

DIABETIC FOOT LESIONS AND THEIR MANAGEMENT

Yousaf Haroun, *Irfan Shukr, *Ahmed Khan Choudhry, **Zakir Hussain

PNS Shifa Karachi, *CMH Rawalpindi, **CMH Abbotabad

ABSTRACT

Objective: To find out frequency of different types of diabetic foot lesions and different surgical procedures performed in our setup.

Study Design: The study is a comparative study analyzing the efficacy of various surgical options for the treatment of diabetic foot lesions.

Place and Duration of Study: The study was done at Combined Military Hospital Rawalpindi from July 2003 to July 2004.

Patients and Methods: A total of 75 patients admitted with diabetic foot lesions were assessed in detail, and the various surgical procedures performed. After admission, history, general physical examinations and examination of the feet were carried out for hygiene, ulcers, gangrene, infection, hair loss, trophic changes in the skin and nails. Sensory and motor assessment and complete neurological examination was done.

The patients were graded according to meggit wagner classification. Complete blood picture, serum blood glucose, urine for sugar and proteins, culture and sensitivity of pus, serum urea and creatinine and X-rays of foot in deep ulcer were done.

Results: Out of the 75 patients male patients were effected more partly because they are more prove to trauma and mechanical stress of life. Out of 75 patients, 57 (76%) were male and 18 (24%) were female patients. Bulk of the patients were admitted through OPD (26) and emergency (16) total 56%, while other were either referred, transferred from peripheral hospitals, physicians or from other wards. Twenty eight patients were on Inj Insulin and 35 were on oral hypoglycemic drugs. The most common infecting agents were staphylococcus (42 patients) and pseudomonas in 28 patients. In majority of the patient incising and drainage of the abscess (12 cases) and toe nail extraction/removal in 11 patients were carried out. The commonest duration of patients in hospital stay was 8-20 days.

Conclusion: The commonest lesion seen was infection and gangrene of the toes. Incision drainage, detriment and amputation of the toes were the common surgical procedures done. Most patients admitted for diabetic foot disease were in grade III and IV.

Keywords: Diabetic foot, Inj insulin, incision and drainage, and amputation.

INTRODUCTION

Diabetic patients who have poor glycemic control may suffer from foot ulceration. This complication has become more prevalent since advances in the general medical care of diabetes particularly the discovery of insulin has prolonged the life expectancy of patients with this disease [1]. A study revealed that 3% of total hospital admissions were of diabetic foot. Most of the patients were elderly males who presented with (Wagner classification) grade III and grade IV (61.7%) disease. Most of the microbial agents were Staphylococci, Pseudomonas and Streptococci [2]. Diabetic gangrene is due to underlying predisposing

factors and these factors are:

- Trophic changes resulting from peripheral neuritis.
- Atheroma of the arteries resulting in Ischemia;
- Excess of glucose or hyperglycemia in the tissues, which lower their resistance to infection including fungal infections [3].

Reduction of the modifiable risk factors, such as body mass index, hypertension, dyslipidemia, increased physical activity and good glycemic control may help to reduce the risk factors of diabetes and its chronic complications [4]. Lesser grade lesions responded well to conservative treatment with antibiotic and surgical debridment while those with higher grades needed amputations. Effective glycemic control,

Correspondence: Maj Yousaf Haroun, Garaded Surgical Specialist, PNS Shifa Karachi,
Received: 22 Sep 2007; Accepted: 29 Jan 2008

timely hospital admissions, appropriate surgical/medical treatment along with patient education in foot care could decrease the morbidity and mortality due to diabetic foot [5]. Twelve percent (12 %) of those above the age of 25 years in Pakistan suffer from diabetes and 10% have impaired glucose tolerance (IGT). The recent bulletin of the International Diabetes Federation on "Diabetes in Pakistan" mentions high prevalence of associated risk factors to the ailment in the country with obesity at the top [6]. Providing patient education and early diagnosis can prevent it. Early referral and prompt treatment are important in the management [7]. Non healing diabetic ulcers can be one of the most frustrating conditions. An ulcer is classified as non-healing, whenever there is no clinical improvement after four weeks of treatment. Poor foot protection and continuous mechanical stress are the important reasons of non-healing ulcer [8].

