

The Road To and Beyond Amputation: Outcomes of Major Limb Amputations In Vascular Surgery Department of Tertiary Care Hospital

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ABSTRACT

Objective: To analyze the etiologies and outcomes for major limb amputations in patients presenting in a vascular surgery department.

Study Design: Observational study.

Place and Duration of Study: Department of Vascular Surgery, Combined Military Hospital, Lahore, Pakistan, from Jan to Dec 2021.

Methodology: Non-probability convenient sampling technique was used. Patients of either gender who had major limb amputations within the study period were included. Data were partially collected from patient files in our records. The patient's current status and data confirmation were done via telephone. Variables including gender, type of amputation, site of amputation, cause of amputation, comorbidities, survival, causes of death, side of amputation, prosthesis, other amputations, revision of procedure, position of limb, and procedure-related complications were presented as frequencies and percentages. Quantitative variables, including age, were presented as mean and standard deviation.

Results: A sample of 97 patients was included in the current study; 23 were lost to follow-up. There were 12.4% females and 87.6% males. The mean age of the cases was 55.26 ± 9.77 (age range 27-72 years). The major cause of amputation was acute limb ischemia. 29.0% of patients died within 3 months of the procedure. The major cause of death was MI (36.0%) and the majority of patients died within 40 days of the procedure 18(64.0%). In this study, 95.0% of patients had lower limb amputation, while 9.0% of patients had other amputations previously. There were 19.0% of patients in our data who used a prosthesis after amputation of either limb. There were 13.0% of patients found with wound infection, 8.0% with wound failure and 7.0% with phantom limb after the procedure.

Conclusion: Acute and chronic limb ischemia along with diabetic foot infections constitute the major causes of amputation in a vascular surgery unit. Mortality is high, especially in the postoperative period, in this population, with cardiovascular disease constituting the major cause of death. Prosthesis rates are very low. Major morbidity and mortality may be avoided by screening in at-risk populations, prompt referral to a vascular surgeon, implementing aggressive management protocols for modifying cardiovascular risk factors, and encouraging prosthesis application and availability.

Keywords: Acute Kidney Injury, Amputation, Cerebrovascular Accident, Limb ischemia, Stroke

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INTRODUCTION

According to the data, peripheral vascular disease (PVD) is among the leading causes of major limb amputation worldwide.¹ Peripheral vascular disease with irreversible lower limb pathology has a high morbidity and mortality rate.²⁻³ In therapeutic amputation, an extremity is removed when it is either life-threatening or its function has been irreparably lost; in traumatic amputation, an extremity or part of it is accidentally separated.⁴ Regardless of the reason, losing a body part is never easy.⁵ Major limb amputation is thought to be a serious but preventable

public health issue that has a significant impact on the patient and family in terms of their economic, social, and psychological well-being, especially in developing nations with limited access to prosthetic services.⁶ Lower limb amputations can range from forefoot amputations to more extensive proximal knee and hip disarticulations, depending on the anatomical level. Globally, the rate of lower limb amputation varies greatly, from 5.8 to 31 per 100,000 people.⁷ A three-year study in England found 34,109 amputations.⁸ Between 2007 and 2012, 1115 patients in Sindh, Pakistan, had major lower limb amputation, accounting for 47.4% of all amputations. A study on 339 patients undergoing lower limb amputation for PVD or diabetes complications in the UK found

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mortality rates of 12.4% at thirty days and 35.7% at 1 year.⁹

According to Delesalle *et al.*, of the patients who had a below-knee amputation (BKA) two years prior, 40% had fully recovered their mobility, 15% had a subsequent above-knee amputation (AKA), 15% had an extra contralateral amputation, and 30% had died.² According to the local data available, the majority of the patients undergoing major limb amputations are under 40 years of age, with trauma being the major cause in Pakistan.¹⁰

Data are scarce for patients undergoing major limb amputations in dedicated vascular surgery units regarding etiology and outcomes of limb amputation in the Pakistani population. Therefore, we have undertaken this study with the aim to analyze the etiologies and outcomes for major limb amputations in patients presenting in a dedicated vascular surgery department.

METHODOLOGY

A retrospective observational study was conducted at the Department of Vascular Surgery, CMH, Lahore, Pakistan, from Jan to Dec 2021. Non-probability convenience sampling technique was used. The study was approved by the ethical review committee, IRB# 389/22. Sample size was calculated with Raosoft software with a confidence interval of 95% and a margin of error of 5%. The sample size was 46.

Inclusion Criteria: Patients of either gender, aged > 35 years, who had major limb amputation (defined as any amputation which was transtibial, transfemoral, or transradial) within the study period were included.

Exclusion Criteria: Patients who had minor amputations were excluded. Patients who did not attend the phone calls were excluded as lost to follow-up.

