Section: Surgery

Original Research Article

EVALUATION AND MANAGEMENT OF DIABETIC FOOT ULCERS

Dushyant Sharma[1], Maneshwar Singh Utaal[2], Subhash Chawla[3]

[1]Junior Resident, Department of Surgery, Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana, Ambala, India
[2]Assistant Professor, Department of Surgery, Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana, Ambala, India
[3]Professor & Head of Department, Department of Surgery, Maharishi Markandeshwar Institute of Medical Sciences & Research, Mullana, Ambala, India

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Corresponding Author:
Dr. Maneshwar Singh Utaal,
Email: maneshwar@live.com

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Abstract

Background: One of the most common co-morbidity in our community is Diabetes. Diabetic foot Ulcer(DFU) is long term complication of diabetes and the mortality and morbidity caused by it is a major issue in the health community. This study is aimed to study the clinical and bacteriological profile of diabetic foot ulcers and to describe the ulcers by studying and thus comparing the outcome to decrease the mortality and morbidity by diabetic foot disease by identifying various measures. **Materials and Methods:** We prospectively evaluated 50 patients who were admitted in Department of General Surgery at MMIMSR, Mullana, with proven Diabetes Mellitus(DM) and with Diabetic Foot Ulcer underwent a detailed clinical evaluation. Data was collected and analysed. **Result:** Patients usually presented with poor glycaemic control and higher grade in Wagner's classification. Medical management with antibiotics and oral hypoglymic drugs to maintain glycaemic control and daily dressings with different dressing materials helped only a few patients while majority of the patients needed sharp debridement or amputations. **Conclusion:** To reduce the burden of diabetic foot, patient education and a good glycaemic control is foremost. Diabetic foot when and if diagnosed early with hospitalization and appropriate medical (intravenous antibiotics, oral hypoglcemic agents, diabetic diet, multivitamins) and surgical management (debridement, disarticulation, amputation) yields decreased mortality and morbidity thus not only improving the outcome of the disease but also reducing the rate of complications.

INTRODUCTION

Diabetes accounts for more >14% of total health resources which is available for diabetics in a developed country, whereas in India this number climbs to >37% with the available resources. For a clinician who treats diabetes, diabetic foot ulcer can be a major hurdle. Diabetic foot ulcers (DFU) are also one of the most common complication in patients with poor glycaemic control, poor foot care, neuropathy and peripheral vascular disease. It is also one of the most common cause for non-traumatic foot amputations and osteomyelitis of foot. These ulcers are usually in the areas of foot which are presented with repetitive trauma and pressure sensations.[1]

Diabetic foot ulcers consist of a variety of pathological conditions which affect feet in patients who are also affected by Diabetes Mellitus(DM) and DFU are defined as lesions involving a skin break with loss of epithelium, they can extend into the dermis and deeper layers and sometimes they involve bone and muscles as well. Amputation is defined as removal of a terminal, non-viable portion of the limb. The lifetime risk of a diabetic patient developing a foot ulcer is as high as 25%.[2]

The aetiology is defined multifactorial at best with underlying causes as calluses, foot deformities, ill-fitting footwears, dry skin etc. About 60% of diabetics will develop neuropathy which will eventually lead to development of a foot ulcer. There is increased risk with people who are flat footed as the disproportionate force across the foot leads to tissue inflammation in those high risk areas of the foot.

Distal sensorimotor with autonomic neuropathy often combined with arterial insufficiency caused by atherosclerosis in terminal arteries sparing the pedal arteries are the major cause in classical diabetic foot.[3] 60-70% have neuropathy only, 15-20% have peripheral vascular disease and 15-20% have a mixture of both.[4]

Gold standard treatment is surgical debridement, good glycaemic control, control of infection and relieving the pressure at the wound site. Clinician should be vary of osteomyelitis. Total contact casing is the one of the most studied technique for pressure

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relief,[5] adding bed rest and orthopaedic shoes helps as well. Frequent debridement by scalpel of the dead tissue in the neuropathic ulcer promotes wound healing thus improving the outcome.[6] Mild infections can be treated with oral antibiotics.

MATERIALS AND METHODS

After approval from ethics committee, 50 patients of Diabetic Foot Ulcer admitted in MMIMSR, Mullana, Ambala have been included in the study. The selected cases have been studied with respect to detailed history with references to onset, duration, progression, site, presence/absence of occlusive disease. Any history of similar ulcer with history of trauma noted and clinical profile with any associated diseases have been noted as well. Bilateral A/V Doppler, FBS and RBS charting, with Hba1c were done as well. Follow up was done for 10 days and preventive measures were suggested as well.

