

## Pattern and Management Approach of Diabetic Foot Disease in a Developing Country

A. U. Ekere MBBS, FMCS, FWACS, E. Bob-Yellowe MSc, MD, A. Dodiya-Manuel MBBS

Orthopaedics and Trauma Unit, Department of Surgery, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

### ABSTRACT

**Background:** Diabetes mellitus is a common endocrine illness in our environment. Diabetic foot gangrene is its commonest surgical complication and is a health burden in Niger Delta region of Nigeria. The aim of the study was to highlight the demography, bacterial incidence, time frame to development of diabetic foot, reaction to ablative surgery and the use of San Antonio wound classification system for the treatment decision.

**Methods:** We retrospectively reviewed 46 diabetic feet in 41 diabetics over a 5 year period, January 1999 to December 2003, using the San Antonio classification system. The case notes of all patients seen in the University of Port Harcourt Teaching Hospital were included in the study.

**Results:** There were 32 males and 9 females with a male female ratio of 3.6:1. The age range was 34 to 90 years with a mean of 56± 12 years. The mean duration between diagnoses of diabetes mellitus and development of foot disease was 13± 5 years.

Twenty four patients (59.5%) with stages A or B irrespective of the grade had a chance of limb salvage using appropriate antibiotic, serial wound debridement, regular dressing and skin grafting where necessary. Of the 24, 3 absconded, 5 died and 16 healed and were discharged. The remaining 17 patients (40.5%) were stages C and D and were offered ablative surgery irrespective of the grade. Nine discharged against medical advice, 5 died and 3 were discharged in good condition.

**Conclusion :** This is a disease of the older population. Delay in accepting ablative surgery affects prognosis. Outcome in management of diabetic foot disease can be improved by education, early presentation, funding for establishment of specialized diabetic foot clinics and early decisive definitive management.

**KEYWORDS:** Diabetic foot; Gangrene; San Antonio wound classification system; Amputation and debridement.

Paper accepted for publication 30th May 2005.

### INTRODUCTION

Diabetic mellitus (DM) is a common health problem world-wide, and infact the commonest

endocrine disease in Nigeria with a prevalence of 2.2%<sup>1-3</sup>. Diabetic complications are said to be on the increase in the tropics and the diabetic foot is the commonest surgical complication of diabetic mellitus<sup>3,4</sup>. Umebese and Ogbemudia in Benin, Nigeria, described a diabetic foot as clinically developed sympathetic skin ulceration over the foot or below the malleoli, which might grow into large sizes, and so infection and ischaemia becomes obvious<sup>5</sup>. Using clinical findings, Wheat *et al* defined a septic diabetic foot as one in which exists soft tissues infection with or without osteomyelitis, wet gangrene and necrotizing cellulites and abscess<sup>2,5-7</sup>. Generally, diabetic foot refers to the variety of pathological conditions that may affect the feet in people with diabetes<sup>8</sup>.

Diabetic foot constitutes the second commonest indication next to trauma for limb amputation in Nigeria<sup>7-11</sup>. The mortality in these cases are high, worse in our environment where cultural beliefs deter early ablative intervention<sup>3,9,12</sup>.

The Wagner's grading<sup>2,8</sup> has a draw back in that it does not differentiate between neuropathic and ischaemic ulcers with or without infections<sup>2,5,8,13-15</sup>. The San Antonio system is a better predictor of outcomes than the Wagner classification<sup>6,12</sup>. Ofiaeli and Agbai<sup>16</sup> concludes that some form of trauma including scratching is needed in our environment for diabetic foot disease to develop. The aim of this paper is to highlight the demographic indices, time frame from diagnosis of DM to development of diabetic foot, bacterial flora, patients acceptance of ablative surgery and treatment approach using the San Antonio wound classification and crude mortality rate of diabetic foot disease in the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

### PATIENTS AND METHODS

A retrospective study was carried out in patients with Diabetic Foot disease seen in the University of Port Harcourt Teaching Hospital over a 5 year period between January 1999 to December 2003. Clinical records were examined to determine age, sex, laterality, trophic change and presence or absence of arterial pulsation (dorsalis pedis and posterior tibial arteries). Wound swabs culture reports, urinalysis, fasting blood sugar level on admission

and electrolytes, urea and creatine clearance results were noted. All the lesions were graded from 0 to 3 according to the depth and the level of involvement of the ulcer; and staged from A to D depending on the presence or absence of ischaemia and/or Infection. Diabetic control was done by the Medical team. Non diabetics with foot ulcers were excluded from the study.

Treatment modality was divided into two modes.

**A. MODE 1:** Limited surgical treatment comprising the use of systemic antibiotics based on sensitivity pattern, adequate debridement, supervised, regular wound dressing and skin grafting where necessary in patients with stages A and B irrespective of the grade.

**B. MODE 2:** Non limited (Ablative) management ie, below knee amputation and disarticulation of 3 digits in one patient.

