

# DIABETIC FOOT; SURGICAL MANAGEMENT

ORIGINAL  
PROF-1847

## DR. G. M. KHAN BALOCH, FCPS

Associate Prof. of Surgery,  
Nishtar Hospital, Multan

## DR. ASIM BHATTI

Postgraduate Trainee,  
Surgical Unit-I,  
Nishtar Hospital, Multan

## DR. KHALID HUSSAIN QURESHI, FCPS

Associate Prof. of Surgery,  
Nishtar Hospital, Multan

**ABSTRACT... Objective:** Diabetic foot is one of challenging diseases based on uncontrolled diabetes mellitus. The aim of this study was to evaluate the surgical management in diabetic foot patients presenting with different grades of infection. **Design:** Descriptive study. **Place and duration of study:** Surgical unit I, Department of Surgery at Nishtar Hospital Multan for a periods of two years from January 2009 to December 2010. **Patients and methods:** A total of 120 diabetic patients with different severity of foot infections who presented in causality and surgical outpatient department Nishtar Hospital Multan, where included in this study. Patients included in this study were above age of twelve years and were of both sexes. A detailed history was taken followed by the clinical examination. Routine investigations including complete blood examinations, complete urine examination, renal parameters, X-ray foot, CXR, ECG and pus for culture and sensitivity were recorded. Lesions were rated according to Wagner classification and appropriate medical and surgical treatment carried out. **Results:** This study was carried out on 120 diabetic patients, out of which ninety six (80.0%) were male and twenty four (20%) were female. Male to female ratio was 4:1. Majority of the patients (n=66) were between the age group of 50 to 60 years. In majority of these patients forefront was involved, mostly big or little toe. Patients were grouped into five grades according to the severity of infection. Twenty six (21.6%) patients were managed with antibiotics and dressings, thirteen (10.8%) patients needed debridement and skin grafting while eighty-one needed amputations of different types. Staphylococcus aureus was the commonest organism isolated. **Conclusions:** Majority of the diabetic foot lesions were in grade II to V. Lesser grade lesions responded well to conservative management with antibiotics, dressings and debridement. While those with higher grades needed amputations. Basic principles of management include early detection of diabetic foot, proper control of infection, control of diabetes mellitus and wound care. Delayed and improper treatment leads to osteomyelitis resulting in amputation and permanent disability of deformity

**Key words:** Diabetic foot disease, infection, complication

## INTRODUCTION

Diabetic foot is the most common and serious problem in diabetic patients<sup>1</sup>. Gangrenous foot infections have been described as early as 1000 A.D and diabetic foot infections are associated with substantial morbidity and mortality<sup>2</sup>. The lifetime risk of a foot ulcer for patients with diabetes (type 1 or 2) may be as high as 25 percent<sup>3</sup>. With the availability of insulin therapy since early 1900's, diabetes is no longer fatal disease and with the increased expectancy of life in diabetic patients long term complications have become more common. Most patients are older, but increasing number of young patients also develop diabetic foot ulcer and about one third of the patients are under 50 years of age<sup>4</sup>. Diabetic foot is most common complication of diabetes mellitus presenting for surgical management. Before the development of effective antibiotics the severity of diabetic foot infection almost always needed amputation regardless of peripheral circulation. Foot amputations may be required although many of these are preventable

with early recognition of complications and therapy<sup>5</sup>. A better understanding of pathophysiology of diabetic foot disease, development of new anti-microbial drugs and more sophisticated method of vascular diagnosis and reconstruction as well as better technique in wound care, have all resulted in higher rate of control of these infections together with a higher incidence of foot salvage. Most diabetic foot infections are polymicrobial, with up to five or seven different specific organisms involved. The microbiology of diabetic foot wounds is variable depending on the extent of involvement<sup>6</sup>. Diabetic foot infection is graded according to Maggit-Wenger classification<sup>7</sup>. Regarding the severity of infection at the time of presentation into six grades, (table I) and is managed accordingly ranging from simple wound debridement to amputation and rehabilitation. Antibiotics are given according to the culture and sensitivity reports. This study was performed to evaluate the outcome of surgical management of diabetic foot disease presenting with varying severity of infections.