Operated patients were followed for 3 months via telephonic consultation. Data were collected from patient files in our records. Status of the patient and data confirmation were done via telephone. Informed verbal consent was obtained from the participants. Categorical variables, including gender, type of amputation (Figure-1), site of amputation, cause of amputation, comorbidities, survival, cause of death, site and side of amputation, prosthesis, other amputations, revision of procedure, procedure-related complications, were presented as frequencies and percentages. Quantitative variables, including age,

were presented as mean and standard deviation. Statistical Package for Social Sciences version 21 was used for data analysis.

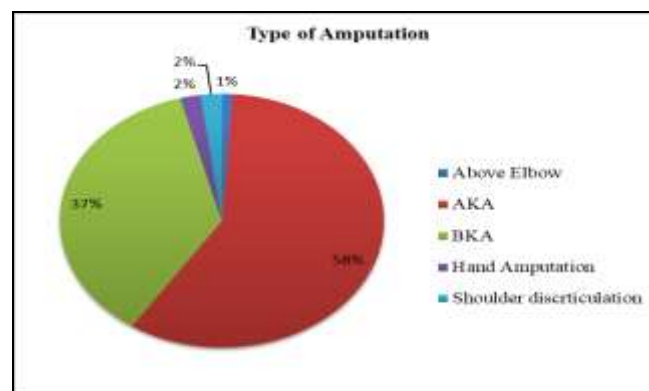


Figure-1: Distribution of Procedures Performed According To The Type of Amputation (n = 97)

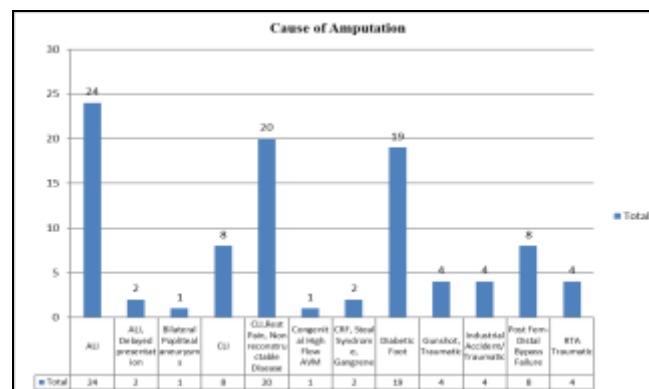


Figure-2: Percentage-wise distribution of causes of amputation (n= 97)

RESULTS

The study population consisted of 97 patients. 23 patients could not be contacted and were labeled as lost to follow-up. The majority were males, 85(87.6%). The mean age of the cases was 55.26±9.77. Sixty-six (68.0%) patients were diabetic, sixty (62%) hypertensive, twenty-seven (28.0%) smokers, thirteen (13.0%) patients with ischemic heart disease, and two (2.0%) patients had chronic renal failure. Twenty-eight (29.0%) patients died within 3 months of the procedure. In-hospital mortalities were 2(7.14%). Only 1 patient needed revision of amputation level. Among other complications, 14.0% of patients had wound infection, 8.0% wound failure, and 7.0% had phantom limb syndrome within the post-operative period. Fig. 1 describes the frequency of procedures performed according to the type of amputation. Figure-2 depicts the distribution of causes of amputation. Table-I shows the frequency distribution of site and side of

amputation, prosthesis, other amputations, and complications. Table-II mentions the frequency distribution of survival and cause of death within 3 months of the procedure.

Table-I: Frequency Distribution of Site And Side Of Amputation, Prosthesis, Other Amputations, And Complications (n = 97)

Variables	Values
Side of Amputation	
Left	52(54%)
Right	45(46%)
Prosthesis	
Yes	18(19%)
No	56(57%)
Other Amputations	
Above knee amputation	4(4%)
Below knee amputation	4(4%)
Toe Amputation	1(1%)
Revision of Amputation	
Yes	1(1%)
No	73(75%)
Site of Limb	
Lower	92(95%)
Upper	5(5%)
Complications	
Wound Infection	13(14%)
Wound Failure	8(8%)
Phantom Limb	7(7%)
None	46(47%)

Table-II: Frequency Distribution of Survival And Cause of Death Within 3 Months of Procedure (n=97)

Death Within 30 Months of Procedure (N = 97)					
Status of Patient	No.	Cause of Death of 28 Patients		Time between procedure and Death	
Alive	46 (47%)				
Death	28 (29%)	Ischemic Heart Disease	7(25%)	<30 days	9(32%)
		Cardiopulmonary Arrest	6(21%)	31-40 Days	9(32%)
		Myocardial Infarction	10(36%)	41-50 Days	5(18%)
		Cerebrovascular Accidents	5(18%)	60 Days or more	5(18%)

DISCUSSION

The findings of the current study showed that there was a male predominance, with 87.6% of patients being males and 12.4% females. The mean age of the studied population was 55.26 ± 9.77 years, with minimum and maximum age being 27-72 years. Limb amputation, a lifesaving modality in the settings of trauma and limb ischemia, is a frequent surgical treatment performed by orthopedic, general, vascular, and trauma surgeons and greatly affects the quality of life of the patient.¹¹ Although it is considered a lifesaving procedure, it severely impacts the economic, social, and psychological aspects of the life of both the patient and his family. This study's goal was to examine the causes, end, and outcomes of major limb amputations in patients who presented to the department of vascular surgery at CMH, Lahore, with

post-amputation alive or dead status, prosthesis, and mobility as major concerns.

