

Diabetic Foot Ulcer - a Prospective Study

S. M. Ali, A. Basit, S. Mumtaz, M.Z.I. Hydrie (Department of Baqai Institute of Diabetology and Endocrinology. Karachi.)

T. Sheikh (Department of Plastic Surgery, Baqai University Hospital, Karachi.)

Abstract

Objective: To detect "Feet at Risk" early, its early diagnosis and treatment of foot ulceration to prevent amputation.

Setting and Method: One hundred patients with diabetic foot problems were seen at Baqai Institute of Diabetology and Endocrinology from 06-01-97 to 14-04-99. Each Patient was examined for peripheral pulses, sensations and reflexes, for dryness of skin, deformity, callus and nail disorders and were photographed on first visit.

Results: There were 65% males and 35% females included in this study. Ninety nine patients were type 11 diabetics, 38% were either smokers or had other addictions (or were addicted to tobacco).

Awareness about risk factors causing foot problems was lacking among all patients. Fifty percent patients were on oral hypoglycaemic agents, 48% were insulin treated, while 2% were on diet and exercise alone. Glycaemic control was poor in 70%, fair in 16% and was good in 14%, 31% were overweight and 5% patients were underweight. Duration of diabetes was greater than ten years in 58%, toes were affected in 44% sole/metatarsal in 18%; rest included malleoli, heel etc. Eleven patients had ulcers on both feet. Neuropathic ulcer were 42%, neuro ischaemic 58%, Sixty nine percent patients were in the age group between 40-60 years. Cause unknown 29% blisters and boil 14%, trauma/cutting 17%, burns 8%, dry skin/callus 10%. Fundal changes were present in 37%; proteinuria in 37%, ischaemic heart disease in 20%, hypertension 18%, In 60% more than one antibiotic was used. Foot ulcers of fifty nine patients healed on conservative management, six patients had below knee amputation, fifteen had toe amputation; nine were still on treatment, eleven lost contact.

Conclusion: Lack of awareness, poor glycaemic control and duration of diabetes were the main factors causing diabetic foot problems. This study also confirmed that microvascular complications should be screened in patients with diabetic foot ulcers. Foot care education would be the most important way of dealing with this major problem (JPM 51:78; 2001).

Introduction

Foot ulceration in diabetics cause serious disability and considerable strain over the scarce resources of the patients and the community. Foot ulceration affects around 15% of patients with diabetes^{1,2}, with a risk of amputation being 15-40 times higher than in non-diabetics³ In U.S.A alone each year it accounts for 30,000 lower extremity amputations, around 20% of all hospital admissions of diabetics and costs more than 200 million dollars per year³ The risk of re-amputation and amputation of the other leg is around 40% in five years¹. The five year mortality rate in patients with diabetes after amputation is around 70%⁴.

Foot ulcerations are usually preventable by accurate identification of those who are at risk of developing foot ulcers with the exception of those type 11 diabetics in whom the lesion is present at the time of diagnosis⁵ In the sub-continent, neuropathic and neuro- ischaemic ulcers are the two major types of diabetic ulcers, as the prevalence of symmetrical polyneuropathy is common⁶; on the contrary pure ischaemic ulcers are very rare⁶⁻⁷.

With the aim to have a local data on this pathology we conducted a Prospective study at Baqai Institute

of Diabetology and Endocrinology to diagnose and treat foot ulcerations early and thus to prevent amputations.

Patients and Method

This was a prospective cohort study. One hundred patients with diabetic foot lesions were seen at Baqai Institute of Diabetology and Endocrinology from January 6, 1997 to April 14, 1999. History of each patient was taken in detail on a proforma which included age, duration of diabetes, sign and symptoms, cause of ulcer, duration of ulcer, any previous treatment taken for the ulcer, previous history of foot ulcer and addiction including smoking.

