Clinical Appraisal of Diabetic Foot in Zawia Teaching Hospital

Mohamed A M Zarrouk

Zawia Teaching Hospital ,Faculty of medicine ,Zawia University ,Libya

Abstract

Background :Diabetes mellitus considered as a leading cause of morbidity and mortality and its complications in diabetic foot are well studied . Chronic hyperglycemia , neuropathy ,angiopathy ,and their consequences like severe infection gangrene and amputations necessitate more care and educations for diabetic foot patients.

Method :This prospective study was undertaken at Zawia Teaching Hospital between August 2013 and May2015 . 38 patients admitted to the general surgical department because of diabetic foot complications which can not be treated as out patients.The patients evaluated demographicaly , clinically ,and compared to a previous study in the same department.

Results : ages of the patients are ranging from the 4^{th} to 9^{th} decades but most of them in the 6^{th} decade and a significant number involve the last two decades .Most of the patients have infective complications , and approximately half of them have chronic diabetes mellitus .As compared to the previous study there is clear early presentations and less number of major amputations.

Coclusion :Diabetic foot complications are consequences of uncontrolled diabetes mellitus which cause significant morbidities.Management of diabetic foot according to a guideline-based care reduces the complications and improve the patient quality of life

Introduction

Diabetes mellitus is an endocrine disease characterized by an inability to control blood sugar in the normal level 1 leading to chronic hyperglycemia 2 which will causes several neurological and micro- and macrovascular complications 1 . Diabetes is considered as a leading cause of morbidity and mortality 3.

There are many systems for diabetic foot assessment .Meggitt-Wagner ulcer classification system is based on wound depth and the extent of tissue necrosis 4 , 5 .The new classification system is more easier and include all the complications of the diabetic foot 6. The university of Texas classification system of diabetic foot addresses the ulcer depth and the

presence of infection and ischemia . As the grade and stage of the wounds increase the healing is less likely with out vascular repair or amputation 4. Diabetic foot complications are the most common causes of hospitalization among diabetics and among those complications are ulcerations , infections , and gangrene 7 . Diabetic foot infections present by at least two of the following presentations oedema , erythema , pain , and purulent discharge 8.

Chronic hyperglycemia affecting small blood vessels causing microvascular diseases and affecting large blood vessels causing macrovascular diseases 2 also persistent hyperglycemia causes abnormal functions of endothelial cells and smooth muscle cells in peripheral arteries 4 . Hyperglycemia causes a progressive neuropathy 7 . Neuropathies are among the most common of all the long-term complications of diabetes affecting 50 % of patients 9 . The risk of developing diabetic neuropathy is proportional to both the magnitude and the duration of hyperglycemia 2 . Diabetic neuropathy is manifested in the motor , autonomic , and sensory components of the nervous system 4. Peripheral neuropathy in dibetes may present in several different forms including sensory , focal , multifocal and autonomic neuropathies 2. Autonomic neuropathyd causes decreased sweat and oil gland functions which result in skin dryness and increased susceptibility to tears and infections . Damaged nerve supply of intrinsic foot muscles causes imbalance between different foot movements which will leads to foot deformities , abnormal bony es , and skin ulceration. Also loss of sensation exacerbates the development of ulcerations 4. Neuropathy and vascular disease are contributing factors to foot proplems in diabetic patients . Severe vascular complications are associated with diabetes mellitus involving small and large blood vessels . The vascular changes are more diffuse and distally located involving the leg vessles . Peripheral arterial occlusive disease is 2-4 times more common in diabetic patients 10. The risk of peripheral arterial disease in diabetic patients is increased by age , duration of diabetes , and associated neuropathy . In diabetic patients peripheral arterial disease is usually accompanied by peripheral neuropathy with impaired sensation . Diabetes mellitus and peripheral arterial disease increase the

presentation with ischemic ulcer and gangrene as compared in nondiabetic patients . Peripheral arterial disease in diabetes adversely affects quality of life contributing to long term disability and severe functional impairment 11.

In diabetic patients the nonhealing foot ulcer constitutes a real challenge for the medical profession 10. Diabetic foot ulcerations are among the most common serious complications of diabetes and their recurrences are often very high ranging from 25 % to 80 % per anum 12. Diabetic foot ulcerations could be neuropathic , ischemic , or neuroischemic in nature 10. according to many studies the risk of developing diabetic foot ulcer is estimated to occur in 10-25% % of all diabetic patients 1, 4, 5,10 , 13, 14 . Many factors contribute to the development of diabetic foot ulcer , the major underlying causes are neuropathy5,7 ,14 ischemia from peripheral vascular disease 10 ,14 and minor trauma 7. Once the ulceration developed the risk of wound progression is increased 13 . Diabetic foot ulceration precedes the diabetes related amputations in 75- 85 % of cases 1,3,4 ,10.

