

## EVALUATION AND MANAGEMENT OF DIABETIC FOOT ACCORDING TO WAGNER'S CLASSIFICATION

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### ABSTRACT

**Background:** Diabetes is one of the most common co-morbid illnesses in our community. One of its complications in the long course is diabetic foot. Morbidity and mortality due to this complication is major health issue. One of the most dreaded complications of diabetes is, foot ulcer and gangrene. Deaths due to foot gangrene are only second to cancer deaths. People with diabetes are at increased risk of complications from wound healing. A foot ulcer occurs in about 15% of all patients with diabetes and precedes 84% of all lower-limb amputations. The Relative Risk of a leg amputation is 40 times higher among people with diabetes than with non-diabetic. Moreover, up to 50% of diabetic amputees will undergo a second leg amputation within 5 years of initial amputation. The management of diabetic foot is focused primarily on avoiding amputation of lower extremities. Hence early recognition and proper therapy of diabetic foot lesions may save foot and leg. **Aim & Objective:** This study is aimed to evaluate and manage the different lesions of the diabetic foot according to Wagner's classification. To describe the lesions we treat study and compare outcomes and to identify measures to decrease morbidity and mortality due to diabetic foot disease. **Materials and Methods:** Diabetic foot patients secondary to type 2 DM and type 1 DM and admitted at Government Thiruvallur Medical College & Hospital, Thiruvallur. 50 Cases were selected and followed for 6 months duration with random sample technique and Classification of the diabetic foot according to Wagner's classification enables to institute proper treatment regimen and outcome retrospective study was done to see the effectiveness of differential treatment based on Wagner's classification. **Results:** The majority of the patients presented with higher grades and with poor glycemic control at the time of presentation. Conservative management with antibiotics was useful in a small subset of the patients. The majority of the patients needed surgical treatment in the form of debridement to amputations. **Conclusion:** Patient education and strict glycemic control can reduce the burden of diabetic foot. Early diagnosis and hospitalization, appropriate treatment including medical and surgical treatment according to the grade can reduce morbidity mortality and improve the outcome of the disease.

## INTRODUCTION

Four categories of diabetes are recognized. Type 1, formerly insulin-dependent diabetes mellitus (IDDM), is an autoimmune disease affecting the pancreas. Individuals with type 1 diabetes are prone to ketosis and unable to produce endogenous insulin.<sup>[1]</sup> Type 2, formerly non-insulin-dependent diabetes mellitus (NIDDM), accounts for 90% to 95% of cases diagnosed. Type 2 diabetes is characterized by hyperglycemia in the presence of hyperinsulinemia due to peripheral insulin resistance. Gestational as well as genetic defects and endocrinopathies are recognized as other types of

diabetes.<sup>[2]</sup> Diabetes is associated with numerous complications related to microvascular, macrovascular, and metabolic etiologies. These include cerebrovascular, cardiovascular, and peripheral arterial disease; retinopathy; neuropathy; and nephropathy. Currently, cardiovascular complications are the most common cause of premature death. Diabetes continues to be one of the most common underlying causes of non-traumatic lower extremity amputations (LEAs)—Mean age at diagnosis of the diabetic foot and mean age at major amputation was significantly lower as compared to Western literature.<sup>[3]</sup> This should be the sole reason to explain favorable results seen in the Indian series,

e specially about survival at 2 years after major amputation, contralateral limb amputation rate, above the knee to below-knee amputation rate. Older patients reported in Western literature are more likely to have advanced atherosclerotic disease involving heart, cerebral circulation, peripheral circulation, and renal circulation thus adversely affecting mortality and contralateral limb amputation rate.<sup>[4]</sup> Above- knee amputation was common in the Western population and the knee to below-knee amputation ratio was 1:2 vs. 1:17 in the Western vs. Indian series.<sup>[5]</sup> The majority of Indian patients have an infection as a dominant feature in the non-neuroischemic foot. In such cases, local debridement, control of infection and diabetes, certainly improve limb salvage. If the infection is fulminant, minor, or at the most below- knee amputation is enough to stop the advancing infective process. As against this in Western patients, where old age and neuroischemic limbs are common, advanced atherosclerosis, and multi- system involvement makes above- knee amputation perhaps the right choice to reduce the overall mortality.<sup>[6]</sup> Although the present study shows favorable results in Indian patients as compared to Western, it will not be surprising if one sees the change in the scenario in the next ten to thirty years. In India, the number of amputations in diabetic patients is found to increase due to several factors like increasing prevalence of diabetes, longer survival, more aging population, continued use of tobacco, barefoot walking, careless home surgical