Objectives of the Study

- a. Frequency of different type of diabetic foot lesion.
- b. Different surgical procedures performed in our setup.

PATIENTS AND METHODS

- a. Setting: This study was conducted at the surgical department of Combined Military Hospital Rawalpindi.
- b. The study type is comparative study analyzing the efficacy of various surgical options for the treatment of diabetic foot lesions.
- c. Sampling: A total of 75 admitted cases of diabetic foot patients were assessed in detail, fulfilling the below mentioned inclusion and exclusion criteria. The study was started in July 2003 and continued till July 2004. (Till the completion of 75 diabetic foot cases).
- d. Sampling Technique: - Convenience (non probability) sampling.
- e. Inclusion Criteria: - Both type I and type 2 diabetics having developed diabetic foot ulcer were included in the study.

f. Exclusion Criteria

Patients with pre-existing conditions e.g. Carcinoma, Chronic Eczema, varicose ulcers and non-diabetic foot infections etc were excluded from the study.

Total of 75 patients were managed during this period. After admission, history was taken (that included the age, sex, occupation, history of the present illness, risk factors like trauma, Insulin or Non insulin dependent diabetes, type of diabetic control, rest pain, Claudication, neuropathies, smoking, alcoholism, past history of admission for diabetic foot and family history of diabetes etc. Examinations of the feet were carried out for hygiene, ulcers, gangrene, infections, hair loss, trophic changes in the skin and nails. For sensory and motor assessment complete neurological examination was done. Posterior tibial and dorsalis pedis arteries were palpated for vascular integrity; other clinical tests included capillary filling tests and buerger's test.

A thorough local examination of the feet of each patient was carried out and graded according to Meggit Wagner classification.

Grade O: High risk foot

Grade I: Superficial ulcer, skin deep

Grade II: deep ulcer involving soft tissue but no bony involvement

Grade III: Ulcer extending to and involvement of bones

Grade IV: Localized Gangrene (fore foot, heel, toe or heel)

Grade V: Gangrene of the entire foot

Complete blood picture, serum blood sugar, urine for sugar and proteins, culture and sensitivity of pus, serum urea and creatinine, x-rays chest, ECG for patient older than 40 years of age were carried out. Progress of disease control was monitored by serum blood glucose levels and urine sugar examinations. X-rays of foot in deep ulcers were done to detect the osteomyelitis. On admission, all previous treatments were stopped. Pus samples were taken for culture and sensitivity and broad spectrum antibiotics were started and were changed

according to the pus culture and sensitivity reports. All patients were given Inj insulin according to the sliding scale of blood sugar level, X-rays for bony involvement were taken. The treatment strategies for these patients included antibiotics and dressings, wound debridement/dressings, incision and drainage, nail removal, toe and ray amputations, mid tarsal amputation, some amputation below and above knee amputation, surgical debridements were started on the day of admission and carried out during the admission if necessary. Dressings were performed regularly. Amputations if indicated were performed through healthy tissues without using a tourniquet. Stump care and pain relief was given the highest priority. For amputations, the presence or absence of the following risk factors were assessed.

- Wound infection and systemic sepsis / toxicity
- Control of diabetes
- Neuropathy
- Angiopathy

Foot and stump exercises, patient education as well as other rehabilitation measures were also taken for patients who suffered major amputations. Hospital stay of each patient was recorded and follow up Proforma (daily prepared) was given to all the patients.

RESULTS

Male patients were affected more partly because they are more prone to trauma and mechanical stresses of life. Out of 75 patients 57 were (76%) males and 18 (24%) were females. Out of these patients 52 (69 %) were in the age range of 51 to 70 years. One male patient was of the age of 83 years.

Bulk of patients were admitted through the OPD (26) and emergency (16) (total 56%) while the rest were either transferred or referred to from the peripheral hospitals, physicians or from other wards.

Few of these patients were already on insulin prior to admission while the rest were

either on an oral hypoglycemic agent, diet or were undiagnosed before the admission and were diagnosed while being investigated for foot lesions (Table. 1). However, all patients were given inj insulin to control their diabetes and the other anti diabetic drugs were stopped. For the control of diabetes, they were however referred to the medical specialist at the time of being sent home.

