International Surgery Journal
Ashokkumar D et al. Int Surg J. 2019 Jan;6(1):88-91
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20185125

Original Research Article

Outcome of patients undergoing amputation for diabetic foot ulcer

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Received: 30 November 2018
Accepted: 14 December 2018

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ABSTRACT

Background: Foot ulcers are the principal cause of severe complications and hospitalization among patients with diabetes, substantially increasing the costs with this disease. Peripheral neuropathy, ulceration, infection, and peripheral vascular disease are the principal factors for ulcer complications and loss of a lower limb in diabetic patients. The aim of the present endeavor was to study the patients undergoing amputation for the diabetic foot ulcer.
Methods: Total 150 patients with diabetic foot ulcer were included in this study. The variables investigated were related to diabetes, infection, and surgical treatment. In our series amputation were done at different levels anatomical levels ranging from toe level ranging from toe level to above knee amputation.
Results: Pus culture and sensitivity done for diabetic foot ulcers reveal *E. coil* as the most common organism (40%). Skin biopsy done in these patients reveal neuropathic changes in 102 patients. 40% of patients had vaso-occlusive disease. Nine out of 150 patients showed osteomyelitis changes emphasizing those diabetic ulcer patients are prone for osteomyelitis of the underlying bone. 46% of patients with diabetic foot ulcer needed either minor or major amputation, which correlates with the standard study.
Conclusions: Lack of awareness about diabetes mellitus and its lower limb complications, poor compliance to the treatment, poorly controlled blood sugar levels, delay in diagnosis, and late presentation to the tertiary care center are all factors which led to the occurrence of diabetic foot ulcer.

Keywords: Complications, Diabetic foot ulcer, Management

INTRODUCTION

Diabetes mellitus (DM) is one of the main problems in health systems and a global public health threat that has increased dramatically. Patients with DM are prone to multiple complications such as diabetic foot ulcer (DFU). DFU is a common complication of DM that has shown an increasing trend over previous decades.[1-3] In total, it is estimated that 15% of patients with diabetes will suffer from DFU during their lifetime.[4] Although accurate figures are difficult to obtain for the prevalence of DFU, the prevalence of this complication ranges from 4%-27%. The morbidity and mortality associated with diabetic foot lesions remain extremely high, and management needs to be optimized to ensure the best outcome.[3,5] Risk factors that can lead to foot wounds in patients with diabetes include loss of protective sensation due to neuropathy, prior ulcers or amputations, foot deformity leading to excess pressure, external trauma, infection, and the effects of chronic ischemia, typically due to peripheral artery disease. Patients with diabetes also have an increased risk for non-healing related to mechanical and cytogenic factors, as well as a high prevalence of peripheral artery disease.[6] Ulcer-related outcome measures are commonly used in clinical trials and are

appropriate for studies designed to assess either the efficacy or the effectiveness of interventions directed to improving wound healing.[7] Such ulcer-related outcome measures include healing, a change in ulcer area, and resolution of the ulcer by amputation. Details of the level and type of amputation performed were recorded. In present study series amputation were done at different levels anatomical levels ranging from toe level ranging from toe level to above knee amputation. Initially, guillotine amputation was done for severely infected, necrotic cases. Later the patients underwent revision amputation.

The aim of the present endeavor was to study the patients undergoing amputation for the diabetic foot ulcer.

METHODS

The clinical material for this study consisted of 150 cases of Diabetic foot ulcer patients admitted in the surgical wards of Thanjavur Medical College and Hospital, Thanjavur during the period of September 2017 to September 2018.

Inclusion criteria

Presence of diabetes mellitus foot ulcers only.

Exclusion criteria

- Trauma as a cause of foot ulcer
- Thermal burns or scalds
- Hansen's disease leading to the trophic ulcer,
- Filariasis and its sequelae.

In the proforma, name and age of the patient, sex, occupation complaints and history in detail were obtained and recorded. Past history of diabetes, hypertension, tuberculosis and ischemic heart disease were enquired into. Smoking and alcohol history were elicited with special reference.

Patients were examined in detail about the general condition like anemia, jaundice, fever, blood pressure and peripheral pulses. The affected part of the ulcer was examined in detail for all the features of an ulcer. Unhealthy granulation, amount of slough, site of ulcer and line of demarcation were noted. A motor and sensory change were examined in detail. Loss of protective sensation was examined using Semmes - Weinstein 10g monofilament. Ankle brachial pressure index, Haematology, pus culture and sensitivity, color doppler study, skin biopsy were examined.

