Treatment Options of Diabetic Foot - Experience at Mayo Hospital, Lahore

Y MUHAMMAD K RAFIQ A R GORAYA S AKHTAR M AHMAD A M CHAUDHRY
Department of Surgery, King Edward Medical College/Mayo Hospital, Lahore
Correspondence to Dr. Yar Muhammad

This study was carried out in North Surgical Unit, Mayo Hospital, Lahore, including 170 patients over a period of five years.. Different types of lesions include plantar infections, infections on dorsum of foot, cellulitis of foot, paronychia, web space abscess, osteomyelitis of the phalanges, septic fore foot gangrene, whole foot involvement and gas gangrene of foot. The control of diabetes should be achieved by insulin and monitored by serial blood glucose estimations. The principles of treatment are generous incision, wound debridement and careful gentle excision of necrotic tissue along with appropriate antibiotics and proper dressings. Various treatment modalities of treatment offered to these patients were only antibiotics, wound debridement, incision drainage & curettage of abscess, nail extraction and amputation at different levels. If possible, amputations should be avoided by good debridements but once the amputation is needed, it should be planned to be performed once and through the healthy tissue. Physicians should be involved in treatment and also early referral of infected lesions to surgeons at an early stage. Moreover, the education of patient to prevent such lesions is of utmost importance.

Key words: Diabetic foot, wound debridement, amputation

Diabetes mellitus is a clinical syndrome affecting carbohydrate, fat and protein metabolism and is characterized by absolute or relative deficiency of insulin.

Surgical complications of diabetes mellitus include abscesses, cellulitis and gangrene of the foot and osteomyelitis. Foot lesions occur commonly among the patients with diabetes, particularly the elderly and those with associated ailment like cardiac failure, renal failure etc[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[2,3]. It is evident that diabetes mellitus causes excessive morbidity and mortality as a consequence of foot problems. Pathogenesis of foot lesions is multifactorial[5] and these are

1. Angiopathy – both micro and macro
2. Neuropathy – sensory, motor and autonomic
3. Impaired immune response
4. Raised blood glucose level

One or more of these factors not only produce the lesions commonly diabetic patients but also impair the healing process. As the diabetic patients are susceptible to slow/impaired healing of foot lesions, so even the minor lesions may end in amputations. Once amputation in one limb has occurred, the prognosis of contralateral limbs becomes poor[8].

A staged, logical protocol must be observed while treating these patients. The major principles of diabetic foot management include blood glucose control, controlling the sepsis by appropriate antibiotics and local wound care by wound debridement or amputation. The biological amputation level (the most distal functional amputation level with reasonable potential to heal) is determined by vascular inflow, tissue nutrition and immunocompetence.- There are certain treatment options available to improve the circulation, but the treatment of neuropathy is usually palliative[10].. Using proper dressings, treating local oedema, restricting ambulation, educating the patients and using protective foot wears are also important.

The microbiology of soft tissue and bony infections is determined by culture and sensitivity of the tissue. Initially empirical antibiotic therapy is started and once the culture and sensitivity results are available, therapy should be targeted towards specific pathogens[7,15].

Material and Methods

This study was conducted on 170 patients admitted in North Surgical Unit of Mayo Hospital, Lahore during 5 years from July 1996 to June 2000 including 122 males and 58 females. All age groups of patients were included except the paediatric group. These patients were admitted through emergency, OPD or shifted from medical units. All the patients were assessed clinically, investigated and entered on a proforma prepared for this purpose.

A detailed history was taken and a thorough physical examination performed. This included age, sex, symptoms and events leading to diabetic foot, history of diabetes mellitus, and control by diet, oral hypoglycaemics or insulin and vascular and neurlogical status of foot. Serial blood sugar, urine sugar, urine ketones were done in all the patients. X-ray foot both anteroposterior and lateral views along with culture sensitivity of any dishcarge were also carried out.

