

Patterns and Causes of Major Lower Limb Amputations in Tertiary Care Centers

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Abstract:

Background: “Amputation” derived from a Latin word ‘amputare’ (to cut out) has been defined as ‘removal of part or all of a body part enclosed by skin. The most common indication for amputation varies from study to study. Trauma, complications of diabetes mellitus (DM) and peripheral arterial occlusive disease (PAOD) are some of the common indications recorded. Complications of DM has been widely accepted as the most common cause with figures ranging from 25% to 90% depending on the study. The surgeon when removing the limb is primarily concerned with saving the life of a patient or getting rid of a diseased or badly injured part of body. The aim of this study is to outline the incidence, patterns, causes and complications of lower limb amputation among patients at a tertiary care hospital.

Materials and Methods: This study is a prospective observational study done in a tertiary care center in Ahmedabad, India from July 2019 to December 2019. The parameters included in the study were age, sex, indication, level of amputation and complications after amputation. All patients who underwent major lower limb amputation and were more than 18 years of age were included in the study. Patients who underwent amputation from another centre and came to the hospital for follow up or management of complications were not included in the study. In case there was a conversion to a higher level, the amputation level was recorded as the revised level. Data collected was entered in a Microsoft Office Excel Sheet and analyzed.

Results: Over the abovementioned period 64 major lower limb amputations were performed. The age ranged from 28 to 76 years with the average age was 55 years. 87.5% of the amputees were males. 47 of the cases underwent Below knee amputation whereas 16 underwent above knee amputation and 1 hip disarticulation was performed. Gangrene due to PAOD was the most common indication of amputation in our series followed by DM complication and a few cases of trauma. Infection was the most common complication involving 24 of the cases. All the infected stumps required debridement with re-suturing. 2 of the cases had wound dehiscence requiring re-suturing and 9 of the cases required revision amputation. The mortality rate in our study was 28%. The average duration of hospital stay was 8 days.

Conclusion: Complications of PAOD and DM were the most common indications of limb amputation in our region. Patient education regarding lifestyle modification (smoking cessation, exercise, dietary modifications), proper control of diabetes and foot care will play a pivotal role in preventing such morbidity. Prosthesis and rehabilitation services will never be good enough to replace an anatomically normal and functional limb

Key Word: Amputation, Gangrene, lower limb amputation, Peripheral Arterial Occlusive Disease, Diabetes mellitus

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I. Introduction

“Amputation” derived from a latin word ‘amputare’ (to cut out) has been defined as ‘removal of part or all of a body part enclosed by skin [2]. Amputation should be considered when part of a limb is dead, deadly or a dead loss. A limb is dead when arterial occlusive disease is severe enough to cause infarction of macroscopic portions of tissue, i.e. gangrene. The occlusion may be in major vessels (atherosclerotic or embolic occlusions) or in small peripheral vessels (diabetes, Buerger’s disease, Raynaud’s disease, inadvertent intra-arterial injection). If the obstruction cannot be reversed and the symptoms are severe, amputation is required [1].

Lower limb amputation (LLA) can be major or minor. Major LLA is the one, which is performed at the level of the ankle or above [3]. The major choice is between an above- and below-knee operation. A below knee amputation preserves the knee joint and gives the best chance of walking again with a prosthesis. However, an above knee amputation is more likely to heal and may be appropriate if the patient has no prospect of walking again [1].

The most common indication for LLA varies in different parts of the globe [3], however, trauma and peripheral vascular disease (PVD) including diabetic foot constitutes the major burden [5]. Complications of

DM has been widely accepted as the most common cause with figures ranging from 25% to 90% depending on the study [6].

According to Ebskov et al. the reported male to female ratios from the UK, USA and Scandinavia are 2:1 and this has not altered over the last 20 years [7]. According to Masood et al. the most common indication in developing countries is complications of diabetes mellitus and trauma [8]. These findings are not in agreement with other studies which reported trauma as the most common indication for major limb amputation

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 [3].

Dormandy and Thomas in 1988 reported that saving the knee joint increases the amputee's rehabilitation potential [9].

Although globally there is a fall in the number of AK amputations as there are more and more efforts to save the knee joint. The usual complication rates range between 20-40% as reported by a study conducted by Chalya et al in Tanzania and by Essoh et al in Nigeria [10]. The most common complication was superficial surgical site infection [11].

The surgeon when removing the limb is primarily concerned with saving the life of a patient or getting rid of a diseased or badly injured part of body [1]. The aim of this study is to outline the incidence, pattern, causes and complications of lower limb amputation among patients at a tertiary care hospital.

II. Material and Methods

This prospective observational study was done in Department of General Surgery, B. J. Medical College, Ahmedabad, India from July 2019 to December 2019. A total of 64 major lower limb amputations performed over the abovementioned period in a surgical unit in the Department of General Surgery were included in the study.