Charcot arthropathy is nowadays mainly associated diabetic foot and should be considered in diabetic foot patients. Patients with amputations of lower extremity have a decreased quality of life , increased health costs and have many concomitant medical illnesses and more likely to have amputation of contralimb 14.

Materials and Methods

This prospective study was undertaken at Zawia Teaching Hospital between August 2013 and May 2015 in the department of general surgery. Demographic data , the clinical presentations regarding the foot lesions , investigations , past histories of the patients ,and the treatment modalities were recorded in a special form and presented in this study.

Results

A total of 38 patients were admitted as diabetic feet because they can not be managed as out patients (Table 1)most of them in the 6th decade (34%) but a significant number involve the 8th (23%) and 9th (15%) decades.

Table 1 the distribution of the involved patients

Decade	Number of patients	Percentage
4th (31-40 years)	2	5
5th (41-50 years)	5	13
6th (51-61 years)	13	34
7th (61-70 years)	3	8
8th (71-80 years)	9	23
9th (81-90 years)	6	15

There were 23 males and 15 females (Figure 1). The right foot was involved in 19 cases , the left foot involved in 16 cases and both feet involved in 3 cases (Figure 2) .

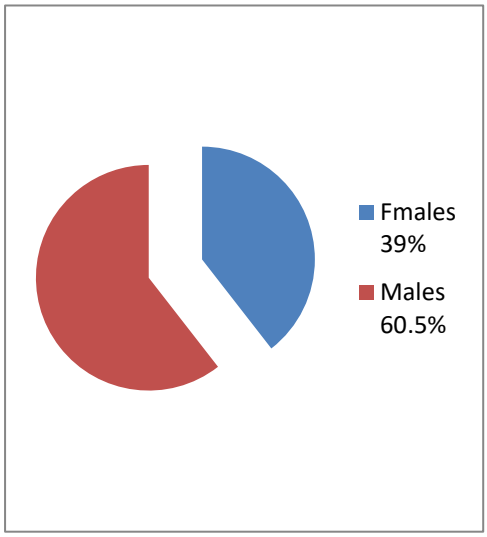

Figure 1Sex distribution

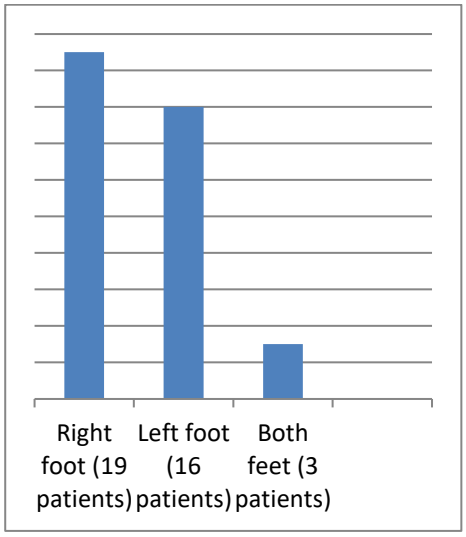

Figure 2 The involved foot

The feet clinical presentations which evaluated (Table 2) include pain recorded in 23 patients (60.5%) ,swelling presented in 22 patients (57.8%) ,redness found in 19 patients (50%) ,fever presented in 7 patients (18.4%) ,pus discharge found in 9 patients (23.6%) ,ulceration presented in 11 patients (28.9%) ,cellulitis diagnosed in 21 cases (55.2%) , abscess presented in 5 cases (13.1%) , osteomyelitis found in 8 patients (21%) ,and gangrene presented in 16 cases (42%) (Figure 3,4,5,6) .

Table 2 Clinical presentations of the involved feet

Clinical presentation	Number of patients	Percentage
Pain	23	60.5
Swelling	22	57.8
Redness	19	50
Fever	7	18.4
Pus discharge	9	23.6
Ulcer	11	28.9
Cellulitis	21	55.2
Abscess	5	13.1
Gangrene	16	42
Osteomyelitis	8	21

Figure 3 Diabetic foot abscess. Figure 4 Osteomyelitis in the diabetic foot

Figure 5 Diabetic foot Gangrene Figure 6 Diabetic foot management

Of the 38 patients 17 had diabetes mellitus for more than 10 years (44.7%) , 10 had history of previous diabetic foot (26.3%) and 8 had previous amputations (21%) (Table 3).

Table 3 Past history

Past history	Number of patients	Percentage
Diabetes >10 years	17	44.7
Diabetic foot	10	26.3
Amputation	8	21

Most of the studied patients had high level of glycoglysatedhaemoglobin , diffuse atherosclerotic changes of the lower limbs as proved by Duplex Ultrasonography and assosciated chronic illnesses like Hypertension , Cardiac illness , and Renal impairment .