The questionnaire was filled to assess the risk factors. Peripheral pulses of lower limbs i.e. femoral, popliteal, dorsalis pedis and posterior tibial were assessed for patency of circulation, in each patient by palpation and graded as (a) good volume, (b) diminished volume and (c) absent. Vibration sense was checked for neuropathies by 128Hz tuning fork, touch sensation or sensory neuropathy was assessed by using IOg monofilament which was applied perpendicularly to the feet buckling at the given force of log and the filament was pressed against several sites including the plantar aspects of the first toe, the first third and fifth metatarsal heads, the plantar surface of the heel and dorsum of the feet and filament was not applied to any callus sites and the response of the patients in both methods were categorised as:

a) Not feeling (absent), b) Vague feeling (diminished), c) Properly realising (normal)⁹. Each patient was also examined for the presence or absence of ankle and knee reflexes. Feet of each patient were examined for dryness of skin, deformity, callus formation and nail disorders. Fundal changes were assessed for retinopathies, after dilating the pupil with 1% mydriacil (tropicamide 1%) and examined by the examiner using Keeler fundoscope (Vista 20). BMI (Body Mass Index) was calculated after taking the weight of the patient in kilograms and dividing it by height of the patient in meter squares. The BMI was categorized in three grades. Under weight BMI <19, normal BMI between 19-25 and over-weight BMI >25. Blood pressure was assessed using sphygmomanometer (mercuric) and was graded as <135/85 mmHg - normotensive and >135/85 mmHg -hypertensive. Ischaemic heart disease was considered positive if the patient had previous history or positive symptoms. Proteinuria was detected by using Combur-10 test strips and confirmed by laboratory examination using 24 hours urinary protein estimation. Glycaemic control was assessed by measuring HbA_{1c} (glycosylated haemoglobin); upto 6.5 as Good, Between 6.6 - 7.5 as Fair and above 7.5 as Poor.

If HbA_{1c} could not be performed then monitoring of fasting and random blood sugar was done as Fasting Blood Sugar (FBS) upto 120 mg/dl as Good, between 121-140 mg/dl as Fair and above 140 mg/dl as Poor and Random Blood Sugar (RBS) upto 160 mg/dl as Good, between 160-180 mg/dl as Fair and Above 180 mg/dl as Poor. Use of antibiotics and other treatment modalities were recorded. All the foot ulcer patients were photographed at least once either at the start or during treatment. Finally outcome was assessed on the basis of complete healing, toe amputation; below knee amputation or whether they were still on treatment or lost contact.

Foot clinic is run jointly by Consultant Diabetologist, Plastic surgeon with special interest in diabetic foot, Associate Diabetologist and trainee Chiropodist.

Results

There were 65 males and 35 females. Age distribution showed that 12 % were less than 40 years of age, 69 % were between 40 to 60 years of age and 19% were more than 60 years of age. Duration of diabetes in 58% was greater than 10 years, 27% between 5 to 10 years and 15% was less than 5 years. Out of 100. patients only one patient was Type-I Diabetic. In 50% of patients previous history of foot ulceration was present. Thirty percent were either smokers or were addicted to tobacco. In all patients

there was lack of awareness about diabetic foot risk factors. Two percent were on diet and exercise alone, 50% were on oral hypoglycaemic agents at the time of development of foot ulceration, out of which 21% were put on, insulin for tight glycaemic control. In 70%, glycaemic control was poor, in 16% it was fair and in 15% it was good.

According to body mass index (BMI) 31% were overweight, 48% were normal weight and 5% were underweight, while in 16% weighing was not possible because of non-availability of weighing scale chair at the time. In 66% blood pressure was less than 135/85 and in 34% greater than 135/85. In 20% ischaemic heart disease was present and in 62% there was no other concomitant illness. In 37% proteinuria was present and in 37% fundal changes were present.

In 29% patients cause of ulceration was not known, in 14%, blisters/boils were the cause, in 17% trauma/cutting, in 11% burns were responsible (the site, cause and degree of burn are given in tables 1, 2, 3 respectively), in 10% dry skin/callus, in 16% foot wear, in 6% there were other miscellaneous causes like fungal infections, insect/animal bite etc. According to the site, in 44% toes were involved, in 18% sole/metatarsals, in 8% heel, in 5% kissing ulcers between the toes, in 8% malleoli were affected, while 17% had ulcers on other sites. In 43% right foot was involved, in 46% left foot and in 11% both feet were affected. On examination in 21%, sensation was intact, in 68% it was diminished and in 11% it was absent. In 42% peripheral pulses were of moderate volume, in 44% of small volume and were absent in 14%. The ulcers were neuro-ischaemic, 58% and neuropathic, 42% while no pure ischaemic ulcer was seen during this study.

Fifty eight percent patients required hospital admission when seen initially in Baqai Institute of Diabetology and Endocrinology (BIDE), 40% received single antibiotic and 60% combined antibiotic therapy. In 48% Intravenous antibiotics were used. In 33% no operative procedure was needed, in 46% patients debridement/desloughing was done, in 15% amputation of toes and in 6% leg amputation was carried out.

