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CLINICAL CHARACTERISTICS AND SURGICAL MANAGEMENT OF DIABETIC FOOT ULCERS IN INDIA

General Surgery

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ABSTRACT

The prevalence of Diabetes Mellitus is increasing worldwide. India ranks second in the world with more than 61 million cases with diabetes. Diabetic foot ulcer is one of the most common and deadest complications of diabetes and it contributes not only morbidity, amputation and increased health-care costs but also to mortality. The aim of the present study is to evaluate various modes of presentation, complications, modalities of treatment and treatment outcome in cases with diabetic foot ulcer to show how early intervention and proper bedside medical attention will improve outcome. Regular foot-care examinations, including debridement of calluses and ingrowing toe nails, early identification and intervention of ulcer complications provide an opportunity to improve outcome.

KEYWORDS

Diabetic Foot Ulcers, Clinical Characteristics, Surgical Management, India.

Introduction:
Diabetes Mellitus (DM) is a group of metabolic disorders in which there are high blood sugar levels over a prolonged period. According to the latest 2016 data from world health organization (WHO) there are 422 million adults are living with DM globally[1]. Diabetes currently affects more than 61 million Indians, which is more than 7.1% of the adult population and nearly one million Indians die due to diabetes every year[2,3].

A diabetic foot is a foot that exhibits any pathology that results directly from diabetes or any long-term complication of diabetes. Presence of several characteristic diabetic foot pathologies such as infection, neuropathic osteoarthropathy and Diabetic Foot Ulcers (DFUs) is called diabetic foot syndrome. DFUs are a serious source of mortality and morbidity associated with the global diabetes epidemic[4] challenging patients, physicians, health care team and nations[5]. Healing of DFU re-establishes a patient's Quality of Life[6]. The present study aimed to evaluate various modes of presentation, complications, modalities of treatment and treatment outcome in cases with diabetic foot ulcer to show how early intervention and proper bedside medical attention will improve outcome.

Methods:
A total of 100 cases with DFUs from September 2015 to September 2017, aged 15 to 75 years of both the sex were considered for the present study. All cases admitted and treated in Sidhartha Medical College/Government General Hospital, Vijayawada. Data were collected using a questionnaire including socio-demographic details of the patients, mode of onset and presentation were noted. Detailed history of the current illness, previous history of wounds, gangrene or ulcers, any associated arterial or venous disorders associated with diabetes were noted. Cases were evaluated with General physical and local examination and systemic examination based on history and clinical findings.

Investigations such as complete blood counts, fasting and post prandial blood sugar levels, glucose tolerance test, HbA1c, ESR, ECG, complete urine examination for the presence of albumin, glucose, Ketone bodies, X-ray of the part involved, culture and sensitivity of the discharge from ulcer, Duplex Scan, Ankle-Brachial Index were done.

Cases with DFU were treated with conservative treatment, debridement, I & D, split skin grafting and amputation depending on the site, type and extent of lesion after grading according to Wagner's classification. The diagnosis of surgical site infection was done based on clinical examination and identification of microorganisms in the area of operative wound suspected of being infected. The DFUs were graded according to Wagner's classification[7]. Percentage reduction in the ulcer size was measured at the time of discharge using Ulcer Planometry. Patients are re-evaluated on the outpatient basis for 2 months.

Statistical Analysis:
The statistical software namely SPSS 24.0 and Systat 13.0 were used for the analysis of the data and Microsoft Word 2017 and Excel 2017 have been used to generate graphs, tables etc.

Results:
During the two years of study, 100 cases with DFUs were studied. Among these, 60 cases are male patients and 40 cases are female patients (3:2). In the present study table 1 shows the age incidence of male and female cases with DFUs and is found to be ranging from 30-75 years of age. Maximum number of cases are in the range of 51-60 years (37%). Among the 100 cases most of the cases (63) were from rural area.

Table 2 shows the modes of presentation and complications of the cases, most of the cases (60%) were presented with foot ulcer and 10 cases were developed septicemia, 26 cases required minor or major amputation resulting in deformity and three cases died due to complications.

Table 3 shows the various organism cultured, neuropathy, distribution of nature and site of lesions and Wagner's grading system, various treatment modalities used for the cases with DFU. Out of 100 cases, 83 samples reported organisms in culture and sensitivity reporting. Staphylococcus aureus was found in the majority of cases. Out of the 100 cases studied, 60% were found to have peripheral neuropathy. Peripheral neuropathy was diagnosed using vibration sense with 128 hz tuning fork and pin prick test and hot and cold water in test tubes which are 7 degrees above and below the body temperature respectively. The maximum number of lesions were found in the forefoot, especially in the region of 2nd to 5th metatarsals, followed by heel. Most of the cases presented with Wagner's grade 2 or 3. Out of the 100 cases treated, 15% cases were treated conservatively by slough excision and regular dressing with antibiotics and with strict glycemic control. 25% of the cases were treated with wound debridement, 12% of the cases underwent I & D for abscess, 12% of the cases were treated with Split Skin Grafting, 10% of the cases underwent fasciotomy, 20% of the cases were required some sort of minor amputations like

disarticulation, ray amputation and six percent of the cases underwent for a major amputation.

In the present study, requirement of Split skin grafting (SSG) in controlled diabetic patients is 7.5%, whereas in uncontrolled diabetics, it is 30% (Table 4). The amputation rate is 25% in controlled DM and is as high as 30% in uncontrolled diabetics (Table 5).

Discussion:

In India, cases with diabetic neuropathy who live in rural areas are more prone to foot ulcers, due to various reasons such as barefoot walking, ignorance about the importance of blood sugar control and negligence towards minor lesions. Individuals in rural areas often sleep in huts houses where rodents are common; rodent bites to the feet of patients with diabetes can lead to chronic ulcers[8].Such injuries result in frequent and long term admission to the hospital and cause much morbidity.

