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Original Research Article

A five year retrospective study of factors influencing outcome of major lower limb amputations

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ABSTRACT

Background: The word amputation is derived from Latin -Amputare - to cut away. The amputation is indicated when the limb is considered as dead limb/ deadly limb/ dead loss limb. Often cases are referred to tertiary centre late, resulting in complications which requires surgical management. Aim of the study was to compare the outcomes of major lower limb amputations and to identify risk factors associated with mortality and morbidity following major lower limb amputations.
Methods: A retrospective observational study was done for 5 years between January 2014 to November 2019, comprising 276 patients undergoing major lower extremity amputations. Adult patients undergoing lower extremity amputations for ischemic, infected or gangrenous lower limb were included and patients who underwent amputations for trauma or tumours were excluded. The data regarding comorbidities, postoperative complications, outcome of major lower limb amputations were evaluated.
Results: 276 patients underwent lower limb amputations (above knee amputations (AKA)-127, below knee amputations (BKA)-134, forefoot amputations-15). Male patients outnumbered females (6.7:1) and most of them were of elderly age group (mean age 60.56 years). The most common indications for amputations in our study were peripheral vascular disease (120), diabetes (87), necrotizing fasciitis (37). The 1 year mortality rates following lower limb amputations in our study were 14% (BKA) and 34% (AKA).
Conclusions: Lower limb amputations are associated with high mortality rates. Mortality can be expected in both the early and the late postoperative periods and is most probably related to serious comorbidities, such as renal and heart disease, rather than the level of amputation.

Keywords: Major lower limb amputation, Peripheral vascular disease, Necrotizing fasciitis

INTRODUCTION

The word amputation is derived from Latin -Amputare - to cut away. Amputation is classified as cone bearing- ex: above knee and below knee amputation, end bearing- e.g. grittie stoke, Syme's method.

Indications for amputation: The only absolute indication for amputation is irreversible ischemia in a diseased or trauma. Dead limb: gangrene, deadly limb: wet gangrene, spreading cellulitis, arteriovenous fistula, other (e.g. malignancy), dead loss limb: severe rest pain with unreconstructable critical leg ischaemia, paralysis, other (e.g. contracture, traumatized limb).[1]

The main risk factors for lower limb amputations include peripheral vascular disease and diabetes mellitus, and that these operations were associated with high rates of postoperative mortality (7-23%) and morbidity (15-40%).[2-4]

Above-knee amputations and below-knee amputations are usually performed in patients with failed attempts at revascularization, comorbidities or anatomic factors precluding revascularization efforts, or those with extensive tissue loss or infection.[5] Despite the development and more widespread availability of new diagnostic procedures and peripheral vascular interventions, the rates of amputation and subsequent survival have remained relatively unchanged over the last few decades.[6]

Aims and objectives of the study

Aims and objectives of the study was to compare the outcomes of major lower limb amputations and to identify risk factors associated with mortality and morbidity following major lower limb amputations.

METHODS

A retrospective observational study was done, comprising 276 patients undergoing both emergency and elective major lower extremity amputations in Department of General Surgery, KIMS, Bengaluru.

Inclusion and exclusion criteria

Adult patients undergoing major lower extremity amputations for ischemic, infected or gangrenous lower limb were included and the Patients who underwent amputations for trauma or tumours were excluded.

Sample size

All patients satisfying inclusion criteria admitted in K.I.M.S. Bengaluru. This study included 276 patients

Study period

Study was done for 5 years between January 2014 to November 2019.

Method of collection of data

Details of cases, detailed history, clinical examination symptoms and signs, routine blood investigations, radiological evaluation were done.

Data analysis was performed using SPSS software. Basic descriptive and frequency analyses of the study sample were implemented to obtain demographic characteristics, period prevalence of clinical outcomes and complications, and mean age of the study population. In addition, a combination of nonparametric and chi-squared analyses was performed to identify differences in scaled data and rank risk factors associated with amputation, respectively. Value of less than 0.05 was considered statistically significant and was included in our results.

