Original Article

Major lower limb amputation in diabetics

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Abstract

Objective
Lower limb amputation is one of the most feared complication of diabetes mellitus. It is associated with a high mortality rate and a considerable loss of walking ability and independence among survivors. This study was set to review the indications and outcome of major lower extremity amputation (LEA).

Methods
This is a prospective hospital based study conducted in Khartoum Teaching Hospital and Jabir Abu El Iz Diabetic Centre (JADC) during the period of July 2002 to January 2003.

Results
Consecutive seventy diabetic patients who underwent major LEA during the study period were included. Their age ranged between 35-92 years with a mean age of 61 years ±12. The male to female ratio was 1.5:1. Ninety six percent (96%) had Type 2 diabetes mellitus. Fifty two patients (74%) had transtibial amputation and 18 (25%) had transfemoral amputation. The indications for major LEA were intractable sepsis in (80%), foot gangrene (44%) and extensive tissue loss (18%). The most frequently encountered post-operative complication was wound infection in 11 patients (15.7%) followed by ischaemia of the stump in 6 patients (8.7%). The rate of postoperative complications was significantly higher in patients who underwent transfemoral amputation.

Conclusion
Transtibial is the main type of major lower extremity amputation. The most common indication of major LEA is intractable sepsis, followed by gangrene of the foot then various combinations of sepsis, gangrene and extensive tissue loss. Transfemoral amputation is associated with higher rates of complications, re-operation, delayed healing and mortality.

Key words: diabetes, amputation, complication

Introduction
The major problem facing diabetic patients is the development of the long term complications and diabetes related foot problems. This often results in significant social, medical and economic consequences. Diabetic foot complications are the most common cause of major LEA in Sudan accounting for 24.1% (1). Patients who have undergone a major lower limb amputation have a high risk of a subsequent ipsilateral or contralateral amputation. The 5 years risk of a second leg amputation is 28-52% (2). The 5 years mortality rates after LEA among the diabetic population is 68% (3).
There is a lower incidence rate of LEA in diabetic patients of Asian origin, 3-4 cases per 10,000 per year compared to 14.2 cases per 10,000 in white Caucasians\(^4\). Accurate population based statistics concerning the current incidence of ulcers, indication and outcome of amputation in the developing countries is not available. Most of the available data are based on cross-sectional studies showed an incident of ulcers of about 4-10% of diabetic individuals\(^5\).

This study was set to review the indications and outcome of major lower extremity amputation (LEA).

**Patients and methods**

This is a prospective analytic hospital-based study. Seventy patients with diabetes who underwent major LEA in Khartoum Teaching Hospital and JADC during the period July 2002 to January 2003 were included. The study was approved by the ethical committee and the aims and methodology of the study were explained to patients, and their consent was obtained. Patient data was collected using a unified clinical protocol and database, consisting of questionnaire, clinical examination, investigations, amputation surgery and postoperative events.

The clinical protocol included: patients personal data, type of diabetes, duration, mode of control, compliance, history of previous foot education, hypertension and smoking, history of previous foot ulceration, history of previous amputation, the site and type of primary lesion leading to amputation. Surgery details included: caliber of the surgeon, anatomical level and dexterity, type of anaesthesia, prophylactic antibiotics, indications of surgery, wound management and use of drains. Investigations done were: Hb, RBS, FBS, two–hour postprandial glucose. Postoperative events included postoperative wound infection, requirement and indication for reoperation, development of contralateral ulceration, duration of hospital stay, causes and circumstances of death.

Chronic critical ischaemia is defined by either one of the two following criterias:- Persistent ischaemic rest pain requiring analgesia for more than two weeks. Ulceration or gangrene of foot or toes, both associated with ankle systolic pressure of less than 50mmHg or toe systolic pressure of less than 30mmHg\(^6\).

Data were fed to Statistical Package of Social Sciences (SPSS). Descriptive statistics and cross tabulation was performed as appropriate and P<0.05 was taken for significance.

**Results**

Seventy patients with diabetes who underwent major lower limb amputations were studied. The male to female ratio was 1.5:1.0. The age ranged between 35 and 95 years with a mean age of 61.5 years. Sixty seven patients (95.7%) were Type 2 and three (4.3%) were Type 1. Fifty one patients (87.2%) had diabetes for more than 10 years and 29 patients (41%) for 11-19 years. The mean duration of diabetes was 18.3 ± SD 9.0 years. No newly diagnosed diabetic was reported in this series. The level of LEA was not found to correlate significantly with the duration of the disease (p=0.2).

