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RESEARCH ARTICLE

MAJOR LOWER LIMB AMPUTATION AND EARLY FUNCTIONAL OUTCOMES; A TERTIARY HOSPITAL EXPERIENCE IN EASTERN TANZANIA

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ABSTRACT

Background: The present study aimed to determine the indications and short-term complications of major limb amputations as well as early functional outcomes. ***Methods****:* This was a prospective, Descriptive Hospital based study conducted among 52 patients at Muhimbili Hospital complex between January 2022 and January 2023. Main Outcome Measures were patient survival, complications and early functional outcome following amputation. ***Results:*** A total of 52 patients were eligible for the study. The most common indication for major limb amputation was peripheral vascular disease with or without diabetes in 48% of patients. Trauma was the second most common cause of amputations in 40.4% of patients. Stump revision was common accounting for 29.6% of participants significantly contributed by stump infections. The mortality rate was 17.3%; septicaemia accounting for most of the observed deaths (44.4%). Of the 52 participants, 46.2% were independent in carrying out activities of daily living at final assessment with 61.5% of amputees acquiring prostheses at the end of study. Majority of participants failed to acquire prostheses because of poor stump qualities. ***Conclusion:*** Major lower limb amputation continues to result in significant perioperative morbidity and mortality. Preventive measures such education of diabetic patients on foot care and, public enlightenment on accident and trauma prevention strategies will go a long way in reducing the burden of amputation. Making prosthesis available and affordable to amputees is also suggested as a way of improving on the quality of life and functionality of amputees.

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INTRODUCTION

Since it was first described by Hippocrates in 460–377 BC, limb amputation has been a common surgical procedure worldwide. However, it is often associated with profound economic, social and psychological effects to the patient and the family(1). The global annual incidence of amputation ranges from 3 to 44 per 100,000 people, with developed countries far better compared to Developing countries. In US, an estimated 185,000 persons undergo amputation of an upper or lower limb each year. In the United Kingdom despite the aggressive policies of vascular reconstruction and endovascular intervention to prevent limb loss, the prevalence of limb deficiency is 132 per 100,000 populations(2,3). Recent advances in science and technology have made it that emphasis is now being laid on limb salvage in developed countries. The paucity of diagnostic facilities and delayed presentation in developing countries make amputation the commonly available treatment option.(4) Irrespective of the cause, amputation brings a significant and drastic change in a person's life. Feelings of loss and grief, physical limitations, difficulties learning to walk with an artificial limb, and readjustment to an interrupted life all pose considerable challenges.

This effect is more pronounced in developing countries where prosthetic services are not readily available.Social support, effective rehabilitation and appropriate prosthetic treatment can help the amputees in coping and improving their quality of life (2,5). A trend towards better walking ability has been reported in those with better quality stumps and fewer stump problems after amputation. Poorer functional use of a prosthesis and shorter walking distances have also been associated with pain in the stump and phantom pain (6).Cosgrove et al showed that successful rehabilitation of the amputee on a prosthetic limb depends on stump quality and the reported incidence of stump defects that preclude limb fitting may be as high as 50% (7). Overall, there are concerns about prosthetic use and the problems confronted by amputees in the time after discharge because in our setting very little is known about the use of the prosthesis after hospital discharge. This study was intended to give a descriptive analysis of amputee characteristics as well as early functional outcomes.

METHODOLOGY

Study setting and data collection: This was adescriptive hospital-based study conducted at Muhimbili National Hospital (MNH) and

Muhimbili Orthopaedic Institute (MOI), located in Dar es salaam; Tanzania mainland .The study involved all patients who underwent major lower limb amputations in General surgery and orthopedic departments between January 2022 and January 2023. Each patient had an average follow-up of four months. Indications for amputations were obtained from patient's case notes. Follow up interviews were conducted with surviving and consented patients to determine complications suffered within 4 months of primary amputation. Prosthetic fitting was determined by the type of amputation and the remaining stump length as required by orthotist & prosthetists. Data were collected using a pre-tested, coded questionnaire. Using the Katz Index of independence in activities of daily living (Katz ADL) the patients were ranked in adequacy of performance in 6 functions such as: bathing, dressing, using toilet, transferring, walking and feeding. Data collected was analyzed using SPSS version 20 computer software. The relationship between variables was determined by Chi square. A 95% confidence interval and a P values less than 0.05 was considered significant. This study received ethical approval from Muhimbili University of Health and Allied Sciences Institutional Review Board**.**

RESULTS

During the study period a total of 82 patients in both trauma and general surgical wards were recruited. Out of these 52 patients were eligible for the study.