Chalya *et al.*, researched major limb amputations. They enrolled 162 patients aged between 2-78 years. Most of the patients were males with a 2:1 ratio.¹² Although major lower limb amputation is the most dangerous lower limb procedure in vascular surgery, few high-quality studies have looked at the factors that affect death. found that the revision amputation rate was 29.6%. In our study, 14% of patients had wound infection, 8% had wound failure, and 7% had phantom limb after the procedure, but the literature found that the post-operative complication rate was 33.3% and surgical site infection was the most common complication, accounting for 21%.¹²

In a study by Ambler *et al.*, the average age of the patients was 70 years from which 70.5% male while 29.5% were female.¹³ The result of the current study showed that 57(59%) patients had above-knee amputation, 35 (36%) had below-knee amputation, 1(1%) had above-elbow amputation, while 2(2%) had hand amputation and 2 (2%) had shoulder disarticulation. Acute limb ischemia was the major cause with 24 patients (24.74%), followed by chronic limb ischemia with threatened limb and/or non-reconstructable disease with 20 patients (20.62%). Diabetic foot complications were the cause of amputation in 19 patients (19.59%). In a study conducted by Ambler *et al.*, emergency presentation, advanced age, and changes in electrocardiogram were found to be independent factors associated with mortality.¹³ Upper limb amputations were caused by complications of access surgery for hemodialysis or trauma in our data. In our data, 47% of patients were alive at the end of the study period, 29% had died, while 24% were lost to follow-up. Among the 28 mortalities, 18 were within 40 days of the procedure, with 2(7.14%) in-hospital deaths. Research illustrated 9.1% in-hospital mortality, and the mortality rate for BKA was lower than for AKA (p -value<.001).¹³

According to research by Adams *et al.*, doing a BKA promptly can be both lifesaving in cases of serious sickness or trauma and rehabilitative by restoring function with the use of a suitable prosthesis. For instance, many patients who struggle to walk due to severe, non-healing foot ulcers can regain function by amputating the infected limb and getting fitted with a prosthesis.¹⁴⁻¹⁵

Among the patients, 19% opted for a limb prosthesis after amputation. One patient needed

revision of amputation level with more proximal amputation. In another study by Rathore *et al.*, 10% of patients had an unplanned return to theatre, while 3.8% were re-admitted to critical care after amputation, and 79 patients had at least one complication; however, phantom pain was the most common complication found in 25% of cases.¹⁶

The major cause of death was MI in 10(36%), and most patients died within 40 days of the procedure, 18(64%), in our data. Klerk *et al.*, explored the information regarding the cause of death and found that the majority of deaths were reported to be vascular-related.¹⁷ According to a study by Pienaar *et al.*, coronary artery disease is by far the leading cause of death among PVD patients. 10–20% of deaths were due to cerebral vascular disease, while other vascular incidents, including ruptured aortic aneurysms, accounted for 10%(18)

In our study, 24% of patients could not be contacted and were lost to follow-up, while contact was established with 76% of patients, and a telephonic interview was conducted. The impact of the significant number of untraceable patients on the outcomes is unknown. The probability of death in patients who could not be contacted is relatively high, but this is speculative at best.

LIMITATION OF STUDY

The study may be limited by its single-center design and relatively small sample size, which may restrict the generalizability of the findings to other vascular surgery settings. Additionally, the observational nature of the study may limit assessment of causal relationships between risk factors, postoperative mortality, and amputation outcomes. Limited availability of the follow-up data regarding prosthetic rehabilitation may be studied in future to assess long-term functional outcomes.

CONCLUSION

Acute and chronic limb ischemia along with diabetic foot infections constitute the major causes of amputation in a vascular surgery unit. Mortality is high, especially in the postoperative period, in this population, with cardiovascular disease constituting the major cause of death. Prosthesis rates are very low. Major morbidity and mortality may be avoided by screening in at-risk populations, prompt referral to a vascular surgeon, implementing aggressive management protocols for modifying cardiovascular risk factors, and encouraging prosthesis application and availability.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

UJM & AH: Data acquisition, data analysis, critical review, approval of the final version to be published.

AA & NMM: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

RK & SHR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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