Out of 75 % patients all the wound were infected at one or the other time. Culture reports of 39 patients showed mixed bacterial growth, while 36 patients had isolated culture reports. In 6 cases, the culture reports revealed three pathogens. The most commonly involved organism was staphylococcus (56% cases) (Table. 2).

At admission the wounds were thoroughly examined and classified according to meggit wagner classification (Table. 3).

Thus most patients admitted for diabetic foot disease were in grade III and IV collectively constituting 50%. These patient had various foot lesions, abscess of foot and gangrene of toe was the commonest.

For these various lesions various surgical modalities were applied, only few patients needed debridement and E.U.A more than one time and at least 4 patients had two amputations as a result of the less aggressive approach to preserve more of the tissue which ultimately led either to practically necrosed stump or presence of bone's osteomyelitis which necessitates further amputations. Majority of patients needed incisions drainage abscess or toe nail extraction / removal.

According to culture sensitivity (CS) commonest antibiotics used were clindamycin and flouroquinolones.

The commonest duration of patients in hospital stay were 8-20 days. One patient stayed more than 90 days. Two patients died during the hospital stay, one of these patients had chest pain. His E.C.G and cardiac enzymes showed myocardial infarction (MI) along with ventricular fibrillation. The other died because of septicemia, disseminated intravascular clotting (DIC) and shock. The one patient who remained admitted for more

Table-1: Pre admission status of the disease control

| Made of treatment | Male | Female | Total | % |
|------------------------------|-----------|-----------|-----------|------------|
| On insulin | 21 | 7 | 28 | 37 |
| On oral hypoglycemic drugs | 27 | 8 | 35 | 47 |
| On diet control only | 2 | 1 | 3 | 4 |
| Undiagnosed before admission | 7 | 2 | 9 | 12 |
| Total | 57 | 18 | 75 | 100 |

Table-2: Frequencies of involved organisms

| Infecting Agents | No of case | % |
|------------------|------------|----|
| Staphylococcus | 42 | 56 |
| Streptococci | 26 | 35 |
| Pseudomonas | 28 | 37 |
| Proteus | 21 | 28 |
| E-Coli | 18 | 24 |
| Bacteroides | 14 | 19 |
| Klebsillae | 10 | 13 |
| Miscellaneous | 8 | 11 |
| Salmonellae | 3 | 4 |

Table-3: Grades of wound according to Meggit Wagner classification

| Grade | Male | Female | Total | % |
|--------------|-----------|-----------|-----------|------------|
| Grade o | 0 | 0 | 0 | 0 |
| Grade I | 8 | 3 | 11 | 15 |
| Grade II | 11 | 5 | 16 | 21 |
| Grade III | 20 | 5 | 25 | 35 |
| Grade IV | 16 | 4 | 20 | 27 |
| Grade V | 2 | 1 | 3 | 4 |
| Total | 57 | 18 | 75 | 100 |

Table-4: Various applied surgical procedures

| Surgical procedures | Male | Female | Total | % |
|---|-----------|-----------|-----------|------------|
| Mild debridement + dressing antibiotics | 6 | 2 | 8 | 11 |
| Incisions drainage & curettage | 8 | 4 | 12 | 16 |
| Toe Nail extraction removal | 8 | 3 | 11 | 15 |
| Toe amputation/Ray Amputation | 7 | 2 | 9 | 12 |
| Mid tarsal amputation | 8 | 2 | 10 | 13 |
| Skin grafting | 9 | 2 | 11 | 15 |
| Syme's amputation | 3 | 1 | 4 | 5 |
| Below knee amputation | 7 | 2 | 9 | 12 |
| Above knee amputation | 1 | 0 | 1 | 1 |
| Total | 57 | 18 | 75 | 100 |

than 3 months recovered completely with conservative treatment, debridement curretages, serial dressings and pro-granulating agents. He was taken to operation theatre (OT) thrice for Amputation but was reluctant and at the operation table, he refused to be operated upon. Currently he is leading a normal life with a slightly modified life style.