Each patient included in the study was thoroughly observed during the entire course of treatment while admitted in the hospital. The parameters' studied include age, sex, indication of amputation, level of amputation, complications after surgery.

Study Design: Prospective observational study

Study Location: This was a tertiary care teaching hospital-based study done in a Surgical Unit in Department of General Surgery, in B.J. Medical College and Civil Hospital, in Ahmedabad, Gujarat, India.

Study Duration: July 2019 to December 2019.

Sample size: 64 patients.

Subjects & selection method: The study population was drawn from the patients who were admitted to a Surgical Unit in Department of General Surgery, B.J. Medical College, Ahmedabad over the abovementioned period of 6 months and had undergone a major lower limb amputation.

The treatment course of the patients was observed till the patient was discharged or unfortunately expired during the course of treatment.

Those Patients who underwent amputation from another centre and came to the hospital for follow up or management of complications were not considered in the study.

Inclusion criteria:

1. All patients who underwent major lower limb amputation
2. Either sex
3. Aged ≥ 18 years,
4. Patients who had failure of revascularization/ bypass surgery performed previously for limb ischemia.

Exclusion criteria:

1. Age less than 18 years of age
2. Patients who underwent amputation from another centre and came to the hospital for follow up or management of complications.
3. Patients who did not give consent for surgery.

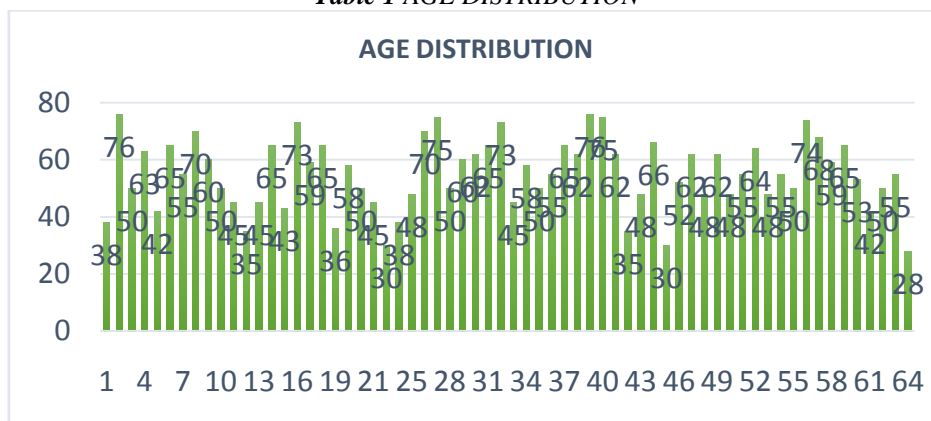
Procedure methodology

All patients who were admitted in the outpatient or emergency department and underwent a major lower limb amputation (level of amputation above ankle joint) in the hospital were closely observed throughout their entire course of treatment in the hospital without any special intervention. Patients' vitals, local examination of the wound, routine blood investigations (including a complete blood count, renal function test, coagulation profile, blood sugar levels) was monitored on a daily basis. Any complications (like surgical site infection, wound dehiscence, gangrene of stump, features of sepsis) that occurred were recorded and managed in the best possible way as per the protocols followed in the hospital. Any revision amputation (a level higher),

debridement or re-suturing of wound performed was recorded. Each patient was followed up till discharge from hospital or death of the patient. All data was entered into a Microsoft Excel Sheet and analyzed. The results of the study has been discussed