The majority of patients (n=51) 73% were found to be irregular in their treatment and 59 patients (75%) had bad glycaemic control. Eleven patients were hypertensive (16%)
and this was significantly more prevalent among patients who had transfemoral compared with transtibial amputation (P=0.017). Twenty three patients were smokers (33.3%) of whom 13 patients (19%) were regular smokers and 10 (14.3%) patients' ex-smokers.

There was a past history of previous foot ulceration in thirty patients (42.85%). Thirty one patients (44%) had history of previous minor and/or major LEA. Fifty two patients (74%) had transtibial amputation and 18 patients (26%) had transfemoral amputation. The indication for LEA was intractable sepsis in 56 patients (80%), ischaemia in 31 patients (44%) and extensive tissue loss in 13 (18.5%). The wound was closed primarily in sixty one patients (87%) and was left open in 9 patients (13%).

The most frequently encountered postoperative complications were wound infection in 11 patients (16%) followed by ischaemia of the stump in 6 patients (8.5%).

The rate of postoperative complications was significantly higher in patients undergoing transfemoral amputation. There is a significant difference in the rate of primary healing in transtibial (77%) and transfemoral (28%) P<0.05.

Nineteen patients (27%) required re-operation, mainly being debridement. The requirement of re-operation was significantly higher among transfemoral (55 %) compared with transtibial amputees (17%) (P=0.008).

Fourteen patients (20%) died in hospital. The mortality rate of transfemoral amputation (n=9) (50%) was statistically higher than that of transtibial amputation (9.6%) P<0.5.

**Discussion**

The slight male predominance in this series can be explained by the fact that males have a more active life style and therefore more prone to foot injuries. The level of lower limb amputation did not differ significantly between males and females(7). The mean age for diabetic amputee reported from the west ranged between (64-71) years(8,9). This can be partly explained by the fact that diabetic patients in western communities are more compliant with treatment, being more educated and have access for vascular intervention in form of angioplasty or bypass resulting in substantial reduction 40-80% in the rate of amputation.

The predominance of Type 2 DM among patients in this study is consistent with the fact these patients are more prone to develop foot ulceration or LEA(10).

It is known that, the longer the duration of diabetes, the higher the degree of neuropathy, which is the main cause of foot sepsis(11). Humphrey RA et al reported that LEA is associated with significantly longer mean duration of diabetes(12).

In this series the level of LEA was not found to correlate significantly with longer duration of the disease. Hypertension was less prevalent in this series, but it was significantly more among transfemoral amputee when compared with transtibial amputee.

Forty percent of patients reported a history of previous ulceration and/or amputation. It is also known that diabetic patients with history of previous ulceration and/or amputation are at increased risk of subsequent amputation(13,14).

These results showed that 59 patients (75%) had bad glycaemic control. This is very serious because hyperglycaemia together with vascular dysfunction is a direct cause of diabetic neuropathy(15).
No Symme’s or through knee or hip disarticulation was done in this series. The ratio of transtibial to transfemoral amputation in this study was 3:1. The ratio was higher in this study compared to that reported by other authors which was 1.5:1\(^{16}\). Their lower ratio can be explained by the higher prevalence of peripheral vascular disease (PVD) among their patients. The commonest indication for major LEA in our series was intractable of sepsis, followed by ischaemia and extensive tissue loss and various combinations of the above.

Van Damme H et al in a series of 186 diabetic related LEAs reported that the most common indications for major amputation were extensive tissue loss, intractable infection and non reconstructable occlusive vascular disease\(^{17}\).

The most frequently encountered postoperative complications were wound infection, followed by ischaemia of the stump.

The occurrence of postoperative complication was significantly related to the level of LEA (P=0.5). The rate of postoperative complications for transfemoral amputation was (61%) while that of transtibial was (17%).

Toursarkissian B et al, in a series of 113 diabetic related major LEAs, reported a postoperative complication rate of (40%)\(^{16}\). The majority of these were wound related (22%). In their series wound complications were more frequent with transfemoral than transtibial (P=0.04).

The requirement of re-operation was significantly higher among transfemoral amputees compared to transtibial amputation.

Primary healing occurred in (77%) of the patients who underwent transtibial amputation and in (28%) in those who underwent transfemoral amputation. This difference in primary healing pattern was found to be statistically significant. Similar healing patterns were reported by Darmandy J et al\(^{18}\).

The mortality rate of transfemoral amputation was statistically higher than that of transtibial amputation. Mortality figures in this study were comparable to those reported by the International Working Group on the Diabetic Foot: (10-40%) for transfemoral VS (5-20%) for transtibial amputation\(^{19}\).

References