All admitted patients given the basic treatment of diabetic foot aacoding to the lesion present which include Bed rest , Analgesics if needed , Broad spectrum antibiotics initially followed by the specific one after the re sults of culture and sensitivity , dressing , debridement , and amputations (Table 4) .

Table 4 Performed amputations

Amputation		Number of patients	Percentage
Minor	One toe	9	28.9
	Two toes	2	
	Total number	11	
Major	Above knee	0	5.2
	Below knee	2	
	Total	2	

According to the new classification of diabetic foot 6 the majority of studied patients , 26 patients (68.4%) in the grade one (infective lesions) which is comparative to other studies , 4 patients (10.5%) in the grade 2 group and 7 patients (18.4%) (Figure 7).

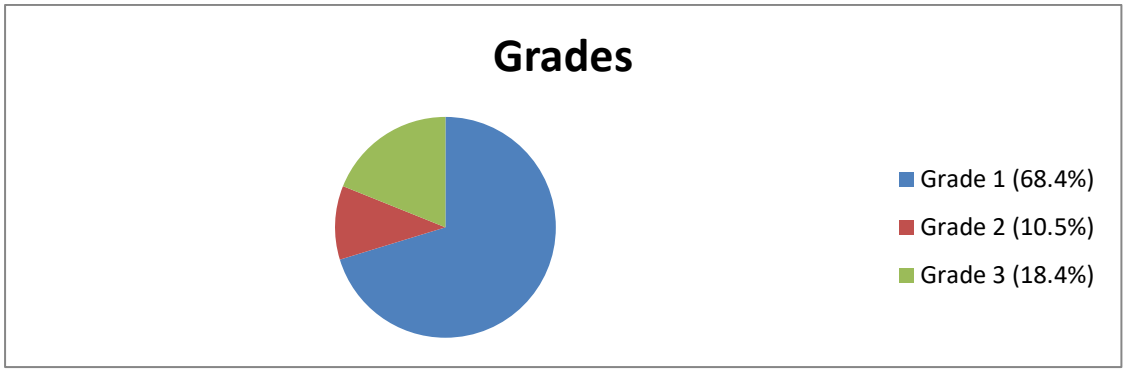

Figure 7 classification of patients according to the new system

Also patients classified according to Meggitt and Wagner method (Table 5) which revealed 5 patients in grade 1 group (13%) , 10 patients in grade 2 group (26.3%) , 9 patients in grade 3 group (23.6%) , 12 patients in grade 4 group (31.5)% , and 2 patients in grade 5 group (5.2%).

Table 5 Classification of patients according to MeggittandWagner method

Grade	Number of patients	Percentage
1	5	13
2	10	26.3
3	9	23.6
4	12	31.5
5	2	5.2

For comparative purposes this study compared to a previous one performed in the same hospital (Zarrouk et al) 15 . It is clear that there were more patients in the early stages (62.9%) in this study and lesser number of patients with advanced stage in this

study as compared to the previous one (Table 6) .

Table 6 comparison between the two studies

Grade	Number of patients in the previous study		Number of patients in this study	
1	2.98	44.73	13	62.9
2	32.8		26.3	
3	8.95		23.6	
4	53.7	55.1	31.5	36.7
5	1.4		5.2	

Discussion

The standard care of diabetic foot should include evaluation of neuropathy , peripheral vascular disease 7 the wounds regarding the presence of infection 13 and the ulcer depth. Vascular assessment include pedal pulses the capillary filling time the blood pressure measurement of lower extremities using Doppler ultrasonography 7. For estimation of peripheral tissue perfusion measurement of toe blood pressure should be combined with investigation of local perfusion e.g. transcutaneous oxygen tension 10 (TC PO2) . Toe pressure and TC PO2 transcutaneous partial oxygen pressure measurement are the most widely used non-invasive methods in assessing foot perfusion and wound healing potential which is expected if the TC PO2 > 50 mmHg 16.

The wound evaluation should include the site , the size , the shape , the depth , the base ,the border 7. It is important also to identifies redness , dicolouration , swelling , and local warmth 12. The clinician must be familiar with the relation between diabetes control and vascular injury. Also it is important to understand neuropathic manifestations and its treatment 2 . There are many ulcer severity scores for the diabetic feet , which categorize different ulcers into

subgroups and help in the management and outcome determination. Meggit-Wagner classification can help in the probability for healing , amputation , need for surgery ,and hospitalization 5. The new classification is simple , easy to understand , includes all the common complications of diabetic foot and revealed that type I diabetic foot complications are the most common complications seen in hospitalized patients 6 .