In the present study, higher number of cases were found in the age group of 51-60 years, similar to reports were found in Ramanaiah et al.[9] and Pankaj et al.[10] and studies. Hence the most prevalence age group with diabetic foot in our study is 51-60 years, comprising 37% of cases. Out of 100 cases 60 cases were male and 40 cases were females. Male to female ratio is 1.5:1. Sex ratio of our study is comparable with that of Ramanaiah et al.[9] study, which had male to female ratio 1.8:1. Higher incidence of diabetic foot in males when compared to females can be justified by the high risk of exposure of males to injuries in their working environment.

Management of diabetes and its complications poses a formidable challenge. It has been reported that diabetic patients who wore footwear both inside and outside their homes developed lesser foot problems than those cases who wore footwear only when they went outside their homes[11].

Among the various modes of presentation of diabetic foot, ulcer was the most common mode of presentation. Pankaj et al and Madan et al. studies reported that ulcer was the most common presentation seen in 52% and 66% of cases respectively.

In the present study, Staphylococcus aureus (41%) was the commonest organism found in majority of cases these results were comparable with Pankaj et al.[10] Madan et al.[12] Mummidi et al.[13] and Tanveer et al.[14] studies.

The site of lesion depends on cyclical tissue hypoxia during ambulation and direct trauma. It becomes more important in the presence of peripheral sensory neuropathy. In the present study, the maximum number of lesions were found in the forefoot, especially in the region of 2nd to 5th metatarsals, followed by heel. Most of the cases presented with Wagner's grade 2 or 3, which is similar to that of Mahakalkar et al.[15] study.

In the requirement of SSG in controlled diabetic patients is 7.5%, whereas in uncontrolled diabetics, it is 30 %. This is very high when compared to Tanveer et al.[14] study, where SSG was required in only 9.72 % of cases. Mortality rate among controlled diabetics is 1%, whereas in uncontrolled diabetics, it is 10 %, which is very high when compared to Tanveer et al.[14] where mortality rate is only 4%. In the present study, amputation rate is 25% in controlled DM and is as high as 30% in uncontrolled diabetics, whereas in a study by Mahakalkar et al.[15] rate of amputation is 20 %.

Conclusion:

A patient with DM is exposed to a number of complications of which DFU is a common condition. The surgeon is usually facing the problem of "Life or Leg". With proper understanding of the disease and the new concepts in the management of DFU, it has been possible to save many limbs and lives. In the present study, we feel that the availability of trained health care professionals to counsel patients in amputation surgery may help in preventing unnecessary delays in patients receiving definitive surgical treatment. Early presentation and hospital admission, aggressive and appropriate medical and surgical treatment according to grade of disease can improve outcome. A multidisciplinary team approach directing at glycemic control, patient education with diabetes on proper foot ware, infection control and early surgical intervention is required in order to reduce the mortality and morbidity connected with Diabetic foot ulcers.

Table-1. Age Incidence of male and female cases with DFU

Age (in years)	Male		Female	
	Number	%	Number	%
15 - 30	0	0	0	0
31 - 40	10	10	4	4
41 - 50	14	14	11	11
51 - 60	22	22	15	15
61 - 70	11	11	10	10
71 - 75	3	3	0	0
Total	**60**	**60**	**40**	**40**

Table- 2. Modes of Presentation and Complications of the cases with DFU

Modes of Presentation	No. of Cases	%
Ulcer	60	60
Gangrene	16	16
Abscess	12	12
Cellulitis	10	10
Necrotising Fasciitis	2	2
Complications		
Septicemia	10	10
Deformity secondary to amputation (minor or major)	26	26
Mortality	3	3

Table- 3. Various Organism Cultured, Neuropathy, Distribution of Nature and Site of Lesions and Wagner's Grading System, Various Treatment Modalities Used for the cases with DFU

Organism Cultured	No. of Cases	%
Staphylococcus aureus	34	41
Pseudomonas	19	22.9
E. coli	12	14.5
Klebsiella	9	10.8
Proteus	6	7.2
Streptococcus	3	3.6
Total	83	100
Neuropathy		
Present	60	60
Absent	40	40
Nature of Lesion		
Superificial Ulcer	15	15
Deep Ulcer	45	45
Abscess	12	12
Cellulitis	10	10
Necrotising Fasciitis	2	2
Gangrene Forefoot	10	10
Gangrene requiring Major Amputation	6	6
Site of Lesion		
Forefoot	65	65
Heel	25	25
Dorsum	10	10
Total	60	100
Wagner's Grade		
0	0	0
1	15	15
2	39	39
3	30	30
4	10	10
5	6	6
Treatment Modalities		
Conservative	15	15
Debridement	25	25
I & D	12	12
Debridement + SSS	12	12
Debridement + Fasciotomy	10	10
Minor Amputations	20	20
Below Knee Amputation	4	4
Above Knee Amputation	2	2

Table- 4. Comparison of SSG and Mortality Rate in controlled and uncontrolled DM among various Studies

	Present Study		Tanveer et al.
	Controlled DM	Uncontrolled DM	
SSG	7.50%	30%	9.72%
Mortality Rate	1%	10%	4%

Table- 5. Lesion Outcome in Controlled and Uncontrolled Diabetic patients

Lesion Outcome	Controlled DM (n = 80)		Uncontrolled DM (n = 20)	
	No. of Cases	%	No. of Cases	%
Healing	53	66.25	6	30
Amputation	20	25	6	30
Skin Grafting	6	7.5	6	30
Death	1	1.25	2	10
Total	80	100	20	100

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