

RISK FACTORS AND CLINICAL CHARACTERISTICS FOR FOOT ULCERS IN PATIENTS WITH DIABETES IN BUCHAREST, ROMANIA

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Foot ulcers remain a serious and challenging complication of diabetes mellitus. They hold the potential of great morbidity and mortality, attended by great economic losses and markedly diminished quality of life.

Prevention, through identifying and eliminating risk factors whenever possible, is an important element in the management of this complication. In this paper, we assess the results of a study carried out on 214 patients presenting with foot ulcers at our outpatient clinic in 2003 and 2004. Males were twice as frequently affected as females, average age was 62.6 yrs. and 62% of cases were related to neuropathy. Most ulcers were located in the toe area (75.9%), 80.1% of patients presented only one lesion, Wagner category was I in 63.9% patients. Only 25.9% of patients could pinpoint an approximate date of onset of their ulcer and the average duration prior to presentation in this group was 149.5 days. Thus the elderly, males and those with neuropathy were at greatest risk of having foot ulcers. The toes were the part of the body at greatest risk. The fact that most patients were unaware of when they first developed ulcers, as well as the relatively long delay before presentation suggests a lack of awareness of the potential dangers posed by foot ulcers.

Key words: Foot ulcers; Diabetic neuropathy; Arteriopathy; Infection.

INTRODUCTION

Foot ulcers continue to remain a challenging and serious complication of diabetes mellitus. The major causes of foot ulceration are peripheral neuropathy and arteriopathy¹⁻³. These may be associated with infection, trauma and foot deformity amongst others. Neuropathy appears to be the commonest causative factor^{1,4}. This is followed by ischaemia, with infection and trauma being strongly associated factors⁵.

We set out to identify what clinical parameters are associated with foot ulceration in diabetic patients in Bucharest. The identification of these parameters should improve our ability to predict and to prevent the development of foot ulcerations, thus improving the quality of life of our patients.

METHODOLOGY

The records of 214 patients presenting with foot ulcer in 2003 and 2004 were studied. Clinical characteristics such as location, probable cause, duration of ulcer prior to presentation and number of ulcers per patient were noted.

The Wagner classification for each ulcer was determined from the patients' records.

Cost precluded HbA1c assays.

The results of the findings were analyzed using simple mathematical formulae. The data was divided into general data and specific data.

RESULTS

The general characteristics of the group were as follows:

- a. Average age = 62.6 ± 11.3 yrs.
- b. Duration of diabetes = 11.5 ± 8.7 yrs.

c. Male:female ratio = 143:71 (2:1)

d. Type 2 = 206, type 1 = 8.

Specific data was as follows:

a. Total number of ulcers 264, average 1.2 ulcers/patient

b. 1 ulcer/patient = 173, > 1 ulcer/patient = 41

c. Average duration of ulcer prior to presentation 149.5 days, only 56 patients able to report.

In some cases, more than one factor was a probable cause

DISCUSSIONS

The average age of the group under study was 62.2 ± 11.3 yrs. This suggested an elderly population of patients. Older age poses the risk of diminished ability for self care, including personal daily foot examinations. This is a result of poor vision and impaired mobility. Poor vision and decreased mobility would also predispose patients to trauma. The absence of these factors in younger patients may make them less susceptible to foot trauma. Most patients, 206 (96.3%), were type 2 diabetic patients and this also correlates with the age of the patient group. Their average duration of diabetes was of 11.5 yrs. There was a 2:1 male ratio of patients presenting with ulcers. This may be due to the relatively active nature of the activities that men are engaged in compared to women, increasing the likelihood that they may suffer from trauma.

80.1% of patients had only one ulcer, yet a significant proportion (19.9%) had multiple ulcers. The average duration of ulcer prior to presentation was 149.5 days, suggesting a lack of awareness and personal care. Another possible contributing factor may also be the tendency to resort to self-care, thus increasing the likelihood that these ulcers may further progress to gangrene.

Table 1 shows that neuropathy and neuroischaemia were the most common contributing factors to ulcer formation (62.0% and 16.7% respectively). Trauma, infection and vascular factors followed in that order. Neuropathy is one of the commonest complications of diabetes mellitus and the frequency of this disorder is increased with increasing age and duration of diabetes mellitus. This combination – older age and neuropathy – may also increase the likelihood of traumatic ulcerations that may also go unobserved for a long time as this group has a diminished ability to care for itself. This may also explain why many patients were unable to pinpoint the approximate period of onset of ulceration, aside from the lack of awareness of the gravity of their condition. It would appear that the most susceptible areas for

foot ulceration are the toes. This is in agreement with an earlier study that we carried out⁶, but also is a cause for alarm as these patients are very susceptible to gangrene due to the lack of collateral circulation in the area of the toes. Vascular factors are an uncommon cause of foot ulcers, but may pose a significant risk of lower extremity amputation, especially with ankle brachial indices below 0.8⁷.

Table 2 shows the location of the ulcers. The commonest location of ulceration was the toe area. This also includes some ulcers in the interdigital area. As we noted above, this is in agreement with an earlier study by us and also supports the finding of neuropathy being the commonest cause of foot ulcer. The sole and the heel, both closely related anatomically had similar ulcer ratios.