The basic principles for diabetic foot treatment includes intensive glysemic control 1,10 optimal foot ulcer care 3 off loading 10, debridment 1,4,5,7,8 proper dressing 14 proper antibiotic 8 revascularisation if indicated 10 surgical excision of the affected bone with osteomyelitis 4 ,5. For diabetic patients with chacot foot the initial treatment of an inflamed charcot foot consists of long- non-weight bearing with a cast which started immediately after diagnosis . Reconstructive surgery required for marked instability , severe deformity and recurrent ulceration 17 . Prevention of the development of ulcers in diabetic patients reduces the frequency of lower extremity amputation by 49-85 % and has greater health benefits 3. The feet of diabetic patients should be examined annually to detect the predisposing conditions to ulcerations 4 . At least half of all diabetic ulcers should be prevented by appropriate management and patient education 9 . Prevention of foot ulcer is directed to individual who are in high risk such as those with neuropathy , peripheral vascular disease ,or structural foot abnormalities 7 .

Speciality diabetic foot clinics have been shown to reduce the incidence of ulceration and amputation in high risk patients.

References

1.Ruth C. Brenyyah , Richard K. D. Ephraim , Ben A. Eghan Jnr and John Asamoah. Bacterial Profile of Diabetic Foot Ulcer of Patients Visiting a Specialist Diabetic clinic at KomfoAnokye Teaching Hospital Kuasi , Ghana. B J of Medicine & Medical Research:2014 4(27) :4501.

2.Michael J. Fowler . Microvascular and Macrovascular Complications of Diabetes. Clinical Diabetes 2011;29(3) :116-122.

3.Monika Maria Ortegon , William Ken Redekop , Louis WilhemusNiessen . Cost-Effectiveness of Prevention and Treatment of the Diabetic Foot .Diabetes Care 2004;27 (4) :901-907.

4.Warren Clayton , Jr and Tom A. Elasy . A Review of the Pathophysiology , Classification , and Treatment of Foot Ulcers in Diabetic Patients .Clinical Diabetes 2009; 27(2): 52-58.

5.StefanBeckert , Maria Witte , Corinna Wicke ,Alfred Konigsrainer , Stephan Coerper . A New Wound-Based Severity Score for Diabetic Foot Ulcers .Diabetes Care 2006 ;29(5) :988-992 .

6.Amit Kumar C. Jain . Type 1 diabetic foot complications .J Diab Foot Comp.2016;8(1)(3):17-22.

7.Ingrid Kruse , and Steven Edelman .Evaluation and Treatment of Diabetic Foot Ulcers . Clinical Diabetes 2006 ;24(2) :91-93 .

8.Gregory T. Matsuura , Pharm D ,and Neil Barg .Update on the Antimicrobial Management of Foot Infections in Patients With Diabetes .Clinical Diabetes 2013;31(2) :59-65 .

9.Andrew J.M. Boulton . Management of Diabetic Peripheral Neuropathy .Clinical Diabetes 2005;23(1) :9-15 .

10.G. Jorneskog .Why Critical Limb are not Applicable to Diabetic Foot and What the Consequences are .SJS 2012;101:114-118 .

11.American Diabetes Association ,Reprinted with permission from Diabetes Care 26:3333-3341,2003 .Peripheral Arterial Disease in People With Diabetes .Clinical Diabetes 2004;22(4) :181-198 .

12.Lawrence A. Lavery , Kevin R. Higgins ,Dan R. Lanctot ,George P. Constantinides ,Ruben G. Zamorano , Kyriacos A. AthanasS.iou , David G. Armstrong , C.Mauli Agrawal .Preventing Diabetic Foot Ulcer Recurrence in High-Risk Patients .Diabetes Care 2007;30(1) :14-20 .

13.Lalita Khaodhiar ,Thanh Dinh , Kevin T. Schomacker ,Svetlana V. Panasyuk ,Jenny E. Freeman ,Robert Lew , Tiffany Vo ,Alexander A. Panasyuk ,Christina Lima ,John M. Giurini ,Thomas E. Lyons ,AristidisVeves .The Use of Medical Hyperspectral Technology to evaluate Microcirculatory Changes in Diabetic Foot Ulcers and to Predict Clinical Outcomes .Diabetes Care 2007;30 (4):903-910.

14.David J. Margolis ,Lynne Allen-Taylor ,Ole Hoffstad ,Jesse A. Berlin .Diabetic Neuropathic Foot Ulcers .Diabetes Care 2002;25(10):1835-1839.

15.Mohamed A. M. Zarrouk , Masaoud A. Edeeb .Diabetic Foot : A Prospective study of 67 patients at Zawia Teaching Hospital .The Libyan Journal of Medical Research 2008;3(3)48-56.

16.M. Venermo ,P. Vikatmaa ,H. Terasaki ,N. Sugano .Vascular Laboratory for Critical Limb Ischemia .SJS 2012;101:86-93.

17.T.-K. Pakarinen ,H.-J. Laine, S. E. Honkonen ,J. Peltonen ,H. Oksala , J. Lahtela .Charcot Arthropathy of the Diabetic Foot. Current Concepts and Review of 36 Cases. SJS 2002;195-201.