

Experience of Various Management Strategies for Diabetic Foot Lesion at Mayo Hospital, Lahore

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Diabetic patients who have poor glycaemic control may suffer from foot ulcerations. This complication has become more since the advances in the general medical care of diabetes particularly the discovery of insulin has prolonged the life expectancy of patients with this disease. A study revealed that 3% of total hospital admissions were of diabetic foot. Most patients were elderly males who presented with (Wagner classification) grade III and grade IV (61.7%) disease. Most microbial agents were Staphylococci, Pseudomonas and Streptococci. Diabetic gangrene is due to the underlying predisposing factors such as trophic changes resulting from the peripheral neuritis, atheroma of the arteries resulting in ischemia, excess of sugar in tissues which lower their resistance to infection including fungal infections. This study is based upon the experience of different management options for diabetic foot lesions at Mayo Hospital.

Key words: Ischaemia, peripheral neuritis, debridement, amputation

Diabetic patients who have poor glycemic control may suffer from foot ulcerations. This complication has become more prevalent since the advances in the general medical care of diabetes particularly the discovery of insulin has prolonged the life expectancy of patients with this disease¹. A study revealed that 3% of total hospital admissions were of diabetic foot. Most patients were elderly males who presented with grade III and grade IV (61.7%) disease. Most microbial agents were staphylococci, pseudomonas and streptococci². Diabetic gangrene is due to the underlying predisposing factors and which are as follows:

- Trophic changes resulting from peripheral neuritis.
- Atheroma of the arteries resulting in ischaemia.
- Excess of sugar in the tissues, which lowers their resistance to infection including fungal infections³.

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 complications⁴. Lesser grade lesions responded well to conservative treatment with antibiotics and surgical debridement while those with higher grades needed amputations. Effective glycemic control, timely hospital admissions, appropriate surgical/medical treatment along with patient education in foot care could decrease the morbidity and mortality due to diabetic foot⁵. Twelve percent of all people above age of 25 years in Pakistan suffer from diabetes and 10% have impaired glucose tolerance (IGT). The recent bulleting of the International Diabetes Federation "Diabetes in Pakistan" mentions high prevalence of associated risk factors to the ailment in the country with obesity at the top⁶. Providing patient education and early diagnosis can prevent it. Early referral and prompt treatment are important in the management⁷. 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 ulcers⁸.

Objectives of the study

- To compare the results and efficacy of various treatment options/strategies.
- To identify the factors which lead to recovery.

Material and Methods:-

- Settings:-** This study was conducted at the North Surgical Ward Mayo Hospital Lahore.
- The study type of comparative study analyzing the efficacy of various surgical options for the treatment of diabetic foot lesions.
- Sampling:-** A total No 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.
- Sampling Technique:-** Convenience (non probability) sampling.
- Inclusion Criteria:-** Both type 1 and type 2 diabetics having developed diabetic foot ulcer were included in the study.
- Exclusion Criteria:-**
 - Patients less than 12 years were excluded as they are treated in Pediatric Surgical Ward Mayo Hospital Lahore.
 - Patients with pre-existing condition e.g Carcinoma, Chronic eczema, varicose ulcers and non-diabetic foot infections etc were excluded from the study.
- Data collection Procedure:-** Detailed histories and clinical data were obtained and recorded in each group as per Proforma attached as annexure 'A'.

After admission, history was taken that included the age, sex, occupation, history of the present illness, risk factors like trauma, boils, insect bites, skin diseases, 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 the nail. 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 accordingly to the Meggit Wagner classification, as:

Grade O: High risk foot

Grade I: Superficial ulcer, skin deep

Grade II: deep ulcer involving soft issue 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.

Laboratory Investigations:

Complete blood pictures, serum blood sugar, urine for sugar and proteins, culture and sensitivity of pus, serum urea and creatinine, x-ray chest, ECG for patients older than 40 years of age were carried out. Progress of disease control was monitored by serum blood glucose level and urine sugar examinations. X-rays of foot with deep ulcers were taken to detect the osteomyelitis.

Management:

On the admission, all previous treatment was stopped. Pus samples were taken for culture and sensitivity and broad spectrum antibiotics were started and were changed accordingly 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, incisions 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.

Amputation if indicated were performed through healthy tissue without using a tourniquet. Stump care and pain relief was given the priority. For amputations, the presence or the absence of the following risk factors were assessed.

1. Wound infection and systemic sepsis/toxicity
2. Control of diabetes
3. Neuropathy
4. Angiopathy, the presence of posterior tibialis and dorsalis pedis artery. Foot and stump exercises, patient education as well as other rehabilitation measures

were also taken for patients who suffered major amputations. Hospitals stay of each patient was recorded and follow up proforma (duly prepared) was given to all the patients.

