

Research Article

Outcomes of Diabetic Foot Patients Following Peripheral Vascular Bypass Surgery

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ABSTRACT:

Aim: The aim of this study was to analyse the outcomes of peripheral vascular disease and the bypass procedure done in patients with diabetic foot problems.

Methods and materials: A cross sectional descriptive retrospective analysis was carried in department of Surgery at St John's medical college, Bangalore, India. The study period was for 3 years from February 2012 to Jan 2015.

Results: A total of 17 patients had undergone open peripheral bypass surgery procedure for diabetic foot problems during this period. There were 13 males [76.5%] and 4 females [23.5%]. 11 patients [64.7%] had history of smoking. 6 patients [35.3%] had diabetes of less than 1 year duration. 7 patients [41.1%] had presented with dry gangrene. 5 patients [29.41%] had associated foot infection. 9 patients [52.9%] had undergone open bypass surgery only without any amputation done on them. The most common surgical procedure performed was femoro-popliteal bypass surgery [76.47%].

Conclusion: The recent trend shows an increase in endovascular procedure over bypass procedure which is decreasing over years. In fact, our series shows hardly one bypass being performed every 2 months in diabetic foot patients. Femoropopliteal bypass remains the commonest bypass procedure. Our limb salvage rate was 89.2%. Dry gangrene is the commonest pathological lesion seen. The inpatient mortality in our series was 11.76%.

Key Words: Diabetic foot, Smoking, Bypass, Arterial disease.

INTRODUCTION

It is estimated that by year 2030, there will be 439 million people in the world suffering from diabetes [1]. Diabetic foot is one of the most common complication of diabetes and it is highly devastating to the patient and their families, both economically and emotionally [2].

There are various predisposing factors that lead to development of diabetic foot ulcer such as neuropathy, foot deformities, trauma, peripheral arterial disease [PAD and infection [3]. Peripheral arterial disease is four times more prevalent in diabetics than in non diabetics [1, 2, 3]. It has been estimated that, even at the time of diagnosis, around 8% of the people with diabetes already have underlying PAD and one third of the patient with diabetes over the age of 40 years will have PAD [1].

Smoking, hypertension and hyperlipidemia further add to the risk of developing peripheral arterial disease among patients with diabetes [2]. In fact, peripheral vascular disease occurs earlier in diabetic patients than non diabetics [4].

The aim of this study was to analyse the outcomes of peripheral vascular disease and the bypass procedure done in patients with diabetic foot problems.

METHODS AND MATERIALS

A cross sectional descriptive retrospective analysis was carried

in department of Surgery at St John's medical college, Bangalore, India, which is a tertiary care premiere teaching hospital. During this period, our department had 4 surgical units and one division of vascular surgery. Diabetic foot problems were treated by the surgical unit. All our peripheral bypass procedure were done by the team in this division. The study period was for 3 years from February 2012 to Jan 2015. The institutional ethics committee approval was taken for this study [Study ref no 135/2014]. The following were inclusion and exclusion criteria

Inclusion criteria

- 1] All diabetic foot patients with peripheral arterial disease
- 2] Patients admitted in our department and who underwent peripheral vascular bypass procedure

Exclusion criteria

- 1] Patients who underwent bypass procedure in non-diabetics
- 2] Patients who underwent endovascular procedures were excluded

RESULTS

A total of 17 patients had undergone open peripheral bypass surgery procedure for diabetic foot problems during this

period. There were 13 males [76.5%] and 4 females [23.5%] [Table 1].

Sl No	Sex	Number	Percentage
1]	Males	13	76.5%
2]	Females	4	23.5%
	Total	17	100%

Table 1 showing distribution of cases in males and females

The average age for males was 57.4 years and for females was 61.3% [Table 2].

Sl No	Sex	Age
1]	Males	57.4 years
2]	Females	61.3 years

Table 2 showing average age

11 patients [64.71%] had left lower limb involved, 5 patients [29.41%] had right side and 1 had bilateral disease.

15 patients [88.24%] had claudication pain history. Only 2 patients [11.76%] gave history of known trauma prior to the lesion. 23.53% of the patients already had history of ischemic heart disease and 58.82% had underlying hypertension. 11 patients [64.7%] had history of smoking [Table 3] and all of them were males.

Sl No	Smoking	Number	Percentage
1]	Smokers	11	64.7%
2]	Non Smokers	6	35.29%
	Total	17	100%

Table 3 showing distribution of cases among smokers and non-smokers

Out of 11 patients, 4 patients [36.37%] had smoking of 10 to 20 years duration and 7 patients [63.63%] had history of more than 20 years of smoking. 6 patients [35.3%] had diabetes of less than 1 year duration, 6 patients [35.3%] had diabetes from 1 to 5 years of duration, 3 patients [17.65%] had diabetes between 5 to 10 years duration and 2 patient [11.76%] had diabetes more than 10 years duration.

11 patients [64.7%] had lesions in the forefoot. 7 patients [41.1%] had presented with dry gangrene [Figure 1] at the foot as the most common lesion [Table 4].



Figure 1 showing a patient having great toe dry gangrene with signs of ischemia like loss of hair and stretch shiny thin skin. Patient had severe rest pain.

Sl No	Pathological lesion	Number	Percentage
1]	Dry gangrene alone	7	41.1%
2]	Dry gangrene with secondary infection	1	5.9%
3]	Dry gangrene with non-healing ulcer	1	5.9%
4]	Infected ischemic ulcer	1	5.9%
5]	Non healing ischemic ulcer	2	11.9%
6]	Rest pain	5	29.4%
	Total	17	100%

Table 4 showing the pathological foot lesions

5 patients [29.4%] underwent bypass surgery for rest pain. 2 patients [11.8%] presented with ischemic non healing ulcer. 5 patients [29.41%] had associated foot infection [Figure 2],



Figure 2 showing dry gangrene of the 4th toe of the right foot along with secondary infection [Arrow] seen at the dorsum of the forefoot [abscess].