Data analysis was done using multi way frequency tables.

## RESULTS

During the study period 41 patients with male to female ratio of 3.6:1 (32 males and 9 females) presented with 46 diabetic feet lesions. Lesions affected 20 right feet, 16 left feet and 5 were bilateral. Ages ranged from 34 to 90 years with a mean of  $56 \pm 12$ , the peak incidence of 68.5% occurring in the 5<sup>th</sup> and 6<sup>th</sup> decades of life (Table I). Of the lot, 17 patients were stages C and D and thus offered ablative surgery, 9 (52.9%) of these discharged against medical advice, 8 (47.1%) had amputation of which 5 (62.5% of the amputees) died; and 3 were discharged in good condition. The remaining 24 patients were of stages A and B and had conservative treatment; 3 discharged against medical advice, 16 (76.1%) were discharged in good condition and 5 (23.9%) died.

Most of the patients (34.0%) belonged to the 1B of the San Antonio system (Table II). *Staphylococcus* was the commonest organisms cultured in 34.0% of the cases [Table III].

Of the 41 patients, duration between the diagnoses of diabetes mellitus and development of diabetes foot disease was documented in 29 cases. Two patients developed the disease in 5 years, 3 patients in 7 years, a patient in 8 years, 4 patients in 10 years, 2 patients in 11 years, 2 patients in 12 years, 3 patients in 14 years and 4 patients in 15 years. Eight patients with diabetic foot disease were diagnosed for the first time on presentation. The mean duration was  $13 \pm 5$  years.

Twenty seven patients spent less than 30 days in hospital, 7 patients between 31 and 60 days, 4

patients between 61 -90 days, and 3 patients between 91 and 120 days.

The three patients that survived in the ablative group accepted the amputation within 7 days of offer. The five patients that died accepted between two and four weeks (1 patient at 2 weeks, 2 patients at 3 weeks, and 2 patients at 4 weeks).

**Table I. Age Distribution**

Age	No Of Patients	%
≤40	3	7.3
41-60	28	68.3
≥61	10	24.4
Total	41	100

**Table II. San Antonio Wound Classification**

Grade/ Stage	No of Patients	
1	A	12
	B	14
	C	1
	D	7
2	A	7
	B	3
	C	4
	D	0
3	A	0
	B	0
	C	0
	D	3

**Table III. Microbacterial Pattern**

Organism	No of Patients	%
<i>Staphylococcus aureus</i>	14	34.0
<i>Pseudomonas</i>	7	17.1
<i>Proteus</i>	5	12.2
<i>Klebsiella</i>	2	4.9
<i>Escherichia Coli</i>	2	4.9
Mixed growth	7	17.1
No growth	2	4.9
No results	2	4.9
Total	41	100

## DISCUSSION

The diabetic foot disease is a challenging problem in Nigeria<sup>9</sup>. This study confirmed earlier observations that this is a problem of the middle age and the elderly, therefore mostly of the type 2 variety<sup>4,5,17</sup>. In our series 92.7% of the patients were above forty years of age. The male preponderance and a commoner affection of the right foot agrees with the observation in Jos<sup>17</sup>. The mean duration of diabetes mellitus before development of the foot disease was  $13 \pm 5$  years in the patients that were aware of their illness. This is similar to other series in the environment<sup>17-19</sup>. Eight patients were diagnosed diabetics on presentation. These patients usually expend their life savings before development of the foot disease which is an added load to a bad situation<sup>3,9</sup>.

Many of these patients have a long hospital stay. Of our 41 patients, 27 left hospital within 30 days and 14 patients were on admission for between 31 and 120 days. This constitutes a heavy economic load in an emerging economy like ours and is bad for an already economically depressed patient. This long hospital stay and treatment are worsened by sepsis. The commonest organism isolated worldwide is *staphylococcus aureus*<sup>13,14,17</sup>, although in a study at Brazil, Enterobacteriaceae surpassed *staphylococcus aureus*, and 17% frequency was also observed to be anaerobes. This organism was isolated in 34.0% of our cases, followed by *pseudomonas* species (17.1%), *proteus* (12.2%) although quite a few of the cultures yielded mixed growth of organisms (17.1%).

Unfortunately in our environment many of our patients present late<sup>3,4,17</sup>, and even at that refuse amputation due to some cultural beliefs<sup>3,9</sup>. In the Niger Delta region of Nigeria amputees are not buried properly since they are regarded as taboos and it is also believed that in their reincarnation, they will be born with missing limbs<sup>9</sup>. These patients are thrown away in the evil forest. In the 17 patients offered ablative surgery, 9 discharged against medical advice, three of the 8 amputated accepted their treatment within a week and all of them survived. The other 5 patients accepted surgery between 2 and 4 weeks, when their clinical states were compromised and they all died. These post operative deaths were usually due to overwhelming sepsis or pulmonary embolism. This agrees with Kidmas *et al*<sup>11</sup> observation in Jos, where in their 12.6% (n=11) overall mortality in major limb amputations, 8 of the patients died from diabetic foot complications. The limited surgery treatment in 24 patients was more accepted and the outcome

encouraging. Only three patients left hospital against advice, 16 patients healed while 5 died. These deaths were largely due to diabetic complications like ketoacidosis, diabetic nephropathy etc.