DISCUSSION

Diabetes mellitus can be defined as a syndrome of abnormal carbohydrate metabolism, resulting in hyperglycemia, with acute metabolic complications and chronic vascular, neurogenic and orthopaedic complications affecting many organs of the body. Lack of proper control of infections in diabetic ulcers may end up with major amputations, inspite of proper debridement surgical complications of diabetes mellitus include abscesses, cellulitis and gangrene of the foot and osteomyelitis. Foot lesions occur commonly among patients with diabetes, particularly the elderly and those with associated ailment like cardiac failure, renal failure ect [9]. Treatment options of diabetic foot at Mayo hospital ref No. 1. Because of the serious or recurrent infections and impaired healing process, even the trivial lesions may

progress to chronic non healing wounds, gangrene (dry or wet) or infections ending in amputation [10]. (2-3 treatment option of diabetic foot at Mayo hospital). The pathophysiology of diabetic foot ulceration is multi factorial. The interaction of diffuse sensorimotor neuropathy, abnormality in capillary blood flow (secondary to hematological disturbances) the diabetic patients have an increased propensity for

infections and infra popliteal arterial occlusive disease in the lower extremity. The best described the pathogenesis. The "malerforans" is the usual mode of patient presentation, although cellulitis with or without plantar abscess formation may occur in a significant number, osteomyelitis, charcot's deformities, Achilles' tendon contractures and the sequelae of generalized atherosclerosis may further complicate the management of these patients. The trend in the management of these diabetic patients with foot disease has shifted during the past two decades from primary (below knee amputation) to limb salvage technique using a multi speciality approach although indications for primary amputation exist (e.g systemic sepsis, significant co morbid factors, poor patient compliance and non reconstructable peripheral vascular disease) [11]. Once a lesion has developed, the infection plays an important role in determining its outcome, whether the primary etiology is neuropathic, ischemic or a combination of the two. There are several reasons for an increased propensity to infection in the diabetics. These include intrinsic abnormalities of the immune system with deficiencies in the cell mediated immunity, impaired leucocyte chemostaxis, phagocytosis, intra cellular bacterial activity and opsonization [1].

CONCLUSION

The commonest lesion seen was cellulitis, abscess and gangrene of toe. Incision

drainage, debridment and amputation of toe was the commonest surgical procedure done. Most patients admitted for diabetic foot disease were in grade III and IV.

REFERENCES

1. Cuscheri SA, Steele RTC, Moosa RA. Diabetic foot disease In: Essential surgical practice, 4th London Oxford University Press, 2002: 785-95.
2. Jamil M, Amin Z, Chaudry TH, Shaheen J, Alvi ZR. Management of diabetic foot infections. J Coll Physicians Surg Pak 2001; 11: 606-10.
3. Russel RCG, William NS, Bulstraode CJK. Diabetic gangrene In Russel RCG, william NS, Bulstraode CJK Bailey and love's short practice of surgery, 24th ed, London: Arnold, UK. 2004: 219 - 20.
4. Chang C, LU F, Yang YC, Wu TJ, Chen MS. Epidemiologic study of type 2 diabetes in Taiwan. Diabetes Res Clin Pract. 2000; 50 (suppl 2): 49-59.
5. Muqin RU, Ahmed M, Griffin S. Evaluation and management of diabetic foot according to wagner's classification. A study of 100 cases. J Ayub Med Coll Abbottabad. 2003; 15: 3: 39-42.
6. Mughal MA, Ahmed S, Akhund IA, Maheri WM, Jan M. The effects of metformin on fasting blood glucose, blood pressure, serum lipid, lipoprotine and body weight in type 2 diabetes. J Coll Phy Surg Pak. 2000; 10: 40-53.
7. Ghazanfar A, Rehman M, Chaudery S, Nasir SM, Khan SA, Ahmed W. Amputations after diabetic foot infection, the cost of neglect. Ann Med Coll. 2002; 8: 4: 255-8.
8. Ghaffar A, Ahmed I. Treatment of non healing diabetic foot ulcer. Pak Armed Forces Med J. 2002; 25: 1: 17 - 20.
9. Burgers EM, Rommano RL, Zettle JH, Shrock RD Jr. Amputation of the leg for peripheral vascular in sufficiency j Bone Joint Surg. 1971; 53A: 874-99.
10. Collin J: Avoiding amputation. BMJ. 1992; 304: 856-7.
11. Water R, perry J, Antonells D, energy cost of walking of amputees, the influence of the level of amputation, J bone joint surg 8A: 42, 1986.