Table 1. Socio-demographic characteristics of the 52 patients with MLLA at MNH & MOI (n=52)

VARIABLE	FREQUENCY (%)
AGE GROUP	
<20	2 (3.8)
21- 40	19 (36.3)
41 – 60	20 (38.5)
>60	11 (21.2)
SEX	
Male	35 (67.3)
Female	17 (32.7)
EDUCATION	
Non-formal	7 (13.5)
Primary	29 (55.8)
Secondary	13 (25.0)
College	3 (5.8)
RESIDENCE	
Dar es salaam	29 (55.8)
Outside Dsm	23 (44.2)
HOSPITAL STAY	
1 - 10 days	33 (63.5)
11 - 20 days	15 (28.8)
>20days	4 (7.7)

There was male predominance (67.3%) in this study. Most patients had hospital stay less than 10 days.

Table 2. Indications for amputation in patients with MLLA at MNH and MOI

INDICATION (n=52)	**FREQUENCY (%)**
PVD with DM	19 (36.5)
PVD without DM	6 (11.5)
Trauma	21 (40.4)
Tumor	5 (9.6)
Infections	1 (1.9)
Total	52 (100)
CAUSE OF TRAUMA (n=21)	
MVC	18 (87.7)
Falls	2 (9.5)
Animal bite	1 (4.8)
Total	21 (100)

Peripheral vascular disease with or without diabetes was the leading cause of amputations (48%). Trauma was the second most common cause of amputation in 40.4% with Motor vehicle crushes being the leading cause of trauma related amputations.

Table 3. Complications observed in patients with MLLA during follow up period

VARIABLE	FREQUENCY (%)
COMPLICATION (n=52)	
YES	22 (42.3)
NO	30 (57.7)
TYPE OF COMPLICATION	
Stump infection	8 (15.4)
Dehiscence	4 (7.7)
Stump necrosis	5 (9.6)
Phantom pain	3 (5.8)
Others	2 (3.8)
STUMP REVISION (n=22)	
	8 (36.4)
YES	14 (63.6)
NO	
REASON FOR REVISION (n=8)	3 (37.5)
Excessive soft tissues	1 (12.5)
Stump Necrosis	2 (25)
Infection	2 (25)
Bone prominences	
DEATH (n=52)	9 (17.3)
YES	43 (82.7)
NO	
CAUSE OF DEATH (n=9)	4 (44.4)
Septicemia	1 (12.5)
Polytrauma	2 (25)
Metastatic tumors	1 (12.5)
Hypostatic pneumonia	1 (12.5)
Snake venom	

Significant complications were noted among amputees (P value =.000**)** with stump infection contributing to most of the complications. 8 patients required stump revision for one or more reasons. Excessive tissues contributed to most of the revisions (37.5%). Septicaemia accounted for most of the observed deaths (44.4%).

Table 4. Use of ambulation aids after MLLA

VARIABLE	**FREQUENCY (%)**
AMBULATION AID (n=52)	
Walking frame	1 (1.9)
Crutches	**40 (76.9)**
Wheel chair	3(5.8)
Non-ambulant	8 (**15.4**)
KATZ ADL SCORE	
Severely diminished	9 (17.3)
Moderately diminished	19 (36.5)
Normal function	24 (**46.2**)
ACQUIRING PROSTHESIS	
YES	32 (**61.5**)
NO	20 (38.5)
REASON FOR NOT ACQUIRING	
(n=12)	6 **(50)**
Stump problems	3 (25)
Financial constraints	3 (25)
Ongoing follow-up	
AMBULATION WITH PROSTHESIS (n=32)	9 (28.1) 23 (71.9)
<30mins	
>30 mins	