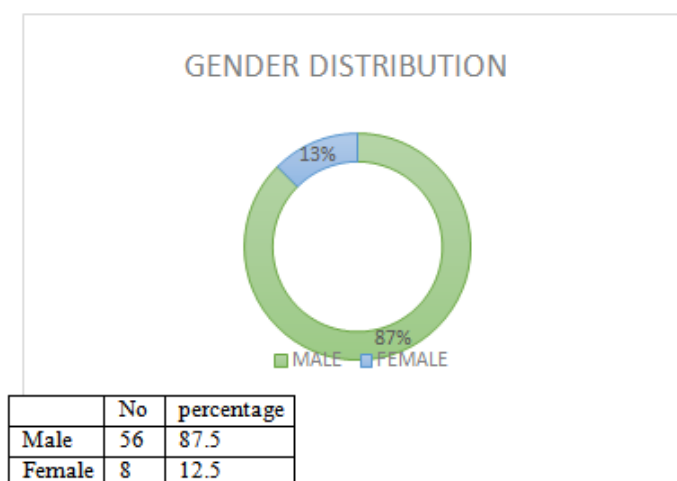
III. Result

Table 1 AGE DISTRIBUTION



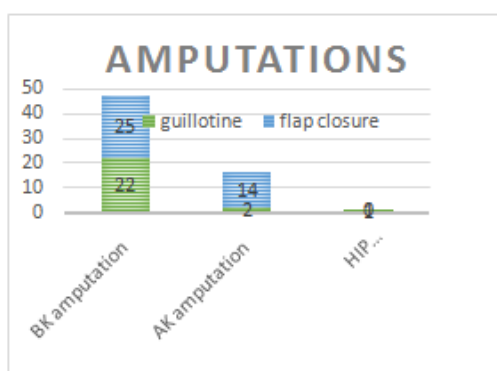
A total of 64 major lower limb amputations were performed. The age of the patients ranged from 28 to 76 years with the average age being 55 years.

Table 2 GENDER DISTRIBUTION



The above pie chart shows distribution of patients based on gender. Total 56 of the patients were males and 8 of them were females. 87.5% of amputees were males.

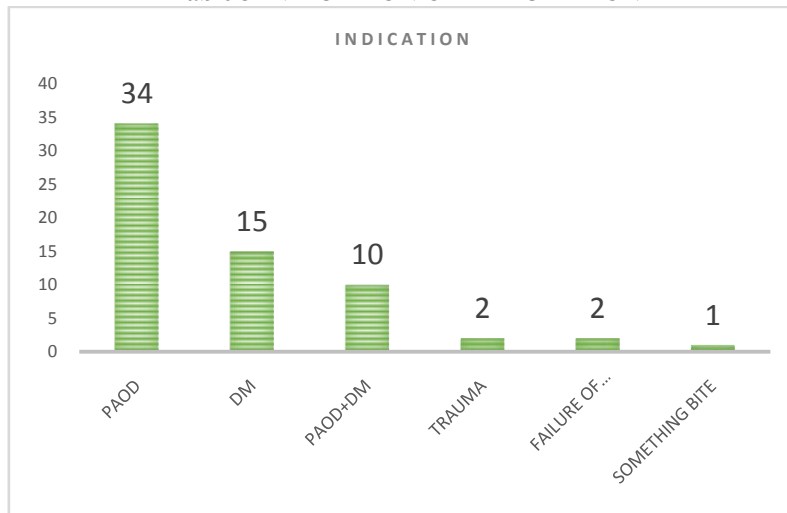
Table 3 TYPE OF AMPUTATION



	guillotine	Flap closure	Total No.	Percentage
B K Amputation	22	25	47	73.5
A K Amputation	2	14	16	25
Hip Disarticulation	-	1	1	1.5

The above chart shows the distribution of the patients based on level of amputation performed. 47 cases underwent Below knee amputation which included 22 guillotine amputation and 25 closed flap amputation. 16 underwent above knee amputation including 2 guillotine and 14 closed flap amputation and 1 hip disarticulation was performed.

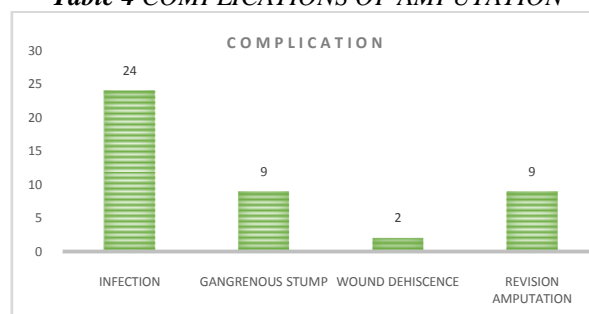
Table 3 INDICATION OF AMPUTATION



INDICATION	NO OF PATIENTS	PERCENTAGE
PAOD	34	53
DM	15	23.5
PAOD+DM	10	15.5
TRAUMA	2	3
FAILURE OF REVASCULARISATION	2	3
SOMETHING BITE	1	2

The above chart shows distribution of the patients based on the Indication of surgery. 34 of the patients developed gangrene due to Peripheral Arterial Occlusive Disease (PAOD). 15 of the amputees had infected limbs due to uncontrolled Diabetes Mellitus (DM). 10 of them had both underlying PAOD and uncontrolled DM. 2 of them had history of recent trauma to lower limb. 2 of the patients had amputation due to failure of Revascularisation surgery which they had undergone previously and 1 of the patients had alleged history of something biting over the limb following which he developed infection and gangrenous changes over the limb. Gangrene due to PAOD was the most common indication of amputation in our series followed by DM complication and a few cases of trauma.

