AMPUTATION REVISION IN AN ASIAN REHABILITATION CENTRE

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ABSTRACT

A retrospective study was carried out of amputation revisions performed at Green Pastures Hospital and Rehabilitation Centre between Jan 1990 and April 2004. The purpose was to determine the reasons for revision and whether these were preventable, and as well assess the outcome of the revision itself. A total of 26 revisions were performed; in 18 cases the primary amputation had been performed at another centre. The primary amputations were due principally to trauma, vascular disease and complications of leprosy. A poorly formed stump was the most common indication for revision (9), followed by recurrent ulceration (5) and infection (3). In 16 cases the need for revision was probably preventable. Only one patient required an amputation at a higher level. Prior to revision only one patient was able to wear a prosthesis; all but one patient were able to ambulate with their prosthesis following revision in a median time of eight weeks. Amputation revision in a rehabilitation centre has a high success rate in ambulation with a low complication rate. Greater attention to detail during the primary amputation will prevent the need for revision in many cases.

Key Words: Amputation, Revision, Rehabilitation, Complications.

INTRODUCTION

Amputation of the leg is distressingly common among the young productive population in Asia, due largely to preventable causes such as trauma, Burger's disease and late-stage leprosy. Often these amputations have to be carried out by surgeons with little experience in amputations. While advances in the design and production of prostheses have made possible the fitting of prostheses in even sub-optimal stumps, the need for revision of previously amputated limbs is still not uncommon.¹ These revisions slow down the rehabilitation process by delaying prosthetic fitting. When the patients come from a long distance to the rehabilitation center for fitting of their prosthesis, the need for surgery prior to fitting can be a major impediment to the patient's rehabilitation. Occasionally the revision must be carried out at a higher level than the initial amputation, which greatly increases the energy expenditure

needed for ambulation as well as the difficulty in overall rehabilitation.²

It is important to identify the common causes for stump revision in order to enable surgeons to be aware of common problems associated with amputation surgery. Education of the primary surgeons should reduce the presentation of this problem in the future. Most studies assessing the results of amputations come from centres performing the primary amputations. These would tend to be centres very experienced in performing amputations, which may have a different spectrum of complications than patients presenting from a variety of centres performing smaller numbers of amputations. This retrospective study was carried out to determine common stump problems presenting to a rehabilitation referral centre in order to identify areas of potential improvement by the primary surgeons. As well the outcome of revision amputation was assessed by the

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following outcome measures: complications, the need to revise at a higher level (i.e. below knee to above knee), and prosthetic rehabilitation rates.

METHODS

This study is a retrospective review of patients undergoing revision of previously performed amputations at Green Pastures Hospital and Rehabilitation Centre (GPHRC), Pokhara, Nepal between Jan 1994 and July 2004 . Included were all patients undergoing lower limb amputations at the ankle level and above, as these are the patients who will routinely require prosthetic fitting. Prosthetic rehabilitation has been carried out at this hospital since 1990, and it functionally services a large part of the west of Nepal. There have been a total of 296 prostheses fitted during the study period. It was designated as the national centre for rehabilitation for war amputees for the International Committee for the Red Cross in 2003. Patient demographics, site and cause of previous amputation, reason for need for revision, level of revision amputation, complications and ability to wear a prosthesis were recorded. Patients who had had a previous traumatic (including burn) amputation but with no subsequent surgical revision prior to presentation to GPHRC were excluded.

RESULTS

There were a total of 26 patients, with 20 males and six females and a median age of 46. Eight patients had undergone previous

amputations at GPHRC and 18 had undergone prior amputation elsewhere. The site of previous amputation is listed in Table 1. The indications for primary amputation are listed in Table 2. The revision amputation was carried out a median of nine months from the initial amputation. The indications for revision are listed in Table 3. Only one patient required an amputation one level higher than their initial amputation. There were five post-operative wound infections which resolved uneventfully. Prior to revision, only one of the patients was able to wear a prosthesis, while after surgery 25 of 26 were able to successfully wear their prosthesis. This was in a 70 year old lady with a primary amputation for ischemia who did not return to the centre for unknown reasons. Median time to ambulation following the revision amputation was eight weeks.

DISCUSSION

Amputations are a commonly performed procedure by both general and orthopaedic surgeons. However in both professions amputations are often seen as undesirable operations and may be performed without great attention to the requirements for subsequent prosthetic fitting, or may be given to junior doctors to perform. Poor planning or performance of the amputation will lead to an increased need for stump revision with resultant delays in rehabilitation. It has been shown that performance of amputations by unsupervised junior doctors leads to a higher revision rate and a lower rate of successful ambulation.^{3,4}

Overall the types of problems seen in patients whose primary

Table I : Level of Initial Amputation

Level of Amputation	Number
Symes	4
Below - Knee	19
Through - Knee	1
Above - Knee	2