## MATERIAL AND METHODS

This descriptive study was carried out in surgical unit I, Nishtar Hospital Multan for a period of Two years from Jan 2009 to Dec 2010. One hundred and twenty patients having long standing diabetes mellitus with foot complications presenting with different severity of infections, were included in this study. Fifty-six (46.6%) patients were admitted through casualty department due to septic lesion or gangrene of the foot while sixty-four (53.3%) patients were admitted through surgical out patient department. Data was collected by taking a detailed history and clinical examination. Description of the wound or ulcer on the foot was noted. These patients were thoroughly examined for any other systemic complication of diabetes mellitus and were investigated for any such problem. Investigations done included complete blood examination, complete urine examination, blood sugar profile, renal parameters, X-ray foot, CXR, ECG, Plain insulin was started according to the blood sugar level and urine sugar reports. Pus from the ulcer was sent for culture and sensitivity. Broad spectrum antibiotics were prescribed accordingly. Patients were evaluated and managed by grading their disease according to Wegner's classification, considering the severity of infection at the time of presentation. The management was planned according to the grade of infection. Surgical procedures carried out were debridement, incision drainage, skin grafting and amputations of different types. Postoperatively some patients needed repeated dressing and wound toilet. Patients were discharged with instructions for proper care of foot and toes. Patients requiring amputation were rehabilitated by physiotherapists. Data was collected and frequencies were compiled.

## RESULTS

In this study 120 patients with diabetes mellitus having foot infections were included. 96 patients (80%) were male, while 24 (20%) were female. Male to female ratio was 4:1. Majority of the patients (n=66) were between the age of 50 - 60 years. The age distribution of these patients is shown in table II. After thorough physical examination and investigations these patients were grouped into five grades according to Maggit-Wegner classification.

**Table-I. Maggit-Wegner classification of diabetic foot ulcer**

Grade of Ulcer	Characteristics
0	High risk foot with no ulceration
I	Skin involvement
II	Skin & soft tissue involvement
III	Skin, soft tissue and bone involvement
IV	Localized gangrene (forefoot, heel or toes)
V	Gangrene of entire foot

**Table-II. Age distribution (n=120)**

Age (in years)	No. of patients	%age
<40	09	7.51
40-50	34	28.3%
50-60	66	55%
Above 60	11	9.1%
Total	120	100%

Treatment strategy was planned according to grade of infection at the time of admission as shown in table III. 26 patients (21.6%) were having grade I infection, and were managed conservatively with debridement and dressing along with antibiotics. 13 patients (10.8%) having grade II disease were treated with debridement and skin grafting. While the main bulk of patients which is 81 (67.5%) needed amputation of different types as shown in table III.

Staphylococcus aureus was the most common organism isolated from the wound of 79 patients (65.8%). Other organisms isolated are shown in table IV. In most patients Clindamycin and Amoxicillin plus clavulenic acid were used as reported by culture and sensitivity reports. In patients with grade III and above I/V antibiotics therapy including quinolones or fusidic Acid were used.

In this study most common postoperative complication observed was wound infection in 35 patients (29.1%). 11 patients (9.1%) had stump dehiscence, 5 (4.1%) developed septicemia while 2 patients (1.6%) had gas

**Table-III. Surgical management of diabetic foot (n=120)**

Grade of ulcer	Management	%age	No. of patients
I	Debridement and non stick dressing	21.6	26
II	Debridement and skin grafting	10.8	13
III	Rays amputation	40.9	49
IV	Local radical surgery	8.3	10
V	Proximal amputation	18.3	22

**Table-IV. Organisms cultured (n=120)**

Infective agent	No. of patients	%age
Staphylococcus aureus	79	65.8
Pseudomonas aeruginosa	10	8.3
Proteus vulgaris	08	6.6
Others	23	19.1

**Table-V. Postoperative complications (n=120)**

Postoperative complication	No. of patients	%age
Wound infection	35	29.1
Septicemia	05	4.0
Gas gangrene	02	1.6
Stump dehiscence	11	9.1

gangrene as shown in table V. Average hospital stay in these patients was two weeks. All patients were advised follow-up for three months along with proper control of diabetic mellitus.