attempt, late reporting to medical center and poor hygienic conditions. Unless urgent steps are taken, India might emerge as a country with the highest rate of amputations for the diabetic foot.<sup>[7,8]</sup>

## MATERIALS AND METHODS

Diabetic foot patients secondary to type 2 DM and type 1 DM and admitted at Government Thiruvallur Medical College & Hospital, Thiruvallur. 50 Cases were selected and followed for 6 months duration with random sample technique and Classification of the diabetic foot according to Wagner's classification enables to institute proper treatment regimen and outcome retrospective study was done to see the effectiveness of differential treatment based on Wagner's classification. Patients with Chronic Diabetic Foot and previous amputations were also included in the study. Patients were recruited from the surgical OPD and admitted. Data were collected by detailed history, clinical examination, wound or ulcer and were recorded in the pre- designed proforma. Age, sex, socioeconomic status, duration and type of diabetes, Wagner's classification, examination findings, blood investigations, renal function test, a swab of the wound. X-ray and treatment provided were collected. Treatment was carried out in both medical and surgical means. Antibiotics – aminoglycosides, cephalosporins, penicillin derivatives were used.

## RESULTS

**Table 1: Sociodemographic characteristics of the patients**

Characteristics	Number	%age
Age/years		
<40	4	8
41-50	24	48
51-60	16	32
>60	6	12

**Table 2: Number of patients according to Wagner's classification (N=50)**

Grade	No. of Patients	%
0	3	6
1	7	14
2	12	24
3	15	30
4	11	22
5	2	4

**Table 3: Treatment provided**

Type of Treatment	No. of Patients	%
Antibiotics alone	8	16
Incision and drainage	2	4
Debridement	14	28
Amputation	25	50
Skin Graft for chronic ulcer	1	2

**Table 4: Type of amputation**

Type of amputation	No. of patient
Rye's/toe	16
Syme's	4
Below knee	5

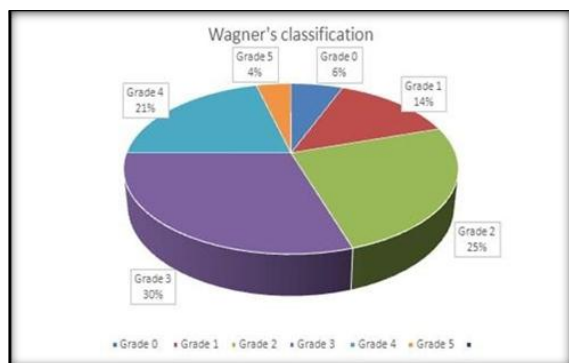
**Table 5: Cause of mortality in diabetic foot disease (N=3)**

Cause	Number of patients
Septicaemia	2
Ketoacidosis	1
Chronic renal failure	1

**Table 6: Culture report**

Investigations	No. of patients	%
Culture		
Staph. aureus Isolated	13	26
Mixed	25	50

Table 1,2,3,4,5,6 & Graph :1 From the above observed data , most of the patients presented with advanced grade, grade 2 – 24%, grade 3-30%, grade 4 – 22%. Henceforth surgical management was required in most of the patients. Amputation in half of the Patients and debridement in 28% of patients highlighting the advanced disease at presentation. Wagner’s classification may be different for a surgeon as compared to the physician because patients come to a surgeon with advanced disease hence the greater grade of patients were in our study in more percentage.