RESULTS

The total numbers of patients included in my study were 150. 120 were male patients accounting for 80%, 30 were female patients accounting for 20%. The incidence of diabetic foot increased with advancing age in present study. The incidence of the diabetic foot was more in the age group for more than 51 years. The number of patients undergoing amputation increased in the age group of 41-50 years. 46% of patients were underwent amputation, in this males are higher in number 36% (Table 1 and Figure 1).

Table 1: Distribution of treatments.

Treatment	Male		Female	
	No.	Percentage	No.	Percentage
Conservation debridement	65	44%	16	10%
Amputation	55	36%	14	10%
Total	120	80%	30	20%

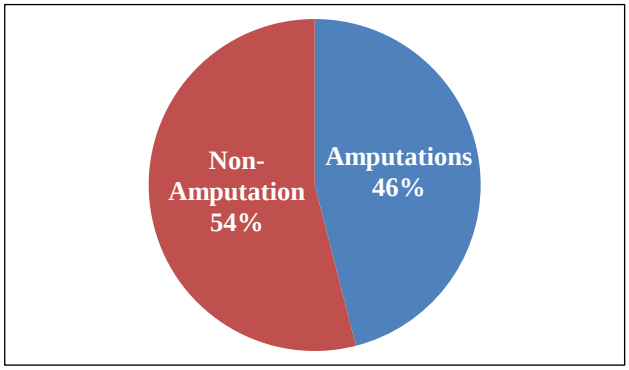

Figure 1: Distribution of amputation.

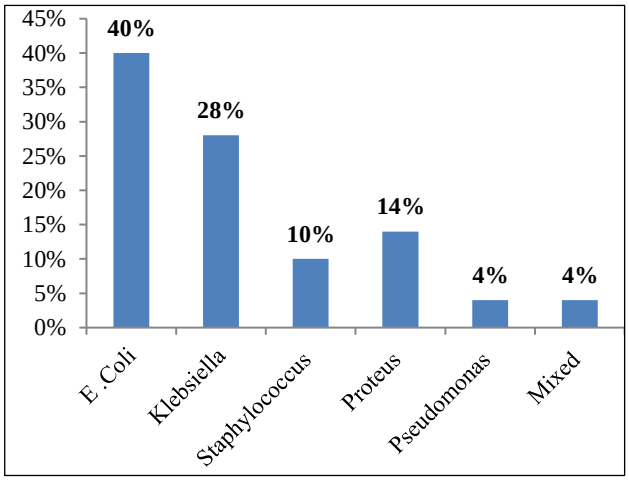

Figure 2: Distribution of organisms.

Smoking being an additional risk factor the number of amputations has increased in this younger age group. 96 patients had uncontrolled diabetes at the time of presentation accounting for 64% of the total. Based on monofilament test and skin biopsy results 102 patients had neuropathic changes accounting for 68% of the total this was comparable with standard results. In present study, vasculopathic changes were recorded based on the ankle - brachial index and doppler study results. The ankle-brachial index less than 0.7 was considered as

insufficient flow. Sixty nine patients had vasculopathy accounting for 46 % of the total which is slightly higher compared to the western study which states the prevalence of vaso-occlusive disease as 30%. Commonest organisms detected were *E. coli* and *Klebsiella* accounting for 68% of the infective organism when compared to standard study which mentions mixed infection -*Staphylococcus*, and *Proteus* as the *Proteus* as the commonest organisms. *Pseudomonas* accounts for lowest incidence about 4% (Figure 2).

In present study majority of patients were sensitive to cefotaxime (54%) and amikacin (78%), ciprofloxacin (26%) and gentamycin (32%), were the next common sensate antibiotics. Other drugs used in present study were metronidazole, erythromycin, and cloxacillin (Figure 3).

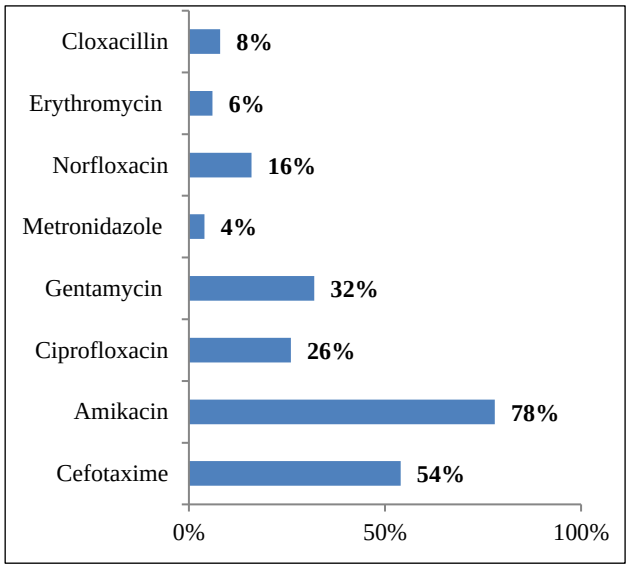

Figure 3: Distribution of antibiotics sensitivity.