46.2% of the patients at fourth month of follow-up were independent in carrying out activities of Daily living, while 17.3 % were highly dependent. At the end of study majority of amputees (61.5%) acquired prostheses. Stump problems were frequent in 50% of patients precluding prosthetic fitting. Three patients were still in follow-up for some reasons including stump problems and8 patients died before they could acquire prostheses

DISCUSSION

This study has provided an insight on early functional outcomes and a trend towards acquisition of prostheses in our setting and has highlighted factors that precludes artificial limb fitting. However, being a complex tertiary hospital, the results of this study might not echo the practice in other hospitals. The observed male preponderance among amputees in this study is in agreement with the findings by other authors(1,8,9). There were no any reason(s) to explain for the male preponderance in this study, However; one could argue this difference is probably because most of MLLA in this study were due to trauma. Trauma patients tend to be young males and active hence prone to MVCs. Peripheral vascular disease with or without diabetes was the leading cause of amputations though diabetes alone contributed most of the cases. Similar findings were reported by Chalya et al in northwestern Tanzania(1). Although the figures of PVD as a cause of amputation are lower than those reported from developed countries (10), it appears to support the cardiovascular disease epidemiological transition being experienced in Africa. Studies have shown that approximately 80-90% of limb amputations in developed countries are performed as a result of vascular problems (11).

This suggests that control of blood sugar and better diabetic foot care are useful measures in reducing amputations. The observed high rate of trauma related amputations can partly be explained by rapid increase in motorization and other factors such as non-helmet use by riders and their passengers, passenger overload, lack of certified driver training and valid licensing, over speed and reckless driving, poor regulation and law enforcement and possible use of alcohol and drugs. Implementation of stringent road safety regulations therefore would be a feasible control measure. Significant complications were noted among amputees (P value =.000) with stump infection contributing to most of the observed complications but insignificant to limit prosthesis use.8 patients required stump revision for one or more reasons. Excessive tissues contributed to most of the revisions (37.5%). The mortality rate in the present study (17.3%) is comparable with that reported in other studies (11). The reasons for high mortality rate in our study are diabetic-related complications, wound sepsis and advanced malignancies. The use of a prosthesis indicates the state of rehabilitation and the benefit of the prosthetic fitting process in general. Of the 52 followed patients, more than half of the participants acquired prostheses. However; stump problems were frequent in 50% of the patients precluding prosthetic fitting. 23 used prosthesis for more than 30 minutes per day while 9 could ambulate with the prosthesis indoors and outdoors for less than 30 minutes per day. The finding of reduced functional performance of the patients four months after amputation confirms the conclusions reported in the literature. This could possibly be contributed by peripheral vascular disease. This is more pronounced in diabetic population as sensory & motor neuropathy can cause gait abnormalities and deformity; autonomic neuropathy causing abnormal blood flow; macro vascular disease-causing ischemia; poor glycemic control causing increased risk of infection(4). This reflect the level of effectiveness of the early detection of diabetes mellitus and the foot at risk, medical education, patient compliance and overall control of diabetes mellitus in this population.

The problem is also the time lag of 16 weeks between surgery and the fitting of the prosthesis, a delay observed in another Finnish study (12). It is generally argued that; activating postoperative training, reducing the delay in the prosthetic fitting and organizing the regular follow-up of amputees the chance of a poor functional and social outcome may be minimized. There is also a need to assess several independent variables in order to determine the feasibility of prosthetic use and ambulation following major lower limb amputation. Comparable findings of stump problems in this study have been reported by other authors partly being associated with the level of surgeon performing the amputation (7).

Improving surgical skills seems to be of paramount importance in reducing stump- related complications and may have impact on mobility using a prosthesis. Further studies to associate the level of a surgeon and stump quality is highly needed.

CONCLUSION

Major lower limb amputation continues to result in significant perioperative morbidity and mortality. Preventive measures such as education of diabetic patients and public enlightenment on accident and trauma prevention strategies will go a long way in reducing the burden of amputation. Making prosthesis available and affordable to amputees is also suggested as a way of improving the quality of life and functionality of amputees.

COMPETING INTERESTS: The authors declare that they have no competing interest

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