**Figure 1: Distribution according to Wagner's classification**

## DISCUSSION

Diabetes is associated with complications in the long run. Foot infection and subsequent amputation of a lower extremity are some of the most common reasons for hospitalization. As observed in our study, it is more common in males. The more common age group is between 40-60 in our study.<sup>[9]</sup> Diabetic patients have always suffered from complications affecting the lower limbs. Foot infection and subsequent amputation of lower extremities are the most common cause of hospitalization among diabetic foot patients.<sup>[10]</sup> Preventing strategy including patient's education in foot care, prophylactic skin, nail care, and footwear reduces the risk of foot ulceration and lower limb amputation by 25%. Prescription footwear accommodating deformity and decreasing pressure and shear force applied to the skin overlying the bone prominence, keep individuals ambulatory, and protect them from ulcer formation,<sup>[11]</sup> Grading diabetic foot lesion according to Wagner's classification helps in

correlating appropriate treatment to the proper grade of the lesion with a better outcome. The hallmark of diabetic foot is its gross infection and major contributing factors for late presentation are poor knowledge about the disease, undetected diabetes, trust in faith healers, barefoot gait.<sup>[12]</sup> Peripheral neuropathy and infection are common risk factors for the diabetic foot. Grade 3 – requires some sort of amputation.<sup>[13]</sup> Prevention strategy including patient education in foot care, prophylactic skin, nail care, and footwear reduces the risk of foot ulceration and amputation rates. Peripheral neuropathy and infection are common risk factors in our study The standard treatment for diabetic foot according to Wagner's classification is prevention for grade – 0. Antibiotics and good glycemic control for grade – 1. Grade – 2 needs hospital admission as they need surgical intervention along with antibiotics and glycemic control. Grade – 3 requires some sort of amputation. Grade – 4 needs wide debridement and amputation. Grade – 5 the preferred treatment is below-knee amputation.<sup>[14]</sup> Well-established widely used Wagner's wound classification system provides a description of ulcers to a varying degree and is easy to use among health care providers and can provide a guide to planning treatment strategies.<sup>[15]</sup> Pham HT et-al prospective cohort study has shown that diabetic patients with foot ulcers have a lower survival rate when compared with nondiabetic patients with foot ulcers has been demonstrated that skin oxygenation plays an important role not only in predicting the healing of diabetic foot ulcers but also in the development of the lesion.<sup>[16]</sup> Landau Z et-al study shows that topical hyperbaric oxygen and low-energy laser therapy was found effective in chronic diabetic ulcer.<sup>[17]</sup> There were mortalities in our study, all had grade 5 Wagner's diabetic foot disease of this one was due to septicemia and another due to chronic renal failure with diabetic ketoacidosis.<sup>[18,19]</sup> Our study concluded that prevention strategy including patient education in foot care, prophylactic skin, and nail care reduces the risk for foot ulcers and lower-extremity amputations. Prescription of footwear accommodating deformity and decreasing pressure and shear forces applied to the skin overlying bony prominence, keep individuals ambulatory, and protects from ulcer formation.<sup>[20]</sup>

## CONCLUSION

Foot ulceration in diabetic patients is resource-consuming, disabling morbidity, which often is the first step towards lower extremity amputation. Prevention is the best treatment.

Wagner's classification helps in correlating appropriate treatment to the proper grade of the lesion with better outcomes. Lesser grade lesions respond well to conservative treatment with antibiotics and debridement while those with higher lesions require some kind of amputation. Effective glycemic control and education are of key importance for decreasing diabetic foot disease. With early presentation and hospital admission, aggressive medical and surgical treatment according to the grade of the disease can improve outcomes and reduce morbidity and mortality due to diabetes. Grading of the diabetic foot lesions according to Wagner's classification helps in choosing an appropriate treatment for the grade. Patient education and strict glycemic control can reduce the burden of diabetic foot. Early diagnosis and hospitalization, appropriate treatment including medical and surgical treatment according to the grade can reduce morbidity mortality and improve the outcome of the disease.

