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Original Research Article

Epidemiology of major limb amputations: a cross sectional study from a South Indian tertiary care hospital

Unnikrishnan E. P., Rakesh Rollands*, Sasi M. Parambil

Department of Surgery, Government Medical College, Kozhikode, Kerala, India

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***Correspondence:**
Dr. Rakesh Rollands,
E-mail: rakeshrollands@yahoo.com

ABSTRACT

Background: Limb loss to amputation is a major problem especially in developing countries where majority of the cases are preventable. It is a burden, not just for the patient, but also for their care givers which imposes tremendous financial and psychological burden upon them. The aim was to outline the patterns, indications and short term complications of major limb among patients attending Government Medical College, Kozhikode, Kerala, India which is a tertiary care centre.
Methods: This was a prospective, observational study that was conducted at Govt. Medical College, Kozhikode, for a period of 18 months. 81 patients underwent major limb amputations in our hospital during the study period.
Results: The age ranged between 23 to 90 years (mean 59.23±14.79). Males outnumber females by a ratio of 4:1. Above knee (transtibial) amputations were the most common. Diabetes mellitus was the most common cause (39.5%) followed by chronic NDMVI (33.3%). Younger individuals who underwent amputation were mostly due to trauma. Most common post op complication was surgical site infection (21%) and the most common organism cultured from the wound was Pseudomonas (50%). The most common additional procedure done was wound debridement. The mortality rate was 10% and mean duration of hospital stay was 23 days.
Conclusions: Complications of diabetic foot ulcers and chronic vascular disease were the most common indications for major limb amputation in our environment. Trauma was the most common indication in younger individuals. The majority of these amputations are preventable by provision of health education, early presentation and appropriate management of the common indications.

Keywords: Amputation patterns, Calicut, Major limb amputation, Short-term outcome

INTRODUCTION

Amputation" derived from the Latin word "amputare "(to excise, to cut out) has been defined as the "removal of part or all of a body part enclosed by skin".[1] The most common indications for amputation vary from study to study. Trauma, complications of diabetes mellitus and peripheral vascular disease are some of the most common indications that are recorded.[2] Complications of diabetes mellitus is widely accepted as the most common cause for major limb amputation with figures ranging from 25% to 90% depending on the study.[3] This is followed by non diabetic vascular insufficiency and trauma.[4,5] The main source of data currently available stems from patients who report to the scanty number of limb-fitting centres in India.

Amputation, unfortunately, in the minds of most surgeons and their patients, represents a failure of therapy.[6] The most appropriate amputation at the right time is a rarity in the Indian scenario. The surgeon, when removing a limb, is primarily concerned with saving the life of a patient or

getting rid of a diseased or badly injured part of a limb under adverse conditions when parents report so late that the surgical exercise is carried out in haste, with ablation rather than reconstruction governing the technique of amputation.

METHODS

It was a cross sectional study done between the period of February 2015 and August 2016 in the Department of General Surgery, Government Medical College, Kozhikode, Kerala, India. All cases of major limb amputation (eighty one cases) admitted in general surgery and orthopedic wards of Calicut medical college were studied. Inclusion criteria was all patients who underwent major limb amputation, more than 13 years of age who were willing to participate in the study. Exclusion criteria was patients who declined consent, those who were less than 13 years of age and those patients who underwent amputation from another centre and came to our hospital for follow up or management of complications.

Recruitment of patients was conducted after the decision to amputate the limb was made by the attending surgeon. The decision to amputate the limb, indications and levels of amputation was determined by the attending surgeon based on clinical evaluation and radiological investigations (e.g. plain x-rays of the affected limb, Doppler studies etc.). Patients were screened for inclusion criteria and those who met the inclusion criteria were offered explanations about the study and requested to consent before being enrolled into the study. Amputation was performed by the attending surgeon who also prescribed the postoperative care of the patient. Major limb amputation was defined as any amputation at or proximal to wrist and ankle. In case where conversion to a higher level was required, the amputation level was recorded as the new revised level. Patients were followed up till discharge or death. Patients who developed complications were managed appropriately.

The complications faced by these patients were studied. In case of wound infection, pus was sent for culture and sensitivity and the results were followed up. Any additional procedures done for the amputation stump were also noted and followed up. Data were collected using a pre-tested, coded questionnaire and analysed using SPSS version 18 computer software.

RESULTS

A total of 81 patients underwent major limb amputations during the period of this study. Mean age of the population is 59.23 years with a SD of 14.79. The age group ranged from 23 years to 90 years. Of these, 66 patients were male and 15 were female. The incidence in men was 4 times more than that seen in women (Table 1).

The most common amputation performed was lower limb amputation (90%). Among the lower limb amputations, above knee (trans-tibial) amputations were the most common (53.1%). 37.1% of the patients underwent below knee amputation. Above elbow amputation was done in 6.2% of the cases. The remaining 3.7% cases underwent below elbow amputations. There were no reported cases of knee disarticulation, hip disarticulation, hemipelvectomy, elbow disarticulation or shoulder disarticulation during the period of this study (Table 2).