## DISCUSSION

Long standing diabetes mellitus leads to many multi-system complications. Foot ulcers develop in 20-30% of such patients<sup>8</sup>. as reported in a study conducted in U.S.A, one out of every four diabetic patient will develop some kind of foot problem during life time<sup>9</sup>. Diabetic foot infections can develop as a result of neuropathic or

ischemic ulcers, cracks, or defects in the skin of the foot or nail beds (paronychia)<sup>10</sup>. However in our population the major problem is gross infection in patients with diabetic foot. Major contributing factors for late presentation include bare foot gait, attempts at home surgery, trust in quacks and un skilled personals and undetected diabetes<sup>11</sup>. It is more common in males, which form 80% of our patients with diabetic foot and 20% female, with male to female ratio of 4:1. A study done by Munawar J showed that patients who develop foot ulcers are most frequently males having diabetic mellitus for long duration and usually have non palpable pedal pulses and reduced joint mobility<sup>12</sup>. In another local study 66.6% were male and 33.3% were female<sup>13</sup>. In our study 21.6% patients with superficial ulceration and erythema, 10.8% had deep ulceration with bad granulation tissue, 40.9% had osteomyelitis, 8.3% had gangrenous patches on pressure areas while 18.3% patients had gangrene of foot. In a local study common presentations were patients with ulcers 21% abscess in 31% and gangrene in 12.5%<sup>13</sup>. As patients come with advanced disease to surgeons so for this reason patients with grade III to V are in majority in our study.

Diabetic foot infection is usually polymicrobial in nature consisting of gram +ve and gram -ve aerobes as well as anaerobes. However the most common micro-organism isolated is Staphylococcus aureus followed by streptococcus and pseudomonas<sup>14</sup>. In this study Staphylococcus aureus was isolated from culture of pus in 65.8%, where as Staphylococcus aureus was isolated in 54% of cases in a study done by Zafar A<sup>13</sup>, Wounds with extensive local inflammation, necrosis, or gangrene with signs of systemic toxicity should be presumed to have anaerobic organisms in addition to the above pathogens. Potential pathogens include anaerobic streptococci, Bacteroides species, and Clostridium species<sup>15</sup>.

Depending upon extent of foot infection, lesions are graded into five groups as in Maggit-Wegner classification. For grade I and II disease broad spectrum antibiotics such as clindamycin along with gentamicin or amoxicillin plus clavulenic acid are usually prescribed for at least 2-4 weeks<sup>16</sup>, However ciprofloxacin and metronidazole have also been found useful. Superficial diabetic foot infections require local wound care

including relief of pressure on the ulcer, wound cleansing, and debridement of callus and necrotic tissue<sup>17</sup>. In our study 21.6% patients were treated with antibiotics and debridements. Fusidic Acid (Fucidin) 250 mg twice a day was used in our patients having long standing non healing superficial ulcers of the foot with good results. Patients having grade III grade V disease needed some form of amputations for their management and comprise a bulk of patients. In our study 76.5% patients were in these grades unlike other local study where only 36% needed amputations<sup>13</sup>. In our study 10.8% patients needed skin grafting. In our study 9.1 percent patients develop wound infection, 4% patients developed septicemia and 1.6% patients had gas gangrene.

Diabetic foot complications are the most common cause of non traumatic lower extremity amputations in the industrialized world. The risk of lower extremity amputation is 15 to 46 times higher in diabetic than in non diabetics<sup>18</sup>. Furthermore, foot complications are the most frequent reason for the hospitalization in patients with diabetes, accounting for up to 25 percent of all diabetic admissions in the United States and Great Britain. Repeated debridement and incision drainage of abscess along with wound toilet with hydrogen peroxide is needed frequently in such patients<sup>19</sup>.

## CONCLUSIONS

Diabetic foot infection being the most common complication of diabetic mellitus reporting to surgeons requires multi-disciplinary approach for its management. Effective control of infection and diabetes itself along with surgical procedures required according to grade of infection are the most important steps in management of such patients. Thorough and repeated examinations and necessary investigations to assess the grades of infection at the time of presentation are very essential. Some time there is underlying osteomyelitis of the foot bones in patients presenting only with small superficial ulcer. If not treated properly minor infection can get complicated into more grade of severity leading to deformity and disability. It is recommended that patient should be trained for care of foot and the prevention of infection at the time of discharge, and those having

amputation need rehabilitation. Prophylaxis and appropriate management of patients at risk of developing foot ulcers would contribute to reduce the number of amputations among diabetic patients.

Copyright© 20 Oct, 2011.

