



## DIABETIC FOOT ULCER; SEQUELAE

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## INTRODUCTION

Diabetic foot management is one of the major part of work load for a general surgeon. Its management is a challenge for medical professionals. Community medicine physicians are also playing role to prevent and mitigate the sufferings of patients with diabetes. Morbidity, mortality<sup>2</sup> and compromise in quality of life associated with the disease is alarming.

A trivial ulcer is often the forerunner of diabetic foot which in its due course may cost part or whole of lower limb. It acts as a gateway for invasion of bacteria. If diabetes is not well controlled and bacterial entry is not combated, infection can spread to deeper tissues, including bone.<sup>3</sup> A diabetic foot infection may be cause of almost two third of total non-traumatic lower limb amputations even in the developed world.<sup>3</sup> To avoid this, all clinicians who see such patients should be able to handle this potentially devastating problem.<sup>3</sup>

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**ABSTRACT... Objective:** The number of diabetic patients is increasing at a rapid rate<sup>1</sup>. Management of diabetic foot has been a challenge for medical professionals. This study was carried out to find the sequelae of diabetic foot ulcer management. **Study design:** Observational analytical study. **Setting:** Military Hospital, Combined Military Hospitals Rawalpindi and MIMC teaching Hospital, Mirpur (AJK). **Period:** Sep 2009 to August 2013. **Materials and methods:** Total 310 patients were included in this study as outdoor and indoor cases. Out of these 184 were males and 126 were females. Age affected ranged from 20 years to 90 years. Average age was 50 years. Wagner's grading for diabetic foot ulcer was used as guideline for management. **Results:** Hyperglycemia was controlled in consultation with physicians in all these patients. Out of these 310 patients 199 (64%) patients got their feet wounds healed on conservative management without amputation while 111 (35.8%) patients had to undergo some amputation at some level. **Conclusion:** Diabetes mellitus, fore runner of so many diseases requires multi-disciplinary approach. Well controlled diabetes mellitus, good feet hygiene, rational antibiotics in light of culture/sensitivity report and timely conservative or active surgical intervention produce good results in diabetic foot management.

**Key words:** Diabetic foot ulcer, infection, amputation

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Diabetic foot with gangrene is quite a common indication for below knee amputation all over the world. More than 50,000 lower extremity amputations are carried out annually in USA alone<sup>4</sup>. This trend continues to rise in spite of efforts for excellent control of hyperglycemia and limb salvage. Quality of life is miserable with diabetic foot ulcer and even more after amputations at any level. Patients with diabetic foot are twenty times more prone to undergo amputation than remaining population.<sup>5</sup> Good preventive measures early diagnosis and intervention pays a lot. Negligence on part of patient or treating doctor may ultimately result in limb loss. Foot infection is a serious medical problem and establishment of specialized diabetic foot clinics has been considered necessary in different studies to prevent further worsening of the foot disease and avoid amputations.<sup>6</sup>

Bone involvement may be present in approximately

20% of diabetic foot infections.<sup>7</sup> Timely imaging and radiological investigations like simple X-Ray and ultrasound of the affected part, CT scans, radio isotope bone scans and MRI may pick bone infection.<sup>7</sup>

Associated peripheral vascular disease in the patient makes the illness even worse making it chronic ischemic diabetic foot (CIDF) and due attention must be given to CIDF.<sup>1</sup>

## PATIENTS AND METHODS

This study included 310 patients with diabetic foot and was conducted in the departments of Surgery Military Hospital (MH) Rawalpindi, Combined Military Hospitals (MH) Rawalpindi and Mohi Ud Din Islamic Medical College Teaching Hospital, Mirpur (AJK) during a period of four years from Sep2009 to Aug 2013. These hospitals re tertiary care /referral hospitals. Most of the patients were entitled relatives of serving Armed Forces personnel and retired Armed Forces personnel themselves. Civilian non entitled patients reporting in CMH/MH were also included in this study.

After detailed history and clinical examination, following laboratory and radiological investigations were carried out in all patients. Blood complete picture, Blood sugar level (fasting and random), Phosphorylated hemoglobin (Hb1AC), Serum urea, creatinine, X-Rays affected foot and ankle AP/ Lateral view, X-Ray of tibia / fibula of affected side( if indicated), Doppler scan for arteries of the leg on affected side. Nerve conduction studies and electromyographic studies (NCS & EMG) were carried out in selected cases. The diagnosis of osteomyelitis was made on clinical grounds, obviously dead bone or on X-Ray findings.

Patients who had good control of hyperglycaemia on oral hypoglycaemics were continued on oral anti diabetics. Most of the patients had to be placed on Inj humulin for strict control of diabetes. Repeated wound dressings were done in each case with pyodine, hydrogen per oxide and at times, with duoderm. Initially empirical oral or injectable antibiotics were used but repeated culture sensitivity tests were also used for rational

antibiotic therapy. Repeated wound toilet, debridement, curettage or excision was done in most of the cases. Vaseline guaze/ Bactigras dressings were done for healthy diabetic ulcers. Amputations at various levels were decided according to individual case after counseling and written consent from the patient and his/her attendant.

## RESULTS

In this study out of total 310 patients 184(59.3%) were males and 126 (40.6%) were females with male to female ratio of 3:2. Age ranged from 20-90 years (average 52). Common age group was 5<sup>th</sup> and 6<sup>th</sup> decade of life. All foot ulcers were classified on the basis of Wagner's classification: Grade 1 were 80(50%) presented with foot ulcer, Grad 2 with cellulitis foot were 45(20%), grade 3 with small or big toe gangrene 15 ( 32%), Grade 4 with gangrene of foot and leg were 18 (20 %).