Inclusion Criteria

All the diagnosed cases of Diabetic Foot Ulcer

Patients of all age group and both the sexes were included in the study

Exclusion Criteria

Patients with leg ulcer who doesn't have proven Diabetes Mellitus

Patient with leg ulcer with proven malignancy

RESULTS

In our study, out of 50 patients who were included in the study 23 patients (46%) were in age group 51-60 years, 11 patients (22%) were in age group 61-70 years and 9 patients (18%) were in age group 41-50 years. Most common age group involved in our study is 51-60 years followed by age group 61-70 years, this is predominantly because of long history of diabetes and peripheral neuropathy causing trauma which acts as a predisposing factor for diabetic foot ulcers. Mean age of presentation was 55 years with a standard deviation of 10 years, minimum age of presentation was 23 years with the maximum being 73 years. Out of 50 patients, in our study, male was the predominant sex involved accounting for 35 cases (70%) whereas females were 15 cases (30%).

Duration

In our study, out of 50 patients, 18 (36%) had a history of diabetic foot ulcer from last 4-8 days, 13 patients presented within 4 days of diabetic foot ulcer history & 7 patients presented within 8-12 days of prior history of diabetic foot ulcer. Mean Duration in our study is 13.19 days with a standard deviation of 19.86.

Laterality: In our study, out of 50 patients, Right limb was the more commonly affected limb in 31 patients (62%) with 17 patients (34%) presented with diabetic foot ulcer in left lower limb & a mere 2 patients (4%) had bilateral presentation

Distribution of Diabetic Foot Ulcer in lower limbs

In our study, out of 50 patients 38 patients (76%) have had history of trauma before the development of a diabetic foot ulcer and 12 patients (24%) had no history of trauma. This signifies that trauma is an important factor in predisposition of Diabetic Foot Ulcers.

In our study, out of 50 patients, 10 patients (20%) presented with diabetic foot ulcer on plantar foot, 9 patients (18%) had diabetic foot ulcer presentation on dorsum foot, 6 patients (12%) had diabetic foot ulcer combined in dorsum and plantar foot like either the dorsum foot ulcer extending up to plantar or vice versa.

Site Of Ulcers

Out of 50 patients, 36 patients (72%) had local rise of temperature and 14 patients (28%) had no rise of local temperature out of 50 patients, 14 patients (28%) had an average size of 6-7 cm, 9 patients (18%) had average size of 5 cm & 8 patients (16%) had an average size of 4 cm

Glycated Haemoglobin (HbA1c) out of 50 patients, 47 patients (94%) had glycated hemoglobin >6.5 (Diabetic) and 3 patients (6%) were in prediabetic category

Type of Bacteria: In our study, out of 50 patients, 16 patients (32%) grew Staphylococcus Aureus, 12 patients (24%) had Pseudomonas, 11 (22%) had no growth in Pus culture & sensitivity.

Duplex Scan Result Distribution: In our study, out of 50 patients, 15 patients (30%) had normal study in duplex scan, 13 patients (26%) showed Atherosclerotic changes in bilateral lower limb arteries, 5 patients (10%) had stenosis of Anterior Tibial and Posterior Tibial Arteries.

Healing & Follow up: out of 50 patients, 27 patients (54%) had repeated/frequent wound debridement, 8 patients (16%) underwent disarticulation of corresponding toes, 6 patients (12%) had their forefoot amputated, 3 patients (6%) had below knee amputation.

In our study, out of 50 patients, 15 patients (30%) on follow up were reported as healed in a time period of 5 weeks, 10 patients (20%) reported the same in a time period of 7 weeks and 6 patients (12%) were reported as healed in 10 weeks. Average Healing time period was around 7.12 weeks in our study with a standard deviation of 2.67. Minimum healing time was 4 weeks with maximum extending up to 14 weeks.

Table 1: Duration of Diabetic Foot Ulcer before presentation

Duration(in days)	No. of Cases	Percentage
<4	13	26%
4-8	18	36%
8-12	7	14%
12-16	5	10%

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16-20	2	4%
>20	7	14%
Total	50	100%

Table 2: Laterality

Side	No. of Cases	Percentage
Bilateral	2	4%
Left	17	34%
Right	31	62%
Total	50	100%

Table 3: Sites of Ulcer distribution in lower limbs

Site of Ulcer	No. of cases	Percentage
1st & 2nd T	1	2.0%
1st &; 3rd T	1	2.0%
1st T	4	8.0%
2nd & 3rd T	2	4.0%
2nd T	2	4.0%
3rd T	2	4.0%
4th & 5th T	1	2.0%
4th T	3	6.0%
DF	9	18.0%
DF+PF	1	2.0%
HL	3	6.0%
HL+PF	2	4.0%
MA	4	8.0%
PF	10	20.0%
PF+DF	5	10.0%
Total	50	100.0%