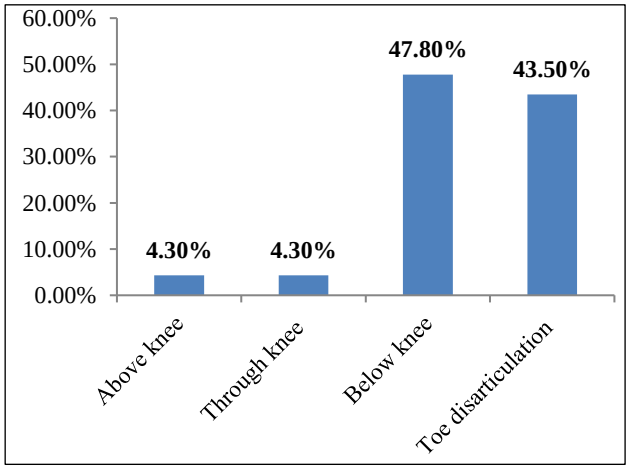

Figure 4: Distribution of type of amputations.

Nephropathic changes were recorded. 53 patients had nephropathy accounting for 35% of the total. This was comparable to that of standard study which mentions 30-40%. Amputations were done at various levels in the diabetic foot patients based on the ischaemic and gangrenous charges. 69 patients underwent amputation accounting for of the total. Among the amputees, 55 were male (36%), and 14 were female (10%). Below knee amputation was done in 30 the amputees and toe disarticulation were done in 33 of the amputees. Toe disarticulation and below knee amputation were the commonly performed amputations (Figure 4).

DISCUSSION

Foot ulcers affect one in ten diabetics during their lifetime. Patients with diabetes have increased risk of lower-extremity amputations and the main cause is diabetic peripheral arterial disease accelerated by the direct damage to the nerves and blood vessels by high blood glucose levels. Wound healing is also impaired from affected collagen synthesis. Diabetic vascular disease has three main components: arteritis and small vessel thrombosis; neuropathy (possibly ischaemic in cause); and large vessel atherosclerosis. In combination these are almost bound to cause problems in the weight-bearing areas. The diabetic foot ulcers are often deeper and more frequently infected than other leg ulcers reflecting the severe end vessel ischaemia and opportunistic infection which is the common experience of the diabetic.[8-11]

Factors, such as age and the duration of the disease will increase its incidence and risk of death from uncontrolled infection. Due to peripheral neuropathy, there is loss of sensation. As a result, neuropathic changes, such as foot deformity, decreased protective sensation and skin fissures, caused by diminished sweating lead to formation of diabetic foot infections, which leads to further damage ultimately leading to gangrene formation. Diabetic neuropathy develops as consequence of chronically elevated blood sugar levels, which cause vascular and metabolic abnormalities.[12]

The course of treatment of the infected diabetic foot depends on its severity. Not infrequently the complications of hyperglycemia, odor, or circulatory collapse bring the patient to the hospital with a limb-threatening foot infection. The severity of tissue destruction and sepsis may not be totally apparent from just looking at the ulcer or infected callus, especially in patients who have continued to bear weight on a painless area or do not have the visual acuity to recognize a problem. It is imperative to unroof all encrusted areas and to inspect the wound to determine the extent of deep tissue destruction and possible bone and joint involvement. Observational studies suggest that 6%-43% of patients with diabetes and a foot ulcer eventually progress to amputation.[13,14]

Ramsey et al, reported amputation rates of 11.2% in patients with new-onset foot ulcers over a 4-year period.[15] This is in agreement with crude amputation rates (16%),

5-year amputation rates (19%), and mean time to amputation (58months) in present study series. Absence of peripheral pulses has been established to be a risk factor for subsequent amputation.[16,17]

