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Original Research Paper

Surgery

SURGICAL MANAGEMENT OF PATIENTS WITH DIABETIC FOOT ULCER (DFU) AT A TERTIARY CARE HOSPITAL IN CHENNAI, INDIA

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ABSTRACT

Background: Diabetic foot ulcer is a major complication in patients with diabetes mellitus and it calls for a surgical intervention. Surgical management still remains a challenge.

Methods: Study was conducted at the Hand and Reconstructive Microsurgery Department in a Tertiary Care Hospital, Chennai. We used a proforma for data collection and SPSS version 20 for analysis.

Results: Among 118 DFU patients with type 2 DM, 72% male and 28% female with a mean age of 55.4 years. Ischemic ulcer was the common type and forefoot was commonly affected. Split skin grafting was done for a majority followed by debridement; many adhered to treatment, diet and physical exercise; and 89% got their DFU healed in one-year follow-up.

Conclusion: Early and appropriate surgical intervention and management of patients with DFU would result in reduced morbidity and mortality, and better quality of life.

KEYWORDS : Diabetic foot Ulcer, Type 2 Diabetes, Surgical Management, Treatment Outcome

INTRODUCTION

Diabetes mellitus (DM) is a serious, chronic disease occurring in an individual whose pancreas does neither produce enough insulin (a hormone that regulates blood glucose), nor his/her body effectively use the insulin it produces.[1] Diabetic foot ulcer (DFU) remains as one of the major complications among patients with DM. DFU, which is associated with neuropathy in a patient with DM, is considered as a major public health problem worldwide as it results in increased morbidity and mortality rate.[2-5]Until now, DFU is a major cause for hospitalization and death of individuals with DM.[6-9] About 20% of hospital admissions for individuals with DM is due to the occurrence of DFU, and it is well known to lead to infection, gangrene, amputation, and even death in the absence of effective care and appropriate multi-model treatment.[10]

In patients with DM, the prevalence of DFU is estimated to range from 4% to 10% suggesting that almost 25% of them may have the risk of developing DFU in their lifetime.[11-13]While 2.5% of people with DM develop foot ulcers each year, 15% of them will develop chronic ulcers on the foot or lower extremity in some point of life.[14-16]Besides, it is reported that eight out of 10 amputations are done in patients with DM and 85% of all the non-traumatic lower limb amputations done in patients with DM follow a foot ulcer.[11,15,16]

In developing countries, lower limb amputations are common among patients with DFU, [17] and all such patients undergo simple and or complex surgical procedures. Though a majority of diabetic foot ulcers reported to get healed, 10% - 15% of cases remain unhealed and may lead to limb amputation.[18] Diabetic foot ulceration, therefore is still a major health problem for developing countries as patients often report to the tertiary care hospital with advanced foot ulcers, and making it difficult for the surgeons to manage. A few factors associated with late admission of patients with DFU in hospital are: lack of knowledge related to DM, socio-cultural barriers, and poor economic status.[19]

Many studies have recommended the inevitability of early and appropriate surgical interventions during primary stages of DFU in order to reduce mortality and to improve quality of life in patients with DM.[20,21]With the advent of multi-disciplinary team approach, the management of DFU involves surgical procedures, and therefore, the present study was carried out to describe our experience in surgical management of DFU – clinical profiling, surgical procedures carried out, post-operative complications, treatment adherence and treatment outcomes in one year of follow-up.

MATERIALS AND METHODS

This observational descriptive study was carried out at the Department of Plastic surgery, Hand and Reconstructive Microsurgery in a Tertiary Care Hospital, Chennai, between 2016 and 2017. A total of 118 patients with DFU who attended the department were the respondents of this study.

INCLUSION CRITERIA:

a) All patients who attended our department for DFU management
b) Non-healing ulcer with a duration of ≥ 2 months on antibiotic and wound care
c) Those patients with DFU who gave voluntary consent to participate in this study

EXCLUSION CRITERIA:

a) Patients with foot ulcer secondary to venous disorders and or arterial diseases but not due to DM.
b) Patients who were already on antifungal treatment for a diagnosed fungal infection.
c) Those patients who were allergic/contraindicated for antifungal treatment.
d) Those patients with DFU who did not give their consent to participate in this study.