Table 4: Size distribution of Ulcers

Size (in cm)	No. of cases	Percentage
1	2	4.0%
2	3	6.0%
3	6	12.0%
4	8	16.0%
5	9	18.0%
6	7	14.0%
7	7	14.0%
8	3	6.0%
10	2	4.0%
14	2	4.0%
16	1	2.0%
Total	50	100.0%

Table 5: Glycated Hemoglobin Distribution

Hba1c group	No. of cases	Percentage
< 6.5	3	6.0%
> 6.5	47	94.0%
Total	50	100.0%

Table 6: Bacterial Profile Distribution

Organism	No. of cases	Percentage
No growth	11	22.0%
Staph. Aureus	16	32.0%
Pseudomonas	12	24.0%
Klebsiella	3	6.0%
Enterobacter	1	2.0%
Staph. Pyogenes	3	6.0%
E. coli	2	4.0%
MRSA	2	4.0%
Total	50	100.0%

Table 7: Duration of Healing Distribution

Healing (in weeks)	No. of cases	Percentage
4	4	8.0%
5	15	30.0%
6	6	12.0%
7	10	20.0%
8	2	4.0%

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9	2	4.0%
10	6	12.0%
12	2	4.0%
13	1	2.0%
14	2	4.0%
Total	50	100.0%

DISCUSSION

Diabetic foot ulcers are a major health problem in the developing countries like India and lead to a large amount of socioeconomic Burden. In this study, we have explored the various clinical, investigatory and treatment aspects of the diabetic foot ulcers which would be beneficial to reach a diagnosis without unnecessary delay and provide adequate treatment which would lead to early recovery and to a larger extent prevent recurrence of the disease.

In our study most of the patients suffering from lower limb ulcers were of the age group 40-60 year (64%). The incidence of lower limb ulcers was more common in males (70%) than females (30%).

Diabetic Foot ulcers are the most common type of lower limb ulcers. These results were comparable with study done by Bukkegar G et al,[7] and Naryana GL et al,[8] who also found diabetic ulcers as the most common type of lower limb ulcers accounting for 30% and 38.27% respectively.

The most common systemic disease associated with lower limb ulcerations was Diabetic Mellitus Type II accounting for 50% of cases. Diabetes Mellitus is associated with delayed cellular response to Injury, compromised cellular function at the site of injury and reduced wound tensile strength.

Microbiological Profile is an important parameter as it has application to general principles of treatment as well as institution specific guidelines for management. We found that the most common Gram +ve organisms isolated were S. aureus (30%) and Gram-ve organisms were P.aeruginosa (26%). Similar Bacterial profile was reported by Rudraiah HGM et al,[9] in which organism isolated were S.aureus (26%) followed by P.aeruginosa (20%).

The study also found that most of the pathogens were multi resistant to the commonly prescribed medication such as Amoxicillin, Cotrimoxazole, Gentamycin, Amikacin, Piperacillin, Ceftriaxone. These findings reflect the widespread and indiscriminate use of antibiotics with poor patient compliance and self-treatment without prescription.

The treatment modalities of lower limb ulcers included surgical treatment in the form of wound debridement, wide local excision, stripping and ligation, split skin grafting, flap cover and amputation. Non-surgical treatment such as aseptic dressings, compression bandaging, antidiabetics, antihypertensives and antimicrobials according to culture and sensitivity were used.

The treatment of diabetic ulcers done by control of the hyperglycaemia with oral hypoglycaemic agents and subcutaneous insulin therapy as the patients presenting with deranged blood sugar levels have depressed inflammatory response and decreased host response to injury. Yazdanpanah L et al[10] advocated Similar approach to control infection. Debridement of the wound was done, we used surgical debridement in majority of patients which has also considered the better approach for debridement than the other methods of debridement in review by Yazdanpanah L et al.[10]

Early surgical debridement reduces the risk of amputation, healing by secondary intention and facilitates the early granulation tissue formation. Diabetic foot care and proper glycaemic control were found to be key aspects to prevent occurrence or recurrence of the Diabetic ulcers.

CONCLUSION

Early diagnosis and prompt treatment of diabetic foot ulcers has been found to have a great positive impact on the outcome of the patient leading to faster recovery and decreasing morbidity related to the disease. Detailed clinical assessment supplemented with required investigations is an effective tool for early diagnosis, following which proper treatment plan should be decided keeping in mind the patient requirement and results. Dressing and debridement are effective modalities with amputation as a final modality where the part of limb or limb could not be saved.

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