A casual look at our series revealed that in treatment, the stage of the foot disease was an important determinant of the treatment option used. All patients offered ablative surgery were of stage C and D while those in A and B were managed conservatively. This suggests that the San Antonio system of wound classification can help in early decision of treatment modality to be used thus avoiding unnecessary wastage of time and resources<sup>6,14</sup>. The time tested repeated debridement, offloading and dressings for lower grades and antibiotics, limited or total amputations for higher grades still remains the gold standard.

In conclusion, outcomes in the management of diabetic foot disease in our environment can be improved by education, early presentation, funding for establishment of specialized foot clinics, and early decisive definitive management.

## REFERENCES

1. Alebiosu CO, Kadiri S, Akang EU. Pathological study of Diabetic Nephropathy based on Renal Biology: A Prospective study. *Nigeria Journal of clinical Practice* 2000; 5(1):5-9.
2. Boulton AJM. The Diabetic Foot. *Surgery* 1996; 14(2) : 37-39.
3. Ekere AU, Chinenye S, Dodiya-Manuel A. The Diabetic Foot- A Review. *Nigerian Journal of Orthopaedics and Trauma* 2003; 2(1):4-10
4. Anyanwu SNC. The Diabetic Foot- A major Surgical problem in our Environment. *Nigerian Journal of Surgery* 1994; 1:26-28.
5. Umebese PFA, Ogbemudia A O. Management of Diabetic Foot: Objective Results in 40 patients using a new Diabetic Foot Severity Score. *Nig J Surg* 1998; 5(1):10-12.
6. Boulton AJM. The diabetic foot: a major problem for the New Millennium. *International Diabetes Monitor* 2001; 13(1):1-7.
7. Wheat L J, Allen SD, Henry M, *et al*. Diabetic Infection Bacteriologic Analysis. *Arch Int Med* 1986; 146: 1935-1940.
8. Adotey JM, Jebbin N. Amputation in University of Port Harcourt Teaching Hospital. *Nigerian Journal of Orthopaedics and Trauma* 2002; 1(1):29-33.
9. Ekere AU. The Scope of Extremity Amputations in a Private Hospital in the South- South region of Nigeria. *Nigeria Journal of Medicine* 2003; 12(4): 225-228.
10. Onuba O, Udoidio E. The Scope of Amputations in the Developing Countries. *Postgrad Doctor (Africa)*. 1987; 11(5): 118-121
11. Kidmas AT, Nwadiaro HC, Igun CO. Lower Limb Amputations in Jos. *East Afr Med J* 2004; 81(8):427-9.
12. Armstrong DG, Lavery LA, Harkless LB. Validation of a Diabetic Wound classification system. *Diabetic Med* 1998; 14:855-859.
13. Cunha BA. Diabetic Foot Infections. *Emedicine*. <http://www.emedicine.com/MED/Topic 3547.htm>. 2003; 1-

- 19.
14. Laing P. The Development and Complications of Diabetic Foot Ulcers. *Am J Surg* 1998; 176 (Supp 2A): 115-195.
15. Wagner FW. Algorithms of Diabetic Foot, Care. In : Levin ME, O Neal LW( Eds). *The Diabetic Foot*, 2<sup>nd</sup> ed. St. Louis: Mosby, 1983; 201-302.
16. Ofiaeli RO, Agbai A. Pathways to Diabetic Ulceration and Gangrene in Nigeria. *Orient Journal of Medicine* 2001; 13(1,2):57-59
17. Nwadiaro HC, Puepet FH, Ike EI, Kidmas AT, Nwadiaro P.O. Prognostic Indices of Diabetic Foot disease. *Nigerian Journal of Orthopaedics and Trauma* 2003; 2 (2):84-89.
18. Akanji AO, Adetuyibi A. The pattern of foot lesions in Nigerian Diabetic Patients. *West Afr J Med* 1990; 9(1):1-5.
19. Dagogo-Jack S. Pattern of Diabetic Foot Ulcer in Port Harcourt Nigeria. *Practical Diabetes Digest* 1991; 75-78.
20. Eldor R, Raz I, Ben Yetuda A, Boulton AJ. New and Experimental Approaches to Treatment of Diabetic Foot Ulcers: A Comprehensive Review of Emerging Treatment Strategies. *Diabet Med* 2004; 21(11): 1161-73.
21. Carvaliho CBM, Neto R, Aragoa LP, Oliviera M, Norgvria MB, Fofti A.C. Diabetic Foot Infection: Bacteriologic Analysis of 141 Patients. *Arq Bras Endocrinol Metabol* 2004; 48(3): 406 - 413.