RESULTS

In our study 276 patients underwent major lower limb amputations with more preponderance in men with the male to female ratio was 6.7:1 (Figure 1). Majority of patients in 60-80 years age group (mean age - 60.56 years) (Figure 2). Out of the 276 patients, 134 patients underwent below knee amputation, 127 patients underwent above knee amputations (AKA) and 15 patients underwent forefoot amputation (Table 1). Male gender, smoking, diabetes mellitus, peripheral vascular disease and necrotizing fasciitis were found to be the most common risk factors for undergoing lower limb amputations (Table 2).

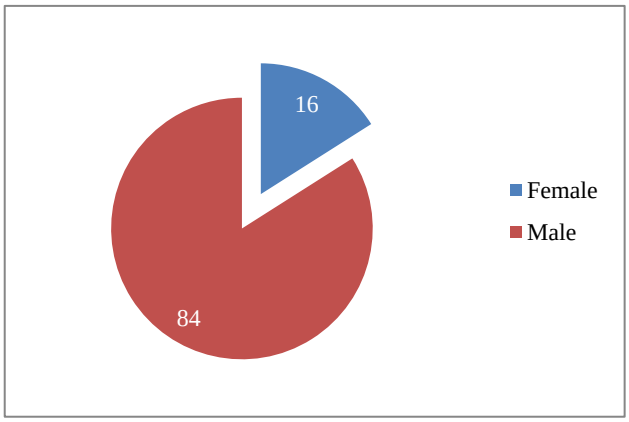

Figure 1: Gender distribution in study population.

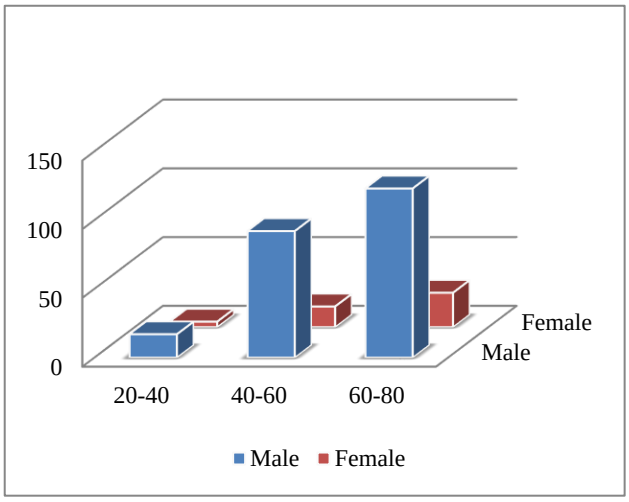

Figure 2: Age distribution of study population.

The mean age of patients was 60.56 years.

Table 1: Outcomes among study population.

Procedure	No. of patients
Forefoot	15
BKA	134
AKA	127

Table 2: Risk factors associated with lower limb amputation in the study population.

Study population	Total patients	AKA	BKA	P value
Number of patients	276	127	134	0.034
Male gender	232	114	104	0.049
Smoker	112	46	66	0.33
Diabetes mellitus	87	30	57	<0.001
Peripheral vascular disease	120	54	66	0.03
Necrotizing fasciitis	37	17	20	0.44
AKI / CKD	67	32	35	0.67
Ischemic heart disease	44	19	25	0.53

Table 3: Comparison of complications among AKA and BKA patients.

Comparison	AKA (n=127)	BKA (n=134)
Post operative complications		
Cardiovascular	31	18
Renal	9	11
Pneumonia	16	13
Debridement	17	22
Revision amputation	2	12
Guillotine amputation	14	7

Cardiovascular complications were the most common complication irrespective of level of amputations compared to renal and pulmonary complications. Patient requiring revision amputation were more among below knee amputation patients whereas patients undergoing Guillotine amputation were among above knee patients. (Table 3).