After obtaining ethics clearance from the institutional review board and written informed consent from all patients, a comprehensive proforma was developed by the department to record sociodemographic details, medical history, surgical procedures, post-operative complications if any, treatment outcomes and treatment adherence. For the purpose of this study, necessary

investigations were also recorded in the proforma. A detailed clinical proforma included variables such as type and duration of DM, location and duration of DFU, type and anatomical site of ulcer, and sensation in diabetic foot. We then recorded all surgical procedures conducted on patients followed by post-operative complications. Then we assessed the treatment adherence and the outcomes over a year of follow-up. First, the collected data were entered in Microsoft excel and then imported into Statistical Package for Social Sciences (SPSS) Version 20. All data were analysed using SPSS data analytics software.

RESULTS

Among the 118 patients with DFU, 72% of them were male and 28% of them were female respondents. The results of the study showed that a majority (63.6%) of the patients were in the age group of 41-50 years. Among the total participants, 45% had completed their primary education. About 69%of the patients were involved in light physical work; and 74% of them received a monthly salary between Rs. 5001 and Rs. 10,000. Ninety-two percent of patients were married and 60% of them had one or two dependents, as shown in Table 1.

TABLE 1.Sociodemographic Variables Of Patients With DFU

Sociodemographic variables (n=118)		No. of patients	%
Age	21-40 years	11	9.3
	41-60 years	75	63.6
	≥ 61 years	32	27.1
Sex	Male	86	72.9
	Female	32	27.1
Education	Illiterate	14	11.9
	Primary	54	45.8
	Secondary	43	36.4
	Tertiary	7	5.9
Occupation	Unemployed	12	10.2
	Unskilled worker / Coolie	94	79.7
	Skilled worker / Private sector	10	8.5
	Retired	2	1.7
Nature of work	Light physical work	82	69.5
	Moderate physical work	24	20.3
	Heavy physical work	12	10.2
Monthly income	< 5000	22	18.6
	5001-10000	87	73.7
	>10000	9	7.6
Marital status	Unmarried	3	2.5
	Married	109	92.4
	Separated	3	2.5
	Widowed	3	2.5
No. of dependents	None	5	4.2
	1 to 2	71	60.2
	3 to 4	39	33.1
	≥ 5	3	2.5

In connection to clinical profile of the patients, 64.4% of them had DM for a period between 1 and 5 years, and all of them had type 2 DM. While 37% of patients had DFU for a period between 1 and 5 years, 36% of them had it for less than a year. Fifty percent of patients had their DFU on right foot and the same percent of them had it on their left foot (Table 2). About 89% of patients had the ulcer on their forefoot; a majority (60%) of them had ischemic ulcer; and 48% of them reported low sensation in their feet.

TABLE 2. Clinical characteristics of DFU patients

Clinical profile (n=118)		No. of patients	%
Duration of DM	Less than a year	36	30.5
	1-5 years	76	64.4
	6-10 years	6	5.1
Type of DM	Type 1	0	0.0
	Type 2	118	100.0
Duration of DFU	< 1 year	42	35.6
	1-5 years	44	37.3
	6-10 years	26	22.0
	> 10 years	6	5.1
Foot of ulcer	Right foot	59	50.0
	Left foot	59	50.0
Anatomical site of ulcer	Forefoot	105	89.0
	Toe	6	5.1
	Foot sole	7	5.9
Type of ulcer	Neuropathic	9	7.6
	Ischemic	71	60.2
	Neuro-ischemic	38	32.2
Sensation in DF	Low	57	48.3
	Medium	40	33.9
	High	21	17.8

Almost 52% of the patients had split skin grafting and 30% of them underwent only debridement. While 11% of them had flap cover, 7.6% of them got amputation done (Table 3).