Wagner's Grade	Number	Percentage
Grade 0	Nil	
Grade 1	120	38.7
Grade 2	79	25.4
Grade 3	72	23.2
Grade 4	9	2.9
Grade 5	30	9.6

**Table-I.**

Neurovascular status of the limb was evaluated clinically and with the help of Doppler Scan and EMG/NCS.

Out of 310 diabetic foot lesions, wound debridement was done in all (100%) patients, incision, drainage, curettage with excision of necrotic bone only in 165 (53.5%) patients, single toe amputations in 54 (17.5%) patients, Big toe amputations in 14 (4.5%) patients, more than one toes amputations in 4 (1.2%) patients, transmetatarsal amputations in 3 (0.9%) patients, below knee amputation in 25 (8%) patients, Above knee amputations in 11 (3.5%) patients. Two of our patients died due to late consent for above knee amputation, septicaemia and multiorgan failure (Table II).

Procedure	No. of cases	%age
Wound debridement	310	100
Curettage/ drainage only	165	53.2
Excision of necrotic bone	31	10
Big toe amputations	14	4.5
Single toe amputations	54	17.4
Multiple toes amputations	4	1.2
Transmetatarsal amputations	3	0.9
Below knee amputations	25	8
Above knee amputations	11	3.54
Mortality	2	.6

**Table-II. Surgical treatment/levels of amputations in patients treated (n=310)**

In this study foot salvage was 64 %. Mortality rate in this study was 0.6%.

All patients were treated jointly by medical specialist, General Surgeon, orthopaedic surgeon, plastic surgeon and Rehabilitation medical specialist.

## DISCUSSION

Diabetic foot ulcer results in high degree of morbidity and mortality worldwide. Goal of treatment is and should be to restore the normal functioning foot. Loss of protective sensation combined with recurrent trauma is the primary mechanism of foot breakdown<sup>7</sup>. Unchecked infection following trivial trauma travels through tissue planes of the foot.

Various host factors and comorbidities play part in wounds closures and reconstruction. Core knowledge, expertise and skill of the treating/operating surgeon are tools for a successful closure.<sup>16</sup>

A significant number of amputations can be prevented by patients education, foot care, and increased awareness on the part of diabetic care teams, of effective strategies in ulcer management.<sup>8</sup>

Diabetic gangrene is related to three factors: trophic changes due to peripheral neuropathy, ischaemia as a result of atheroma, and low

resistance to infection because of excess sugar in the tissues.<sup>9</sup>

All diabetic foot lesions cannot successfully be treated conservatively. Quite a number of patients require amputation. Muqam et al in the study of 100 patients with diabetic foot reported 48 % total amputation rate.<sup>10</sup>

Goal is and should be to achieve ulcer healing without amputation. In one study median time to healing was six weeks with antibiotics treatment and seven weeks with surgery.<sup>13,14</sup>

In a study of 210 diabetic foot patients by Mivajima S et al 52 % patients required limb amputation<sup>11</sup>. Ghanassia E et al reported that in their study out of 94 diabetic patients, 39 (43%) patients underwent amputation, 24 major and 15 minor.

Diabetic foot infection are often associated with peripheral neuropathy, peripheral arterial disease, and chronic kidney disease (CKD).<sup>15</sup> Deep and thorough understanding of all the complications may prevent the spread of infection, major limb amputation and saving the life.

Offloading of the affected foot, control of microbes, correction of ischaemia and good wound care<sup>15</sup> is good systemic approach in management protocol.

In order to cover/correct various tissue defects plastic or reconstructive surgeon has to use various surgical closure techniques for a successful closure<sup>16</sup> to get fully or maximally functioning body part<sup>17</sup>. Plantar pressure magnitude and measurement location has been emphasized in a study by William R et al.<sup>18</sup>

Foot care practice has been found to be basic factor to prevent diabetic foot ulcer in India by Gopi Chellan et al.<sup>19</sup>

Different local and biologic therapies used in the management of DFUs have been proven effective in a recent study from North America.<sup>20</sup> Recently Sang Jin Lee et al have noticed that high serum

C-reactive protein level predicts mortality in patients with stage 3 chronic kidney disease or higher and diabetic foot infections.<sup>21</sup>

Most recently squamous cell carcinoma arising in a diabetic foot ulcer has been reported in one study.<sup>22</sup>

Our findings support the vigorous conservative management, especially as an initial measure. 64 % of our patients fared well with either soft tissues and bone debridement or partial amputation. In our study the patients with Wagner's grade 1 and 2 were cured completely; grade 3 patients treated by aggressive surgical resection with good results, whereas in grade 4 and 5 patients, conservative management failed and most of them ended up in a major amputation.

One local study reveals that slackness on part of patient, preventive health worker, diabetologist or surgeon will increase morbidity and mortality costing limb and jeopardizing life.

## CONCLUSION

We conclude that good foot hygiene, good control of diabetes, early debridement of foot ulcers and rational use of antibiotics in the light of culture/sensitivity report is associated with good outcome in diabetic foot disease. About one third of our patients underwent amputation at some level. Timely amputation at the level indicated by the degree of disease is also mandatory to save remaining limb and patient's life.

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PREVIOUS RELATED STUDY

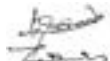
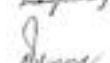
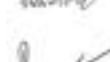
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