Table 1: Distribution of the amputation according to the sex of the population.

Gender	Frequency	Percentage
Male	66	81.5
Female	15	18.5
Total	81	100

Table 2: Distribution of various levels of amputation.

Level of amputation		Frequency	Percentage
Right	Above elbow	2	2.5
	Below elbow	2	2.5
	Above knee	24	29.6
	Below knee	14	17.3
Left	Above elbow	3	3.7
	Below elbow	1	1.2
	Above knee	19	23.5
	Below knee	16	19.8
Total		81	100

Complication of diabetes mellitus (all were Wagner‟s classification stage 4 or 5) was the main indication for the major limb amputations in 32 (39.5%) patients followed by chronic vascular insufficiency in 27 cases (33.3%) cases. The next most common cause was acute limb ischemia in 9 cases (11.1%) and trauma in 6 cases (7.4%). The less common indications for major limb amputations were soft tissue malignancy that could not be treated with wide local excision and primary bone tumors. Other indications for amputation that was noted during the study was sepsis that developed in a limb with elephantiasis and neglected patients who have no other significant comorbidities, but developed ulceration and sepsis of the limb and by the time they presented to the hospital the limb had become non-viable and had to be amputated as a lifesaving procedure (Table 3).

58% of these patients did not have any post-op complications. The most common complication encountered was surgical site infection which was seen in 31 cases (38.3%). Of these 20 cases had SSI, with no other local complications. 5 patients developed wound dehiscence and 7 patients developed stump gangrene. There was only 1 documented case of phantom pain and one case with wound hematoma. Pus from the surgical site was sent for culture sensitivity and the most common organism cultured was *Pseudomonas*, seen in 50% of the cases. Skin flora was cultured in 18.8% cases, MRSA in

15.6% cases and *E. coli* in 9.4% cases. Only 2 cases (6.2%) showed sterile culture (Table 4 and 5).

Table 3: Distribution of various indications for amputation.

Indication	Frequency	Percentage
Non DM vascular insufficiency (acute)	9	11.1
Non DM vascular insufficiency (chronic)	27	33.3
Diabetes mellitus	32	39.5
Trauma	6	7.4
Malignancy	4	4.9
Others	3	3.7
Total	81	100

Table 4: Distribution of post-operative complications.

Post-operative complications	Frequency	Percentage
SSI	20	24.7
Wound Hematoma	1	1.2
Wound Dehiscence	5	6.2
Stump Gangrene	7	9.0
Phantom pain	1	1.2
No Post-op complications	47	58.0
Total	81	100

Table 5: Distribution of organisms cultures from the SSI.

Bacteriological culture	Frequency	Percentage
Pseudomonas	16	50
E-coli	3	9.4
MRSA	5	15.6
Skin flora	6	18.8
Sterile	2	6.2
Total	32	100

Hospital stay of patients ranged from 6 to 92 days with a mean stay of 23.34 days. Among the patients chosen for the study, there were 8 cases (10%) of intra nosocomial death giving it a mortality rate of 10%. Mean duration of hospital stay is 23.34 days (6 days to 92 days) with a standard deviation of 16.07. 61% of the patients did not need any additional procedures to be performed following surgery.

22% of the patients required only simple wound debridement. Secondary suturing was done in 2 patients after proper control of wound infection. In 7 (8.6%) cases revision of the stump had to be done and in 4 (4.9%) cases re-amputation at a higher level had to be performed to attain proper management of wound infection. Skin grafting, though reported as an additional procedure that are done in other centres, was not done for any patient during the period of this study (Figure 1 and Table 6).

Table 6: Distribution of additional procedures done.

Additional procedures	Frequency	Percentage
Wound debridement	18	22.2
Secondary suturing	2	2.5
Re amputation	4	4.9
Revision of stump	7	8.6
Skin grafting	0	0
No additional procedures	50	61.7
Total	81	100

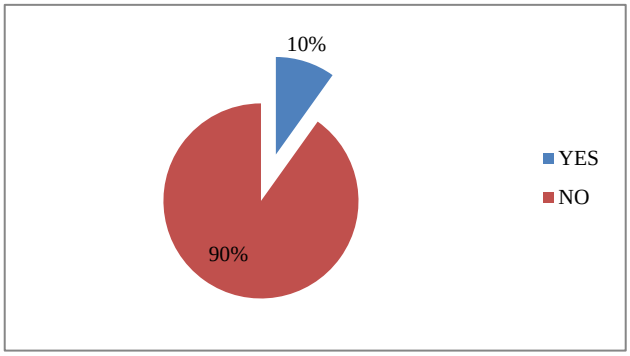

Figure 1: Intra nosocomial death.

DISCUSSION

This cross sectional study was conducted at Calicut medical college on 81 patients who underwent major limb amputations. As the indications and patterns of amputation vary between different hospitals in a country and between different countries, this study was undertaken to analyze the pattern in a large tertiary care centre in Kerala, South India.