## REFERENCES

1. Boulton AJ, **The diabetic foot**. Surgery International 1995;37.
2. Caputo GM, Cavanagh PR, Ulbrecht JS, et al. **Assessment and management of foot disease in patients with diabetes**. N Engl J Med 1994; 331:854.
3. Boulton AJ, Armstrong DG, Albert SF, et al. **Comprehensive foot examination and risk assessment: a report of the task force of the foot care interest group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists**. Diabetes Care 2008; 31:1679.
4. Gottrup F. **Management of diabetic foot: surgical and organizational aspects**. Horm Metab Res. 2005 Apr;37 Suppl 1:69-75.
5. Pecoraro RE, Reiber GE, Burgess EM. **Pathways to diabetic limb amputation. Basis for prevention**. Diabetes Care 1990; 13:513.
6. Embil JM, Trepman E. **Microbiological evaluation of diabetic foot osteomyelitis**. Clin Infect Dis 2006; 42:63.
7. O'Neal, LW, Wagner, FW. **The Diabetic Foot**, Mosby, St Louis 1983. p.274.
8. Pham H, Armstrong DG, Harvey C, Harkes LB, Giurini JM. **A screening technique to identify people at high risk for diabetic foot ulceration: a prospective multicentre trial**. Diabetes care 2000;23(5):606-11.
9. Gerding DN, Piziak VK, Ronbotham JL. **Problems in diabetic foot care**. Patient care 1998;229(13):102-8.
10. Lipsky BA, Berendt AR, Deery HG, et al. **Diagnosis and treatment of diabetic foot infections**. Clin Infect Dis 2004; 39:885.
11. Andrew JM, Boulton, Vileikyte L. **Diabetic foot problems and their management around the world**. In Levin O Neals "The Diabetic Foot" 6th edition. Mosby, Inc. 2001;266.
12. Munawar J, Asghar a, Amin M. **Osteomyelitis of foot in**

- diabetic patients. J surg pak 2003;8(3):32-4.
13. Zafar A. **Management of diabetic foot-two year experience.** J Ayub Med Coll Abbottabad 2001;13(1):14-6.
  14. Sanderson PJ. **Infection of the foot with peptococcus magnus.** J Clin Pathol 1990;30:266-8.
  15. Urbancic-Rovan V, Gubina M. **Bacteria in superficial diabetic foot ulcers.** Diabet Med 2000; 17:814.
  16. Vau-der-Meer JW, Koopmans PP, Lutterman JA. **Antibiotic therapy in diabetic foot infection.** Diabet Med 1996; 13 suppl 1:48-51.
  17. Lipsky BA, Berendt AR, Deery HG, et al. **Diagnosis and treatment of diabetic foot infections.** Clin Infect Dis 2004; 39:885.
  18. Armstrong DG, Lavery LA, Quebedeaux TL. **Surgical morbidity and the risk of amputation due to infected puncture wounds in diabetic versus non diabetic adults.** South med J 1997;98:386-9.
  19. Diaman Poulors EJ, Haritos D, Vfandi G. **Management and outcome of severe diabetic foot infections.** Exp Clin Endocrinal Diabetes 1998;106:346-52.

Article received on: 21/09/2011

Accepted for Publication: 20/10/2011

Received after proof reading: 03/01/2012

**Correspondence Address:**

Dr. G. M. Khan Baloch  
Associate professor of Surgery,  
Surgical unit-I,  
Nishtar Medical College & Hospital, Multan  
fakhir421@gmail.com

**Article Citation:**

Baloch GM, Qureshi KH, Bhatti A. Diabetic foot; surgical management. Professional Med J Feb 2012;19(1): 006-010.

## PREVIOUS RELATED STUDIES

- Altaf Hussain Rathore, DIABETIC FOOT. (Editorial) Prof Med Jour 16(4) 472-474 Oct, Nov, Dec 2009.
- Haji Khan Khoharo, Shuaib Ansari, Fatima Qureshi. DIABETIC FOOT ULCERS (Original) Prof Med Jour 16(1) 49-53 an, Feb, Mar 2009.
- Johar Ali, Ali Akbar, Waqas Anwar. DIABETIC FOOT ULCER GRADES; CORRELATION WITH ANKLE BRACHIAL PRESSURE INDEX (Original) Prof Med Jour 15(1) 133 - 136 Jan, Feb, Mar, 2008.
- Muhammad Saeed Akhtar, Maqsood Ahmad, Mihammad Badar Bashir <ija,,ad Irfan, Zahid Yasin Hashmie. DIABETIC FOOT INFECTIONS; ROLE OF GRANULOCYTE COLONY STIMULATING FACTOR (G-CSF) (Original) Prof Med Jour 15(1) 153 - 161 Jan, Feb, Mar, 2008.

It is better to be lucky  
than good.

*Unknown*