CONCLUSION

There is an increase of amputation in the younger age group of 41-50 revealing that people with diabetes who smoke are more prone to ischemia and gangrene at an earlier age. 46% of patients with diabetic foot ulcer needed either minor or major amputation, which correlates with the standard study. This study confirms that prevention is the most effective way of dealing with the diabetic foot ulcer and that early recognition and liberal debridement with proper antibiotic cover and excellent diabetic control will reduce the incidence of amputations. But amputations have a major role in the treatment of diabetic foot ulcers since patients report late with life-threatening complications and uncontrolled diabetes. A specialist chiropodist is an integral part of the diabetes team to ensure regular and effective chiropody for prevention of diabetic foot ulcer.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Aalaa M, Malazy OT, Sanjari M, Peimani M, Mohajeri-Tehrani MR. Nurses' role in diabetic foot prevention and care; a review. J Diabetes Metabol Disorders. 2012 Dec;11(1):24.
2. Alavi A, Sibbald RG, Mayer D, Goodman L, Botros M, Armstrong DG, et al. Diabetic foot ulcers: part II. Management. J Am Acad Dermatol. 2014 Jan 1;70(1):21-e1.
3. Cavanagh PR, Lipsky BA, Bradbury AW, Botek G. Treatment for diabetic foot ulcers. Lancet. 2005 Nov 12;366(9498):1725-35.
4. Leo S, Pascale R, Vitale M, Esposito S. Epidemiology of diabetic foot. Infez Med. 2012; 20 (Suppl 1): 8-13.
5. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA. 2005 Jan 12;293(2):217-28.
6. Boulton AJ, Armstrong DG, Albert SF, Frykberg RG, Hellman R, Kirkman MS, et al. American Diabetes Association, American Association of Clinical Endocrinologists. Comprehensive Foot Examination and Risk Assessment. Diabetes Care. 2008 Aug; 31(8): 1679-85.
7. Jeffcoate WJ, Price P, Harding KG. Wound healing and treatments for people with diabetic foot ulcers. Diabetes/Metabolism Res Rev. 2004 May;20(S1):S78-89.
8. Lipsky BA, Berendt AR, Cornia PB, Pile JC, Peters EJ, Armstrong DG, et al. 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clinical Infect Dis. 2012 Jun 15;54(12):e132-73.
9. Beks PJ, Mackaay AJ, De Neeling JN, De Vries H, Bouter LM, Heine RJ. Peripheral arterial disease in relation to glycaemic level in an elderly Caucasian population: the Hoorn study. Diabetologia. 1995 Jan 1;38(1):86-96.
10. Schaper NC, Apelqvist J, Bakker K. The international consensus and practical guidelines on the management and prevention of the diabetic foot. Curr Diab Rep. 2003;3:475-9.
11. Lipsky BA, Berendt AR, Deery HG, Embil JM, Joseph WS, Karchmer AW, et al. Diagnosis and treatment of diabetic foot infections. Clin Infect Dis. 2004 Oct 1:885-910.
12. Sadriwala QS, Bapuji SG, Murtaza AA. Risk factors of amputation in diabetic foot infections. Int Surg J. 2018 Apr;5(4):1399-1402.
13. Bild DE, Selby JV, Sinnock P, Browner WS, Braveman P, Showstack JA. Lower-extremity amputation in people with diabetes: epidemiology and prevention. Diabetes Care. 1989 Jan 1;12(1):24-31.
14. Apelqvist J, Ragnarson-Tennvall G, Larsson J, Persson U. Diabetic foot ulcers in a multidisciplinary setting an economic analysis of primary healing and healing with amputation. J Internal Med. 1994 May;235(5):463-71.
15. Ramsey SD, Newton K, Blough D, Mcculloch DK, Sandhu N, Reiber GE, et al. Incidence, outcomes, and cost of foot ulcers in patients with diabetes. Diabetes Care. 1999 Mar 1;22(3):382-7.
16. Lee JS, Lu M, Lee VS, Russell D, Bahr C, Lee ET. Lower-extremity amputation: incidence, risk factors, and mortality in the Oklahoma Indian Diabetes Study. Diabetes. 1993 Jun 1;42(6):876-82.
17. New JP, McDowell D, Burns E, Young RJ. Problem of amputations in patients with newly diagnosed diabetes mellitus. Diabetic Medicine. 1998 Sep;15(9):760-4.

Cite this article as: Ashokkumar D, Vinothkumar S, Anandan H. Outcome of patients undergoing amputation for diabetic foot ulcer. Int Surg J 2019;6:88-91.