All the previous treatment of diabetes was stopped and insulin therapy was started and continued postoperatively. Intravenous line was maintained with normal saline or 5% Dextrose water with 16 units of plain insulin. Blood sugar levels were monitored regularly and patients were closely watched for hypoglycaemia or

hyperglycaemia. Empirical antibiotics were started and after the report of culture & sensitivity the antibiotics were adjusted accordingly. The foot lesions in these diabetic patients include cellulitis of the foot, paronychia, web space abscess, infection on the dorsal and plantar surfaces, osteomyelitis and gas gangrene. The treatment modalities offered to these patients included antibiotics only, wound debridement, incision drainage and curettage, nail extraction, ray amputation, midtarsal amputation, Symes amputation, below and above knee amputation.

After initial management,. proper and generous debridement of the necrotic tissue was performed. All the tissue planes were opened so that pus was freely evacuated. Wound toilet was performed with hydrogen peroxide and normal saline. Where primary amputations were inevitable they were performed well into the healthy tissue.

Daily soakage of the diabetic feet for half an hour in the warm water mixed with Povidone iodine was performed in the ward.. For wounds containing slough and necrotic tissue papaya dressing was used. Serial dressings of the wound were performed in the ward.

At the time of discharge patients were given instructions regarding foot care, diabetes mellitus control and dietary habits..

Table 1 Mode of presentation

Type and extent of lesion	Male	Female	Total	%age
Cellulitis of foot	7	3	10	5.9
Paronychia	5	2	7	4.12
Web space abscess	9	3	12	7.05
Planter infections (Abscess)	22	15	37	21.77
Infections on dorsum of foot	18	10	28	16.47
Forefoot gangrene	25	9	24	14.12
Whole foot gangrene	20	8	28	16.47
Osteomyelitis of the phalynges	15	5	20	11.8
Gas gangrene	11	3	14	8.24

Results

Out of all patients admitted, the foot lesions were plantar infection (21.77%), infections on dorsum of foot (16.47%), forefoot gangrene (14.12%), cellulitis of foot (5.8%), paronychia (4.12%), web space abscess (7.05%), whole foot involvement (16.47%), osteomyelitis of bones of foot (11.8%) and gas gangrene (8.24%). (Table 1). Out of all these patients 34 (20%) patients had diabetic nephropathy and 28 (16.5%) patients had retinopanthy.

The treatment options offered these patients include antibiotics rest and elevation (6.47%), wound debridement (16.48%), incision drainage & curettage (20%), ray amputation (22.37%), midtarsal amputation (11.8%), below knee amputation (15.88%), above knee amputation (8.14%), extraction of nail (3.5%) and Symes amputation (1.18%) (Table 2). Symes amputation was done only in those patients who were not willing for below knee amputation. Thirty one patients were operated twice and 12 patients thrice. In patients with gas gangrene the wound was left open and secondarily closed after 7-10 days. All the patients with gas gangrene underwent above knee amputation.

Table 2. Various treatment options

Type of treatment	Male	Female	Total	%age
Antibiotics only	8	3	11	6.47
Wound debridement	17	11	28	16.47
Incision drainageand curretage	22	12	34	20
Nail extraction	4	2	6	3.5
Ray amputation	26	12	38	22.35
Midtarsal amputation	14	6	20	11.8
Syme's amputation	1	1	2	1.18
Below knee amputation	18	9	27	15.88
Above knee amputation	12	2	14	8.24

Discussion

In the treatment of diabetic foot, it is important that the patient must have a complete initial assessment and laboratory evaluations. The diabetes should be well controlled by insulin. The goal of blood sugar control should be avoidance of hyperglycaemia and keratosis as well as hypoglycaemia[9,11].