3 of whom underwent surgical procedure first and when the wound did not heal, they were subjected for bypass surgery procedure for ischemic ulcers.

9 patients [52.9%] had undergone open bypass surgery only without any amputation done on them in the same period of hospitalization whereas 8 patients underwent some form of amputation along with open bypass procedure in the same admission [Table 5].

Sl No	Amputation	Number	Percentage
1]	No amputations	9	52.9%
2]	Toe amputation	5	29.4%
3]	Transmetatarsal amputation	1	5.9%
4]	Below knee amputation	2	11.8%
	Total	17	100%

Table 5 showing associated amputations that were performed

2 patients [11.8%] underwent below knee amputation after bypass surgery as wound showed no improvement. 3 patients [17.65%] had past history of amputation with 2 patients having had toe amputation and 1 patient had contra lateral below knee amputation.

11 patients [64.1%] had infra inguinal arterial involvement alone [femoro-popliteal disease], 2 patients had inguinal and 4 patients had supra inguinal arterial disease [Table 6].

Sl No	Site of Lesion	Number	Percentage
1]	Infra-inguinal	11	64.7%
2]	Inguinal	2	11.76%
3]	Supra-inguinal	4	23.53%
	Total	17	100%

Table 6 showing site of arterial disease involvement

The most common surgical procedure performed was femoro-popliteal bypass surgery [Table 7] which was done in 13 patients [76.47%].

Sl No	Type of Bypass surgery	Number	Percentage
1]	Femoro-popliteal bypass	13	76.47%
2]	Femoro-femoral bypass	1	5.9%
3]	Ileo femoral bypass	2	11.76%
4]	Femoro-popliteal bypass with iliac stenting	1	5.9%
	Total	17	100%

Table 7 showing the types of peripheral bypass surgery performed

The duration of hospital stay ranged from 5 to 101 days with an average of 23.6 days. 9 patients [52.94%] had their bypass surgery being done within 7 days of admission, 6 patients [35.295] had their surgery between 7 to 14 days and 2 patients [11.76%] took more than 2 weeks for their bypass surgery being done on them. The cheapest cost for bypass surgery was Rs 56118 [1\$=68 Indian rupees] and the expensive cost was Rs 3,98,729 rupees. The cost depended on the ward, duration of stay and associated amputation. Our institute was considered to be one of the economic missionary hospitals for patients.

The inpatient mortality was 11.76% in our study. Our records showed that at the end of 3 months, 2 patients had their wounds healed completely, 3 patients still had non healing wound and 7 patients had lost for follow-up.

DISCUSSION

Diabetes is one of the most important and major risk factor of peripheral arterial disease and it affects the arterial tree in a centrifugal pattern [5]. The prevalence of PAD in diabetes patient differs geographically. It was found to be 3.2% in a study from south India and as high as 15.9% in a western population [6].

Diabetes mellitus as such is associated with infrapopliteal disease affecting the anterior tibial, posterior tibial and peroneal vessels whereas risk factors such as smoking are associated with more proximal peripheral arterial disease [7]. In Ansari et al series [3], more males suffered from Pad in diabetic foot compared to females. In our study also, males were largely affected and most males were smokers with 63.63% having history of smoking of more than 20 years duration. Peripheral arterial disease is also an important risk factor for lower limb extremity amputation in diabetic patients [8]. Majority of our patients (97.06%) had diabetes mellitus of less than 5 years duration who underwent bypass surgery.

Patients with PAD have higher incidence of cerebrovascular and coronary artery disease [6, 8, 9]. In our study, 23.53% had underlying ischemic heart disease and 58.82% had hypertension.

Recent trends have shown that endovascular interventions are more common and are first choice of intervention in PAD patients in diabetes [5, 10]. In fact in Jain et al series [10], it was shown that only 3.32% of patients with diabetic foot problems, who were treated at one of the best limb salvage centres in India, required peripheral bypass surgery.

Different series shows various different bypass surgery procedures, but femoropopliteal bypass is one of the most common bypass procedures which showed a 5 year patency of 83% and 10 year patency of 63% with limb salvage rate of 89% [11]. This surgery is being performed since 1949 [12]. However in Coce et al series [13], aortofemoral bypass surgery was the most commonly done procedure compared to femoropopliteal bypass.

We compared our surgical procedures with Yii et al series [14], where femoropopliteal bypass was the most common bypass procedure in diabetic critical foot ischemia. In our series too, femoropopliteal bypass was the commonest procedure. In Yii et al series [14], 63% had gangrene, 9% had rest pain. In our series, dry gangrene alone was the commonest pathology in 41.1% and 29.4 % had done there bypass surgery in ischemic rest pain. In Yii et al series [14], toe amputation was the commonest amputation done. In our series also, toe amputation was the commonest associated amputation procedure.

CONCLUSION

Peripheral arterial disease in diabetes patient differs geographically. The recent trend shows an increase in endovascular procedure over bypass procedure which is decreasing over years. In fact, our series shows hardly one bypass being performed every 2 months in diabetic foot patients at a tertiary care centre with vascular division facility. Femoropopliteal bypass [76.47%] remains the commonest bypass procedure with salvage rate of 89.2%. There were no cases of Femoro pedal bypass procedure in this series. Around 64.7% had history of smoking with majority having a history of smoking for more than 20 years. Dry gangrene is the commonest pathological lesion seen. Majority of the patients

[52.94%] have their bypass surgery done within a week of admission and the average duration of the stay in these diabetic foot patients is 23.6 days. The inpatient mortality in our series was 11.76%.

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