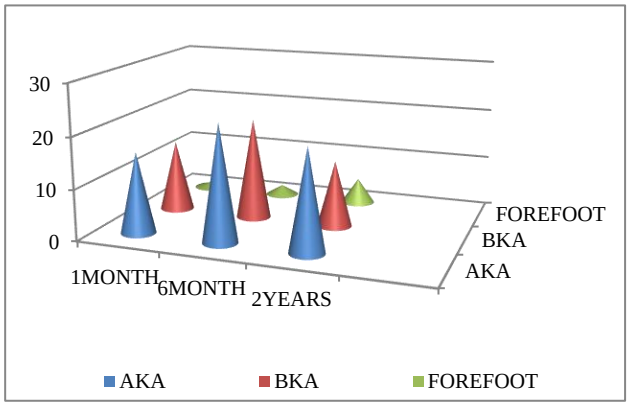

Figure 3: Mortality rates among the study population.

Mortality rates were more common among above knee and below knee amputation patients when compared to forefoot amputation patients especially in the first six months.

DISCUSSION

Major lower extremity amputations are performed in large numbers worldwide. Some studies report a reduced number of amputations due to early vascular interventions in ischemic conditions.[8,9] while other studies claim that major lower limb amputation rates have remained same during the past two decades.[10-12]

Despite advances in revascularization techniques, the most common indication for lower extremity amputation remains a dysvascular limb, including that caused by diabetes mellitus and peripheral vascular disease.[13] The 5 year mortality rate after amputation of dysvascular lower limb ranges from 40% to 60%, with primary vascular disease having a higher morbidity and mortality rate than diabetes mellitus. Morbidity is more frequent after transfemoral amputations than after transtibial amputations whereas in our study morbidity is more common in below knee (transtibial) amputations.[13]

The presence of PAD and diabetes, either alone or in combination, contributes to the majority of major lower limb amputations.[14,15] Li et al describe the overall incidence of diabetes in patients undergoing amputation as approximately 60%.[16]

The 2 years mortality rates following above and below knee amputations (BKA) in this study were 46.4% and 35%, respectively. Rosen et al reported the 30 day and 1 year mortality rates following lower limb amputations were 16.7% and 44%, respectively.[7] Lim et al reported 10% mortality at 30 days that rose to 43% at 1 year following AKA and BKA. Other authors reported an overall survival after BKA and AKA of 83-95% at 30 days, 69-78% at 1 year, and 33% at 5 years.[8,17] The overall mortality rates in our study are lesser compared to those of Lim et al.[17] The major reasons for high mortality in the developing countries is often delay in referring the cases to tertiary center and also the multiple co morbid conditions like diabetes, chronic kidney disease, congestive heart failure (CHF).

While we found higher mortality rates among AKA patients at 2 years (46.4% compared to 35% for BKA patients, p=0.0006), the analysis of short-term mortality (30 days) yielded no significant differences between the two patient groups. Nelson et al reported increased mortality rates (12.8% vs. 6.5%) following AKA compared to BKA, but they did not perform an analysis

to determine if the level of amputation is an independent factor affecting mortality.[8]

A significantly higher rate of cardiovascular complications after AKA was also found (31% compared to 18% after BKA). These differences could not be explained by the preoperative cardiac state, which was similar for both our groups. Lee et al found six independent predictors of cardiac complications: high risk surgery, history of coronary artery disease, history of CHF, history of cerebrovascular disease, preoperative treatment with insulin, and preoperative creatinine of ≥2.0 mg/dl. It is possible that the more extensive tissue loss and blood loss in AKA compared to BKA may be responsible for the increased rates of cardiovascular complication.[14]

The strength and limitations of this study are study strength included the data extraction process, which utilized a wide range of demographic, clinical, and biochemical data to formulate an extensive analysis to support the study aims and limitations being a single center and retrospective study.

CONCLUSION

Both AKA and BKAs are associated with very high mortality rates. Early vascular interventions can reduce the rate of amputations and mortality.

Mortality can be expected in both the early and the late postoperative periods and is most probably related to serious comorbidities, such as renal and heart disease, as well as reduced functional status, rather than the level of amputation. Wound complications are commonly seen after below-knee amputations.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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