## REFERENCES

1. Abbott CA, Vileikyte L, Williamson S, Carrington AL, Boulton AJ. Multicenter study of the incidence of and predictive risk factors for diabetic neuropathic foot ulceration. *Diabetes Care* 2017 21:1071-1075,
2. Boulton AJ, Meneses P, Ennis WJ. Diabetic foot ulcers: a framework for prevention and care. *Wound Repair Regen* 7:7-16, 2009
3. Boyko EJ, Ahroni JH, Stensel V, Forsberg RC, Davignon DR, Smith DG. A prospective study of risk factors for diabetic foot ulcer. The Seattle Diabetic Foot Study. *Diabetes Care* 2015 22:1036- 1042,
4. Frykberg RG. Diabetic foot ulcers: pathogenesis and management. *Am Fam Physician* 66:1655-1662, 2002.
5. Harris MI. Diabetes in America: epidemiology and scope of the problem. *Diabetes Care (Suppl)*3:C11-C14, 2018.
6. Holzer SE, Camerota A, Martens L, Cuerdon T, Crystal-Peters J, Zagari M. Costs and duration of care for lower extremity ulcers in patients with diabetes. *Clin Ther* 20:169-181, 2019
7. International Diabetes Federation and International Working Group on the Diabetic Foot. *Diabetes and Foot Care: Time to Act*, International Diabetes Federation, Brussels, 2015.
8. Jeffcoate WJ. The incidence of amputation in diabetes. *Acta Chir Belg* 2018105:140-144,
9. Kumar S, Ashe HA, Parnell LN, Fernando DJ, Tsigos C, Young RJ, Ward JD, Boulton AJ. The prevalence of foot ulceration and its correlates in type 2 diabetic patients: a population-based study. *Diabetic Med* 11:480-484, 1994.
10. Larsson J, Agardh CD, Apelqvist J, Stenstrom Long-term prognosis after healed amputation in patients with diabetes. *Clin Orthop* 2019(350):149-158,
11. Lavery LA, Ashry HR, van Houtum W, Pugh JA, Harkless LB, Basu S. Variation in the incidence and proportion of diabetes-related amputations in minorities. *Diabetes Care* 201919:48-52,
12. Margolis DJ, Allen-Taylor L, Hoffstad O, Berlin JA. Diabetic neuropathic foot ulcers and amputation. *Wound Repair Regen* 201913:230-236,
13. Mayfield JA, Reiber GE, Maynard C, Czerniecki JM, Caps MT, Sangeorzan BJ. Survival following lower-limb amputation in a veteran population. *J Rehabil Res Dev* 2018 38:341-345,
14. Moss SE, Klein R, Klein BE. The 14-year incidence of lower-extremity amputations in a diabetic population. The Wisconsin Epidemiologic Study of Diabetic Retinopathy. *Diabetes Care* 2019 22:951-959,
15. Pecoraro RE, Reiber GE, Burgess EM. Pathways to diabetic limb amputation: basis for prevention. *Diabetes Care* 201913:513- 521,
16. Pham HT, Armstrong DG, Harvey C, Harkless LB, Giurini JM, Vevs Screening techniques to identify the at-risk patients for developing diabetic foot ulcers in a prospective multicenter trial. *Diabetes Care* 2018 23:606-611,
17. Ramsey SD, Newton K, Blough D, McCulloch DK, Sandhu N, Reiber GE, Wagner EH. Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care* 201922:382 - 387,
18. Reiber GE, Boyko EJ, Smith DG. Lower extremity foot ulcers and amputations in diabetes. In: *Diabetes in America*, 2nd ed, pp 409-427, edited by MI Harris, C Cowie, and MP Stern, NIH Publication No. 201195- 1468.
19. Reiber GE, Vileikyte L, Boyko EJ, del Aguila M, Smith DG, Lavery LA, Boulton AJ. Causal pathways for incident lower-extremity ulcers in patients with diabetes from two settings. *Diabetes Care* 201922:157-162,
20. Shaw JE, Boulton AJ. The pathogenesis of diabetic foot problems: an overview. *Diabetes* 46 (Suppl 2):2019S58-S61