TABLE 3. Type Of Surgical Procedures Carried Out In Patients With Dfu

Surgical procedure	No. of patients	%
Debridement	35	29.7
Split skin graft	61	51.7
Flap cover	13	11.0
Amputation	9	7.6
Total	**118**	**100.0**

A majority (56%) of the patients did not have any complications after surgery as depicted in table 4. However, 21% of them had contracted a surgical site infection which was treated again with wound care management, antibiotics and good glycaemic control. About 7.6% had anaemia, 6.8% had wound hematoma, and none of them had a diabetic coma.

TABLE 4. Type and frequency of post-operative complications

Post-operative complication	No. of patients	%
No complication	66	55.9
Surgical site infection	25	21.2
Stump gangrene	4	3.4
Phantom pain	1	0.8
Diabetic coma	0	0.0
Wound hematoma	8	6.8
Skin grafting failure	5	4.2
Anaemia	9	7.6
Total	**118**	**100.0**

Among the patients with DFU, 64% of them adhered to the treatment regimen as per medical advice. Over 31% of the patients were little irregular to treatment, majorly due to socio-economic reasons. Six patients were lost to follow-upwithin a year of surgery. A large number (83%) of patients reported dietary practice adherence and cent percent of the patients participated in this study reported to engage in regular physical exercise. Postoperatively, the foot ulcer has healed for 89% of patients, and for 10% of them it was partially healed in a year of follow-up (Table 5), and it was evident that a majority of patients benefited from the surgical interventions.

TABLE 5. Type and frequency of treatment adherence and treatment outcome

Treatment adherence and outcome (n=118)		No. of patients	%
Treatment adherence	Regular follow-up	75	63.6
	Irregular follow-up	37	31.4
	Lost to follow-up	6	5.1
Dietary adherence	Yes	98	83.1
	No	20	16.9
Physical exercise	Yes	118	100.0

	No	0	0.0
Treatment outcome	Not yet healed	1	0.8
	Partially healed	12	10.2
	Healed well	105	89.0

DISCUSSION

Diabetes has a great risk for foot ulceration, especially in type 2 diabetes as found in this study, and it is a major problem most common in developing nations than developed nations. In our study, most of the respondents reported to have DFU were males than females. This trend is probably due to the habits and lifestyle of men including smoking and alcohol consumption. This finding is in corroboration with the results of other studies conducted in India and abraod.[22-25] Most of the patients with DFU in our study belonged to the age group of [41-60] years and such a finding was reported by a couple of other studies.[22-26]In the present study, 95% of them had the DM for a period of ≤ 5 years, and duration of DM was much longer in patients with DFU may be owing to the laxity of diabetic care. Similar findings were reported by other researchers.[23,25,27,28]

Our study results indicate that patients with DM had a greater possibility of developing Ischemic foot ulcer and Neuro- ischemic foot ulcer, and most ulcers occurred in the forefoot region. In our study, only nine patients (7.6%) had neuropathic ulcer.About 97.5% of patients with DFU received surgical interventions, almost 52% of them had split skin grafting and 7.6% of them underwent lower limb amputation and the same results were reported by other studies.[20,22,29-31]With early screening and newer form of surgery and treatment lesser number of patients require lower limb amputation. Though 56% of the patients did not have postoperative complication, surgical site infection was the most common one accounting for 21.2% of patients.[22,32]Our surgical interventions for the patients with DFU have produced a positive outcome with a vast majority (89%) of clients reported to have their ulcer healed in a year of follow-up. Besides, a majority of them adhered to treatment, dietary practice and physical exercise. Evidences show that complications of DM can be minimized by early screening and appropriate interventions.[33]In the present study, however, surgical management has brought positive outcomes for those patients with DFU.

CONCLUSION

Ulceration of the foot in diabetes is common and it could be disabling. Among patients with DM, DFU is the major source of morbidity and mortality as it frequently leads to amputation of the lower limb. Healed ulcers may often recur. These poise a major challenge for the surgical management of DFU. Therefore, surgeons should be part of the DFU care management team to provide early and appropriate intervention in the pursuit of reducing morbidity and mortality in patients with DFU, and thereby enhancing patients' quality of life.

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