Table II : Indication for Initial Amputation

Indication for Initial Amputation	Number
Trauma	9
Complications of leprosy	6
Peripheral vascular disease	8
Infection	1
Cancer	1
Congenital Malformation	1

Table III : Indication for Revision

Indication for Revision	Number
Poor stump	9
Recurrent ulceration	5
Infection	3
Stitch abscess	2
Neuroma	2
Ischemia	2

amputation was carried out in GPHRC compared with those done elsewhere is fairly similar to those seen in the one previous study done from a referral rehabilitation centre (infection, ischemia).⁵ Of those patients where the amputation was carried out outside of GPHRC, the most common reason for revision was poor coverage of bone. While in many cases the prosthesis can be modified to minimize this problem, this is more difficult in above-knee amputations as the prosthesis is end weight-bearing. Poorly covered bone will lead to recurrent ulceration from high-pressure areas and cause pain on ambulation and non-use of the prosthesis. Careful approximation of fascial layers with long-lasting absorbable sutures and avoidance of infection will reduce this complication to a minimum. For below-knee non-ischæmic amputations a fishmouth type of amputation is often recommended.¹ This however provides for coverage of the distal tibia with only a thin layer of fascia. As such we recommend the use of the Burgess amputation with a long posterior musculofascial flap,^{1,6} which provides a thick durable flap to cover the distal tibia. An extensive review of the literature on amputation techniques by Persson⁷ also came to the conclusion that a fishmouth type of below-knee amputation should be avoided. Avoidance of excess flap tissue, careful suturing and good post-amputation bandaging will reduce the incidence of "floppy" stump to a minimum.^{6,7} The blood supply to the posterior calf was studied which demonstrated that the blood supply to the skin arises from perforating vessels from the gastrocnemius muscles, with no contribution from the soleus.⁸ As such this muscle should be removed to reduce the bulk of the stump. Semi-rigid dressings have been shown to hasten prosthetic fitting, both by preventing trauma to the stump and by reducing swelling.⁹

Only two neuromas were seen in this series. High division of the major nerves well above the level of amputation will avoid this complication in virtually all cases. Suture abscesses, seen in two cases, are also avoidable by the use of absorbable material for ties and suturing.

Those revisions due to poor stump formation, neuroma and stitch abscess were probably preventable with more appropriate surgical technique. Overall then 13 of these 26 revisions were preventable.

With recent developments in prosthetic technology, the range of the length of acceptable amputation is large. In an adult a stump length of anywhere from 8 cm from the knee joint line to 4 cm above the ankle joint can allow for reasonable fitting of a below-knee prosthesis.

Surgeons in our referral area have a good understanding of length requirements and we seldom experience problems in this area. A protruding fibula was seen in three cases, which

required shortening. The fibula needs to be divided just above the level of tibial division.

Only one patient had to undergo an amputation at a higher level to obtain a good stump (below-knee to above-knee). It has been shown that energy expenditure in ambulation following a Syme's amputation is 13% higher than normal.² Energy consumption following below knee amputation is 33% more than normal in vascular amputees vs 7% greater than normal in traumatic amputees.² Following an above knee amputation, 87% more energy is required for ambulation in vascular patients vs. an increased 33% in traumatic amputees.² Some elderly patients are unable to cope with the increased energy expenditure and may become confined to a wheelchair or be highly activity restricted. In a study of amputees for a variety of etiologies, 51% of below-knee amputees achieved ambulation while only 30% of above-knee amputees ambulated following amputation.¹⁰ As such all efforts should be made to keep the level of amputation or stump revision at the lowest level possible, although one study questions this teaching.¹¹

The rate of rehabilitation following amputation varies widely depending on the patient population. Those having BKA for peripheral vascular disease achieved successful prosthetic ambulation in only 66% of survivors in one study,¹² whereas studies of amputation revisions following traumatic amputation often report a 100% rate of successful prosthetic rehabilitation.^{13,14,15} The 96% rate of successful prosthetic rehabilitation in this study was certainly associated with the generally young age of the patients and relatively few amputations for vascular disease.

This study did not assess the need for stump revision prior to presentation at our centre, although this is quite common in our referring hospitals among those patients with peripheral vascular disease. While often this is due to inadequate blood supply, failure to control infection prior to operation and too-tight post-operative bandaging are also common causes for the need for stump revision.

A problem commonly seen at our centre is that of flexion contracture of the knee following a below-knee amputation. While this responds to therapy and splinting, it significantly delays prosthesis fitting, and can be easily avoided with appropriate splinting and patient education by the primary surgeon.

CONCLUSION

In this study the most common reason for the need for stump revision was a poorly made stump, usually due to poor bone coverage. The need for stump revision significantly increased

the hospitalization time and the time for prosthetic fitting. The primary surgeon must be meticulous in his/her amputation planning and performance in order to prevent the need for subsequent stump revision with its attendant delay in rehabilitation.

ACKNOWLEDGEMENTS

Many thanks to Dr. Rishi Sharan for his work in collecting some of the data.

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