Age

Mean age of the population is 59.23 years which was not similar to the findings in other studies, which showed the mean age to be around 30 to 50 years of age.[7,8] This difference is probably because in those studies, trauma was the second most common indication for amputation and the younger age group was affected more.

Sex

In our study, there was a notable male preponderance as was noticed in all the studies undertaken.[7] According to Ebskov et al the reported male:female ratios from the UK, USA and Scandinavia are 2:1 and this has not altered over the last 20 years.[9]

Indication

Complications of diabetic foot ulcers were the most common indication for major limb amputation in our study, followed by chronic vascular insufficiency and acute limb ischemia. Diabetic foot and vascular insufficiency together constitute upto 84% of the cases of

limb amputations. According to Masood et al, the most common indication in developing countries is complications of diabetes mellitus and trauma.[10] These findings are not in agreement with other studies which reported trauma as the most common indication for major limb amputation.[11,12] In developed countries, atherosclerosis is the most common indication for lower limb amputations while in developing countries diabetic foot and trauma are the leading causes. In our study, trauma, although ranked fourth, was the most important indication for amputation in younger individuals. This usually leads to the bread winner of the family being dependant on the others for support and care.

There were also patients who presented with advanced soft tissue malignancy and those who presented after they developed sepsis as a result of neglect and poor personal hygiene. Most of these patients could have saved their limb if they had presented early to the hospital. It reflects a lack of education and lack of awareness among the general population. Easy and early access to healthcare needs to be provided which can identify such patients before they develop advanced disease and with timely intervention, can lead a normal or near-normal life

Level of amputation

Dormandy and Thomas in 1988 reported that saving the knee joint increases the amputee's rehabilitation potential.[13] Although globally there is a fall in the number of AK amputations as there are more and more efforts to save the knee joint, our study showed that the most common level of amputation done is Above Knee amputation (53%). According to Nwadiaro et al this could be because, most of the patients present late with advanced gangrene or in sepsis where the surgeon would be forced to go for a higher level of amputation.[14]

Complications

The complication rate in our study (48%) was higher than that of the studies conducted by Chalya et al in Tanzania and by Essoh et al in Nigeria.[8,15] The most common complication was superficial surgical site infection. *Pseudomonas* was the most common organism isolated. This is different from other studies where *Staphylococcus* and *Streptococcus* were the most common organisms cultured[8]. This high rate of post-operative complications is probably because of the severity of the sepsis that the patient had prior to amputation.

Additional procedures

22% of the patients required only simple wound debridement. Secondary suturing was done in 2 patients after proper control of wound infection. In 7 (8.6%) cases revision of the stump had to be done Re-amputation rate was 4.9%. this was lower than the rate of re-amputation noted in the Tanzanian study by Essoh et al which recorded 23% re-amputation rate and Nigerian study by Chalya et al (9.9%).[7,8]

Hospital stay

Mean duration of hospital stay in our study was 23.34 days which is much lower than the data obtained from other studies which suggest a mean duration of hospital stay ranging from 59 to 65 days.[8] The longer duration of hospital stay noted in the other studies is because the patient is usually discharged once the rehabilitation process is complete. In our hospital, once the wound heals and the patient's general condition improves, the patient is discharged with rehabilitation and prosthesis planning done on an out-patient basis.

Mortality

The mortality rate was noted to be 10% which was lower than other studies like that of Essoh et al and Nwanko et al which reported a mortality rate of upto 16%.[7,15] It was however comparable to that reported by Massod et al which was based in Pakistan.[16] The main reasons for mortality in our study are diabetic-related complications, wound sepsis and the delayed presentation of the patients to the hospital.

CONCLUSION

Complications of diabetes mellitus and vascular insufficiency were the most common indications for limb amputations in our region. All the patients with diabetic foot that had their limb amputated had Wagner grade 4 or grade 5 disease. The patients present to the hospital late and so it is not only difficult to salvage the limb but we are more often than not, forced to go for a higher level of amputation as evidenced by the higher number of trans-tibial amputations seen in this study. The patients need to be educated at an early stage of their disease regarding the potential complications of diabetes. The need to maintain proper glycaemic control and the importance of protective footwear need to be stressed to these patients. Patients with vascular insufficiency should be educated regarding the problems associated with smoking and should be encouraged to discontinue the same. Easy and early access to healthcare needs to be provided which can identify such patients before they develop advanced disease and with timely intervention, can lead a normal or near-normal life.

Trauma, although lower down the list, as far as the indication for amputation is concerned, is the most common reason for amputation in younger individuals. The reason for trauma was road traffic accidents and accidents in their workplace. Limb loss at an early age is associated with a serious economic crisis for the family. The patient is left dependant on a prosthesis for the rest of his life and so it cannot be stressed enough that prevention is definitely better than cure. With stronger traffic rules and safer work place environments, the

number of patients that lose their limb to trauma can be decreased significantly.

No matter how good the prosthesis and replacement services available are, it will never be good enough to replace an anatomically normal and functional limb. So it cannot be stressed enough that prevention is better than cure.

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