Table 4 COMPLICATIONS OF AMPUTATION



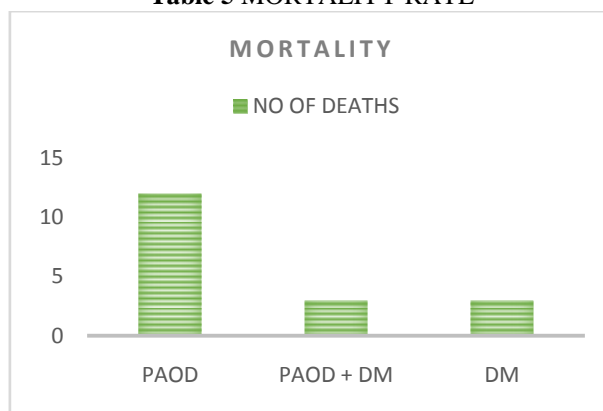
COMPLICATION	NO OF PATIENTS	PERCENTAGE
SURGICAL SITE INFECTION	24	37.5

GANGRENOUS STUMP	9	14
WOUND DEHISCENCE	2	3
REVISION AMPUTATION	9	14

The above chart shows distribution of complications after amputation. 35 out of 64 patients developed some or the other complication. 24 of the patients had Surgical Site Infection. 9 of them developed gangrene of the amputated stump. 2 of them had dehiscence of the closed stump.

Infection was the most common complication. All the infected stumps required debridement with re-suturing. The cases with wound dehiscence required re-suturing and 9 of the cases required revision amputation.

Table 5 MORTALITY RATE



The total number of deaths during the course of study were 18, which accounts for a mortality rate of 28%. The cause of death in majority of the cases was a sudden cardiorespiratory arrest due to septicemia and in others due to Myocardial Infarction.

The duration of hospital stay was 8 days on an average. The maximum duration of hospital stay was 32 days and the minimum duration of hospital stay was 4 days.

IV. Discussion

In limb amputations, the indications are many and the pattern varies from place to place [7]. The general trend usually is PAOD being the leading cause in developed countries, because of sedentary lifestyle and increased life expectancy. Moreover, males are more prone to risk factors of PAOD like smoking and tobacco chewing [12].

Males are at risk of trauma, especially in developing countries where male population work outside exposed to accidental hazards [13].

Pooja and Sangeeta in their epidemiological report from January 2008 to January 2010 from Kolkata, India found 70.3% of the amputations were traumatic [12]. Paudel et al. in retrospective review from 1997 to 2004 found RTA leading cause accounting for 74.29% of LLA in adult population in a tertiary care hospital of Nepal [15].

In our series, only 53% limbs were amputated for gangrene due to PAOD, 23% limbs for complications of Diabetes mellitus, 11% of patients had underlying PAOD as well as DM, 3% each due to trauma and failure of previous revascularisation surgery and 1% due to other causes like infected wound following something bite. Mean age of the population is 55 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 [16]. This difference is probably because in those studies, trauma was the second most common indication for amputation which included majority of young patients.

As the age of onset of diabetes reduces and the age of survival increases, more time exists for complications of diabetes including LLA to develop [17].

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 30 years [7]. Findings from our study also show an obvious male predominance.

Males are always at risk of trauma, especially in the developing countries where male population work outside and thus exposed to the accidental hazards, moreover, males are more prone to risk factors for PVD like cigarette smoking and tobacco chewing in countries of South East Asia than the females, who mostly take care of households and are indoors. A similar study from Karachi, Pakistan had 86.6% patients as males and 86% male patients in a study from Kolkata, India [8,2]

It has been seen that an early minor amputation can prevent a later major amputation [19]. However, in this study minor amputations have not been included, so such evidences cannot be commented upon.

Dormandy and Thomas in 1988 reported that saving the knee joint increases the amputee's rehabilitation potential [9]. 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 also showed that 73% of the amputations performed were below knee amputations.

Removal of the non-functional or dying or infected limb from the body may improve the quality of life of the patient and help in early ambulation [20]. However, patients with co-morbidities, especially diabetes increases the risk of mortality in the peri-operative period [7].

Mortality in the postoperative period in our series was 28%. 15 out of 18 deaths (83%) were patients of PAOD with a previous history of cerebrovascular accident died of cardiac arrest in the post-operative period.

Wound infection is the most common complication in the postoperative period [11] which in our study was found in 37% of the patients. The overall complication rate in our study (54%) was much higher than most other studies [21].

The most common complication was superficial surgical site infection [11]. This high rate of post-operative complications and deaths could probably be sepsis due to late presentation to the hospital prior to amputation.

V. Conclusion

Complications of PAOD and DM were the most common indications of limb amputation in our region.

Patient education regarding **lifestyle modification** (smoking cessation, exercise, dietary modifications), proper control of diabetes and foot care will play a pivotal role in preventing such morbidity.

Prosthesis and rehabilitation services will never be good enough to replace an anatomically normal and functional limb.

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