Fifty nine percent patients had complete healing of the wound without any residual deformity or amputation with pyodine dressings alone or debridement or desloughing along with pyodine dressing. In 15 patients toe amputation was done; 11% lost contact, 9% are still under treatment, 4 % had below knee amputations and two above knee amputation.

Discussion

The goals and objectives of our study were to diagnose and treat foot ulcerations and prevent amputation. Our study highlighted the fact that there was total lack of awareness about foot care in our diabetic population, worse than what other studies have shown⁷ This finding is very important as foot ulceration, particularly amputation is a preventable entity in many cases¹⁰. With adequate education, routine foot care and attention to foot wear¹⁰ incidence of ulcers and amputations can be reduced by 44-85%⁷. Hence foot care advice and knowledge about risk factors is very important for patients with diabetes.

The other important aspect is the glycaemic control and duration of diabetes in relation to foot ulceration. Eighty five of our patients were diabetic for greater than five years (since diagnosis) and seventy patients had poor glycaemic control. This has been shown in other studies also^{7,11,12}. Poor glucose control, duration of diabetes over ten years and male sex are also significant risk factors for foot ulceration¹¹ and risk of amputation increases 2 to 4 folds with both age and duration of diabetes⁷. Forty two of our patients had neuropathic ulcers and 58 patients had neuro-ischaemic ulcers. No pure ischaemic ulcer was seen during the study. This fact is supported by other studies, which shows that peripheral vascular disease is an infrequent event (5-7%) for ulcers or amputations⁷. Purely ischaemic foot with no concomitant neuropathy is rarely seen in diabetic patients⁸ Hence neuropathy is the major

precipitating factor for foot ulceration¹² Moreover, the prevalence of symmetrical polyneuropathy is common but the prevalence of peripheral vascular disease is generally low in Asian Indians⁶. Our finding still needs further evaluation with vascular assessment requiring dopplers and angiographies which were beyond the scope of this study.

Forty seven patients were insulin treated Type-11 diabetics because of poor control on oral hypoglycaemics. Only one was Type-I diabetic. There is increased prevalence of foot ulceration in males^{4,7,11,13} and according to one study male sex is associated with 1.6 times increased risk of ulcers and 2.8 to 6.5 fold higher risk of amputations⁷. This increased prevalence of foot ulceration in males is also seen in our study as 65 patients were male and of the 6 undergoing amputations, 4 were males and 2 females. The reason for increased risk for males has yet to be elucidated.

Thirty seven patients with foot ulceration had proteinuria and fundal changes. Other studies have shown this association of foot disease with other micro and macro vascular complications of diabetes^{7,12,14-16}. Vulnerability index for diabetics includes among others the presence of other complications of diabetes especially retinopathy, nephropathy and autonomic neuropathy⁷.

Twenty nine percent of our patients were unaware of the cause of the trauma. This finding differs from other studies, which quotes foot-wear trauma as the most frequent cause leading to ulceration and amputation⁷. This difference may be explained by severity of the neuropathy but more importantly due to lack of awareness and education about foot care. Thus foot care education is of utmost importance^{7,10,12} in preventing and managing foot ulcers.

Of the 58 patients requiring admission, 50 had a past history of foot ulceration. It is known that a previous history increases the risk for further lesions^{7,11,12,14-16}. Anti-microbials used were Augmentin (Co-Amoxiclav), Metronidazole, Quinolones and in cases of bone involvement, clindamycin as recommended by others^{17,18}. A particular combination for chronically infected ulcers according to this study is that of clindamycin and Ciprofloxacin. During follow-up, ulcers healed in 59 cases while fifteen underwent toe amputation. Amputation was done in 6 patients. nine were still on treatment, while eleven lost contact. Debridement and desloughing was done in forty six patients, while in 33 cases per year no operative procedure was required and pyodine dressing was used. In U.S.A lower extremity amputations are performed in diabetics at the rate of 8.6 per 1,000 patients per year¹⁹ and according to New-Castle study the incidence of non-traumatic lower extremity amputation was 5.7 per 1,000 per year²⁰, which showed that our rate of lower extremity amputation was much higher than other studies.

Acknowledgements

The authors are thankful to the staff members of Baqai Institute of Diabetology and Endocrinology for their co-operation and work during this study. Special thanks to Mr. Farrukh Muslim.

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