Table 3 shows the Wagner category and thus assesses the severity of the ulcers as well as their prognosis at presentation. Wagner I category was seen in 63.9% of cases, while Wagner IV, foot gangrene, was seen in only 4.1% of cases. The Wagner classification is a simple method of prognostication and assessment of ulcers of the foot that is still proving useful in spite of more complicated systems^{1,2}. The figures show that most patients presented with mild ulceration and therefore had a fairly good prognosis.

Foot ulcers are a severe complication of diabetes, that lead to severe economic losses as well as diminished quality of life. There is an increased risk of lower extremity amputation from foot ulceration⁷. This risk of foot amputation is increased on the same side as the foot ulcer⁷. Factors that predispose to the development of foot ulcers in this study include male sex, older age, lack of awareness and peripheral neuropathy. Most patients tend to have only one ulcer at presentation, yet a significant proportion 19.1% of patients presented multiple foot ulcers.

Some authors⁸ have shown that the incidence of foot ulcerations in patients with diabetes is 5.8%. This agrees with our unpublished observations. The 3-year survival rate for foot ulcers is 72% while the incidence of amputation is 15.6%. Mortality from foot ulceration appears to be greater with ischaemic ulcers than with neuropathic ulcers and, though there is a greater incidence of neuropathic ulcers than ischaemic ulcers, the incidence of amputations of ischaemic ulcers are approximately thrice that of neuropathic ulcers⁹. Cost of care was US\$27,987 for the first 2 years after diagnosis⁸.

The recognition of these factors offers us bases upon which to design educational and other preventive strategies. It has been shown that simply being aware of abnormal electrophysiologic

parameters at testing may stimulate patients to better foot care¹⁰.

We have also shown that patients do respond adequately to a structured educational programme

aimed at increasing awareness of their underlying disorder and its complications¹¹. Such structured programmes may go a long way to preventing the development of diabetic foot ulcers.

Table 1

Probable cause of foot ulcer

Probable cause	Neuropathy	Neuroischaemic	Trauma	Infection	Vascular
Number(%)	133 (62%)	36 (16.7%)	22 (10.2%)	19 (8.8%)	10 (4.6%)

Table 2

Location of ulcers

Ulcer location	Toes	Sole	Heel	Foot (dorsum)	Other areas
Number (%)	164 (75.9%)	28 (12.9%)	27 (12.5%)	12 (5.6%)	31 (11.7%)

Table 3

Wagner Classification

Wagner category	I	II	III	IV
Number (%)	138 (63.9%)	33 (15.3%)	34 (15.7%)	9 (4.1%)



Photo 1. Gangrene of toes in the context of peripheral vascular disease.



Photo 2. Neuropathic "Malperforans" plantar ulcer (note presence of callus almost concealing the ulcer).

REFERENCES

1. Watkins P.J., The diabetic foot. *BMJ* 2003; 326:977–979.
2. Nwabudike L.C., Forsea D, Ionescu-Tîrgoviste C, *Diabetic Foot Ulcers. Romanian Journal of Dermatology* **1999**, 26–34, 1999.
3. Nwabudike L.C., Ionescu-Tîrgoviște C. The Pathways to Neuropathic Ulceration (An introductory review) *Romanian Journal of Diabetes, Nutrition and Metabolic Diseases* **2005**;12;4:295–298.
4. Reiber G.E., *et al.* Causal pathways for incident lower-extremity ulcers in with diabetes from two settings. *Diabetes Care* **1999**, 22:157–162.
5. Boyko J.E., *et al.* A prospective study of risk factors for diabetic foot ulcer. The Seattle diabetic study. *Diabetes Care* **1999**, 22:1036–1042.
6. Nwabudike L.C., Ionescu-Tîrgoviște C. Clinical characteristics of patients with foot ulcers and diabetes mellitus *Diabetes metab.* 29:45289, **2003**.
7. Adler A.I., Boyko J.E., Ahroni J.H., Smith D.G., Lower extremity amputation in diabetes. The independent effects of peripheral vascular disease, sensory neuropathy and foot ulcers. *Diabetes Care* **1999**, 22:1029–1035.
8. Ramsey D.S., *et al.* Incidence, outcomes and cost of foot ulcers in patients with diabetes. *Diabetes Care* **1999**, 22:382–387.
9. Moulik P.K., Mtonga R., Gill G.V. Amputation and mortality in new onset diabetic foot ulcers stratified by aetiology. *Diabetes Care* **2003**, 26:491–494.
10. Ionescu-Tîrgoviste C *et. al.*, Awareness of Risk of Foot Gangrene is Greatly Raised by the Finding of an Abnormal Electrophysiologic Parameter. (Abstract) *4th International Symposium on Diabetic Neuropathy 15-19 July 1997*.
11. Nwabudike L.C., Coravu D.E., Ionescu-Tîrgoviste C, Cristofor C, Education improves awareness of the diabetic foot. AdA Congress, June **2006**.
12. Wagner F.W. Jr., The dysvascular foot: a system for diagnosis and treatment. *Foot* 2:64–122, **1981**.