevalence of amputation at or below-knee level.

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Table 1.

Prevalence of amputations compared to all operations.

Year	Operations	Amputations	%
1983	142	7	4.9
1984	275	23	8.4
1985	246	24	9.8
1986	277	26	9.4
1987	395	34	8.6
1988	424	29	6.8
Total	1759	143	8.1

Dodoma hospital is not able to undertake sophisticated investigations, such as skin perfusion pressures, Laser Doppler velocimetry and radioisotope clearance rates, to investigate blood flow in limbs. The incidence of peripheral vascular disease is so low (only one case of diabetic gangrene in our series) that this does not form a serious obstacle to the determination levels of amputation.

### Indications for amputation

Table 3 lists the indications for amputation. Some 38% of amputations were carried out because of tumours. Apart from sarcomas of bone (7) and soft tissues (5), most of the tumours were carcinomas in long standing tropical ulcers combined with infection and destruction of the underlying bone (Fig. 1).

Table 2. Prevalence of amputations by level.

Level of Amputation	Number
Above-knee (AK)	35
Through-knee (TK)	8
Below-knee (BK)	67
Above-elbow (AE)	12
Below-elbow (BE)	7
Other amputations	14
Total	143

Table 3. Prevalence of amputations by indication.

Indications for amputation	Number
Tumour	55
Metabolic	30
Trauma	24
Infection	10
Iatrogenic	10
Burns	8
Miscellaneous	6
Total	143

Metabolic conditions and arteriosclerosis are uncommon causes of gangrene, compared with industrial countries. Only one amputation could be clearly related to diabetic vascular disease in this group; it is also difficult to specify how many amputations were really caused by typical arteriosclerosis, for the history and clinical picture of some patients were not fully convincing. A pathologist is not available at Dodoma, so that the causation can not be confirmed.

There were 24 traumatic amputations. They were caused by criminal acts, usually axes (5), train injuries (4), motor accidents (4), injuries at work (3) and the remainder by casual accidents.



Fig. 1. Tropical gangrene.

Acute infections included four cases of osteomyelitis, which is a common condition in developing countries. There were two cases of gas gangrene, and four severe infections following open trauma of the lower limbs.

Iatrogenic causes included a variety of conditions, ranging from topical herbal treatment to relieve pain in the extremities, to postoperative gangrene and gangrene arising from plasters that were too tight.

Four amputations were carried out for dry gangrene of the foot following the application of a local liquid on razor cuts. The "drug" appeared to cause prolonged vasoconstriction or/and chemical damage of the peripheral vessels, although it could be that gangrene was already established.

Three lower limb amputations were carried out in two poliomyelitis patients after one-stage corrections of severe flexion contractures of hip and knee joints that led to excessive stretching of the popliteal vessels with obliteration of the lumen. Three upper limb amputations were due to unpadded plasters applied by unqualified personnel, with no instructions or warnings to the patient or relatives.

Burns in epileptic patients following falls into fires, resulted in tissue necrosis and severe infection which demanded amputation.

Miscellaneous causes included three amputations for Madura foot. This fungal infection was responsible for destruction of the bony architecture of the foot, the formation of multiple discharge sinuses and subcutaneous abscesses, severe pain and complete loss of function. Three amputations were done for snake bites. The amputations due to snake bites were related to ischaemic limb necrosis partly caused by the venom, and partly because of prolonged ischaemia due to a tourniquet. There was one case of a congenital cavernous lymphangioma which produced a leg weighing 15kg.

Many of the indications related to conditions associated with a tropical country, with relatively few associated with arteriosclerosis and relatively few due to trauma.

### Revision of amputation stumps

Fifteen patients had revision of the amputation stumps. Only two underwent revision because of inadequate blood supply to the amputation stump necessitating amputation at a higher level.

The majority of revisions had chronic infection of the stump. Sinuses were often present, four caused by osteomyelitis, and nine by foreign body in the form of thread in the sinuses. There was some doubt about the method of sterilisation of the thread in some hospitals, and also its use

in the presence of infection. Treatment was by excision of the wound, adequate drainage and any necessary sequestrectomy. In two cases, breakdown of the stump necessitate an amputation at a higher level.

Ten revisions were performed at the request of the Orthopaedic Technologists because of limb fitting problems. Four had stumps that were too long, four had inadequate muscle coverage of the bone, and two had sharp subcutaneous bone edges.