Results:

This study was performed at the north surgical department of Mayo Hospital Lahore from July 2003 to July 2004 in which 75 admitted patients of diabetic foot lesions were included. Male patients were affected more partly because they are more prone to trauma and mechanical stresses of life. Out of 75 patients 57 were (46%) 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 83 years of age.

Bulk of patient were admitted through the OPD (26) and emergency (16) total 56% while the rest were either transferred or referred 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 oral hypoglycemic agents, diet or were undiagnosed before admission and were diagnosed while being investigated for foot lesions.

Table 1 Types of Diabetes mellitus

Type	Male	Female	Total	%age
Type 1 DM IDDM	21	7	28	37
Type 2 DM Non IDDM	36	11	47	63
	57	18	75	100

However, all patients were given injection 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 discharge (being sent home).

Table 2 Pre admission status of the disease control

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

Pus was taken from all the superficial and deep wounds, ulcers of these patients revealed a variety of organisms. 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 3: Frequency of the involved organisms

Infected agents	n=	%age
Staphylococcus	42	56
Streptococci	26	35
Pseudomonas	28	37
Proteus	21	28
E-Coli	18	24
Bacteroides	14	19
Klebsiellae	10	13
Miscellaneous	8	11
Salmonellae	3	4

At admission the wounds were thoroughly examined and classified according to Meggit Wagner classification.

Table 4: Types of wounds according to Meggit Wagner classification

Grade	Male	Female	Total	%
Grade 0	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

Thus most patients admitted for diabetic foot diseases were in grade III and IV collectively constituting 50%. These patients had various foot lesions which also determined the appropriate strategies for their management.

Table 5 Various lesions recorded

Type of lesion	Male	Female	Total	%
Cellulitis of foot	6	2	8	11
Paronychia	4	2	6	8
Web space abscess	5	1	6	8
Plantar abscess	7	3	10	13
Abscess infection dorsum of foot	10	4	14	19
Toe gangrene	12	3	15	20
Foot gangrene	11	2	13	17
Wide spread foot & leg involvement	02	01	03	04
Total	57	18	75	100

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 osteomyelitis which necessitated further amputation.

These patients remained admitted to hospital for a variable period consuming a lot of manpower, hospital resources, bed occupancy and a potential source of cross infection to other patients admitted to the wards. The duration of hospital stay were shown in Table 6.

Table 6: Different management strategies for diabetic foot patients.

Surgical procedure applied	Male	Female	Total	%
Mild debridement + dressing antibiotics	6	2	8	11
Incision 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

Table 7 Duration of hospital stay

Duration	Total	%
1-7 Days	13	17
8-20	21	28
21-30	11	15
31-45	16	21
46-60	10	13
61-90	3	4
More than 90 days	1	1

Mortality

2 patients died during the hospital stay. One of the following had chest pain. His E.C.G and cardiac enzymes showed M.I along with ventricular fibrillation. The other died because of septicemia, DIC and shock. The one patient who remained admitted for more than 03 months recovered completely with conservative treatment, debridement curettages, serial dressings and pro-granulating agents. He was taken to O.T thrice for Amputation but was reluctant and at the operation table, he refused to be operated upon. Currently he is leading 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 in spite of proper debridement. Surgical complications of diabetes mellitus include abscesses, cellulites and gangrene of the foot and osteomyelitis. Foot lesions occur commonly among patients with diabetes, particularly the elderly and those

with associated ailments like cardiac failure, renal failure. 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, (2-3 treatment options of diabetic foot at Mayo Hospital). The pathophysiology of diabetic foot ulceration is multifactorial. The interaction of diffuse sensory motor neuropathy, abnormality in capillary blood flow (secondary to hematological disturbances) the diabetic patients have increased propensity for infections and infra popliteal arteries occlusive disease in the lower extremity. The best described pathogenesis. The "maleroforans" is the usual mode of patient presentation, although cellulites 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, Major tissue loss, significant co morbid factor, poor patient compliance and non reconstructable peripheral vasculature disease). Once a lesion has developed the infection, it 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 diabetes. These include intrinsic abnormalities of the immune system with deficiencies in the cell mediated immunity, impaired leucocyte chemotaxis, phagocytosis, intra cellular bacterial activity and opsonization.

Conclusion:

Diabetes Mellitus has become a common medical problem in underdeveloped countries with considerable morbidity. Reduction of the modifiable risk factors, such as body mass index, hypertension, dyslipidemia, increased physical activity and good glycaemic control may help to reduce the risk factors of diabetes and its chronic complications.

Measures to control infection include strict sterilization of equipment, regular aseptic dressing, culture and sensitivity of discharges and administration of effective antibiotics. Lesser grade lesions responded well to

conservative treatment with antibiotics and surgical debridement while those with higher grades needed amputations. Effective glycaemic control, timely hospital admission, appropriate surgical/medical treatment along with patient education in foot care could decrease the morbidity and mortality due to diabetic foot.

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