Only a few patients are treated non-operatively, only by antibiotics, rest and elevation. Other need surgery in the form of incision drainage and curettage. Removal of nail, amputation at appropriate level i.e., ray amputation, below knee amputation etc. The patients undergoing surgery are given general anaesthesia or regional or local anaesthesia as the case may be. Local anaesthesia is best avoided because it is less effective in presence of infection and it also spreads the infection through the injection site[13]. All the necrotic tissue should be removed. The tissue planes should be opened as they are a potential source of infection. Failure to treat these infections properly may lead to spread of the infection proximally and the patient may end up in below/above knee amputation. Thorough wound toilet, is performed with hydrogen peroxide and normal saline.

Out of 170 patients, in 107 cases the amputations at different levels had to be performed. Out of all the amputations, about 2/3rd amputee are diabetics[7,16]. About 6-15% of all diabetic patients have an amputation at some level at some point in their life[13]. Risk of limb loss is increased 6-8 folds in these patients[12]. In those cases where amputation has to be carried out, it should be through healthy tissue. In this way, serial amputation can be avoided which are the result of amputations carried out

through unhealthy tissue. Physiotherapy, early mobilisation on crutches and well fitting prosthesis are provided to patients in whom amputations are performed..

Physician should be involved in the treatment of diabetic foot lesions. Prevention of the such lesions is of utmost importance. Education and training of the patient regarding foot care and other aspect of diabetic complications should be done.

References

1. Burgers EM, Romano RL, Zettle JH and Shrock RD Jr: Amputation of the leg for peripheral vascular insufficiency. J Bone Joint Surg., 1971;53A:874-890.
2. Byrne RL, Nicholson ML, Woolford TJ et al: Factors influencing the healing of distal amputations performed for lower limb ischaemia. Br J Surg 1992, Vol.79; January, 73-75.
3. Collin J: Avoiding amputation. BMJ April 1992, 304:pp:856-857.
4. Dudley HAF. Infections of the hand and foot in Hamilaton Baileys Emergency Surgery; Bristal Johna Wright and Sons Ltd. 1986; 11th Ed. 668-675.
5. Dyck PJ, Karnes JL, O'Brein P et al: Fiber loss is primary and multifocal in sural nerves in diabetic polyneuropathy suggests ischaemia: Ann. A Neurol 1986:19:pp:440-449.
6. Ellenberg M: Diabetic Foot. N.Y. State J. Med 1973;73:2778-2781.
7. Feingold DS: The diagnosis and treatment of gangrenous and crepitant cellulitis. In remington JS, Swartz MN (eds):Current Clinical Topics in Infectious Diseases, New York, McGraw Hill, 1981; Vol.2:259-277.
8. Fierer et al: The fetid foot. Lower extremity infections in patients with diabetes mellitus. Rev. Infect Dis 1979; 1:210-217
9. Galloway JA: Chemistry and Clinical use of insulin in diabetes mellitus. Indianapolis Indiana. Eli Lilly and Co. Lilly Corporate Centre, 1988; 9th Ed.:105-138.
10. Green D.A., Sima A.A.F, Pfeifer M.A.: Neuropathy. In prevention and treatment of diabetic late complication. Vol.2, Mogenson C.E., Standle E (Eds.)Walter de. Gruyter Berlin, New Yorka, 1989, 1st ed:110-112.
11. Khan N: Control of Diabetes Mellitus, Specialist, Oct-Dec. 1985; 2(4):19-30.
12. Khan O: The incidence and significance of gas gangrene in a diabetic population. Angiology 1974;23:462-466.
13. Mooney V and Nickel VL: Rationale for amputee surgery in the diabetic extremity. Paper presented at Canadian Orthopaedic Association Meeting June, 1971.
14. Robson MC, Edstrom LE: The diabetic foot, an alternative approach to major amputation. Surg. Clin. North Am. 1977;57:1089-110.
15. Stone HH, Martin JD Jr: Synergistic necrotizing cellulitis. Ann Surg. 1971;175:702-711.
16. Weinstein L, Barza MA: Gas Gangrene. N Eng. J Med 1973;289:1129-1131..