### The supply of prostheses

Amputees have to pay for their appliances, and the cost of USD 70 for a below-knee prosthesis is beyond the means of many families. It is the practice for patients to be discharged from hospital soon after the amputation stump is healed and to return later for their prostheses when the stump is mature. Some appear at the Orthopaedic Workshop with artificial limbs they have made themselves (Fig. 2).

The Orthopaedic Workshop in Dodoma was established in 1985, through the financial assistance of an Italian Organisation, CUAMM of Padoma. In an effort to reduce costs, "appropriate" technology has been used, relying heavily on locally available materials. For the last



Fig. 2. Home made artificial limb.

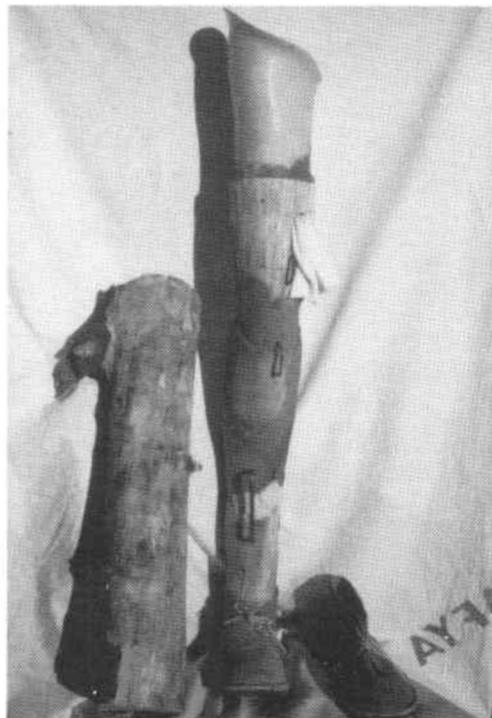


Fig. 3. Above-knee prosthesis using fir wood and resins.

two years, local fir wood has been used. It is durable, light, and easily machined. From the wood, feet and shanks are manufactured, joined to a resin socket (Figs. 3 and 4). Initially 75% of prosthetic components were imported, but now, 75% are manufactured locally.

Resins are still widely used for making the socket. Cow-hide does not do well in the environmental conditions of the region and does not last well at village level. For those patients with limited finance, a peg-leg is manufactured with a simple sandal on a foot (Fig. 5). This is quite adequate to allow farming activities.

### Discussion

The common causes of amputation in developed countries, such as arteriosclerosis and diabetes, are relatively infrequent. This may be partly explained by a life expectancy of only 53 years, which may also explain the smaller number of patients suffering from coronary insufficiency and stroke. There were some cases of established gangrene affecting one limb for which no cause could be firmly established. Sometimes the application of local drugs accentuated the problem and makes amputation inevitable. Three patients admitted their limbs become gangrenous following application of local drug after razor cuts



Fig. 4. Finished above-knee prosthesis.

that are commonly used as pain relieving procedures. One patient had gangrene affecting both lower limbs and one affecting all four limbs.

Because of the relative infrequency of arteriosclerosis, problems arising from incorrect selection of the amputation level were few, as the proximal limit of the problem area was relatively well defined. Attempts to attain a low level only failed in two amputees, and they needed revision to a higher amputation level.

There has been considerable co-operation between the Department of Orthopaedics and the Orthopaedic Workshop in revising amputation stumps from elsewhere to achieve a proper limb fitting. The workshop has carried out an assessment of its work. Of 107 patients who underwent all types of lower limb amputation in Dodoma until the end of 1988, only 29 attended the orthopaedic workshop for their artificial limbs (27%), presumably inhibited by financial reasons. This indicates that in the first four years

the major share of the 88 prostheses made at Dodoma workshop were supplied to patients coming from other hospitals.

The average income of USD 20 per month has presumably made a USD 70 prostheses unachievable by many families. Attempts have been made to keep the costs low by use of low-cost local materials and components; moreover labour costs are not charged to the patients. There is a further factor in that a person who is an amputee and has difficulty in finding employment may use crutches as a source of income. The use of "appropriate technology" is essential to provide a service, and merits considerable further research.

The Orthopaedic Department and the Orthopaedic Workshop have tried to impress on amputees the benefits of limb fitting. Successful amputees have been used as part of the educational programme to demonstrate that a degree of normality can be achieved.



Fig. 5. Below-knee peg-leg.