

WAGNER'S CLASSIFICATION FOR DIABETIC FOOT ULCERS- IS IT STILL RELEVANT?Divakar Choubey¹, Jishan Ahmed²¹Registrar, Department of Surgery, Assam Medical College and Hospital, Dibrugarh, Assam, India.²Professor and Ex-HOD, Department of Surgery, Assam Medical College and Hospital, Dibrugarh, Assam, India.**ABSTRACT****BACKGROUND**

Diabetes is a rapidly growing problem worldwide, making it one of the most challenging health problems in the 21st century. The loss of a limb or foot is one of the most feared complications of diabetes and yet foot problems remain the commonest reason for diabetic patients to be hospitalised. The main emphasis of the current international guidelines on the management of the diabetic foot is prevention, early recognition and treatment. Although, there are many classification systems, the Wagner's classification is a simple clinical classification which helps to classify foot ulcers and plan treatment accordingly.

MATERIALS AND METHODS

65 diabetic foot ulcer patients who were admitted in Assam Medical College and Hospital, over a period of one year, were classified on the basis of Wagner's classification and their outcome studied.

RESULTS

Early grade ulcers had favourable outcome. Grade 4 and 5 ulcers had poor glycaemic control and required some form of amputation.

CONCLUSION

Wagner's classification is a simple clinical classification, easy to comprehend and apply. It has a definite role in predicting outcome of diabetic foot ulcers.

KEY WORDS

Wagner's Grade, Ulcer, Diabetic Foot, Peripheral Vascular Disease, Peripheral Neuropathy, Amputation.

HOW TO CITE THIS ARTICLE: Choubey D, Ahmed J. Wagner's classification for diabetic foot ulcers- is it still relevant? J. Evolution Med. Dent. Sci. 2018;7(28):3155-3159, DOI: 10.14260/jemds/2018/710

BACKGROUND

Diabetes mellitus is a group of metabolic diseases characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action or both. This results in high glucose levels that cause unique eye, kidney and nerve complications, and an increased risk of cardiovascular disease.

Diabetes is a rapidly growing problem worldwide, making it one of the most challenging health problems in the 21st century.

The projections indicate that India will have the largest number of diabetic patients by the year 2025 AD. The loss of a limb or foot is one of the most feared complications of diabetes and yet foot problems remain the commonest reason for diabetic patients to be hospitalised. Diabetic foot ulcers are common and estimated to affect 15% of all diabetic individuals during their lifetime.

Definition

"Infection, ulceration and/or destruction of deep tissues associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb."¹

'Financial or Other Competing Interest': None.

Submission 01-06-2018, Peer Review 25-06-2018,

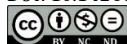
Acceptance 01-07-2018, Published 09-07-2018.

Corresponding Author:

*Dr. Divakar Choubey,
Padma Nagar, Path-1,
Dibrugarh,
Assam, India.*

E-mail: divy9amc@gmail.com

DOI: 10.14260/jemds/2018/710



The term 'diabetic foot' implies that the pathophysiological process of diabetes mellitus does something to the foot that puts into increased risk for tissue damage.

Several foot ulcer classification methods have been proposed in order to organize appropriate treatment plan, but none have been universally accepted. The Wagner-Meggitt classification is based mainly on wound depth and consists of 6 wound grades (Table-1).

Most diabetic foot infections require some surgical intervention, ranging from minor (debridement) to major interventions including amputation. The main emphasis of the current international guidelines on the management of the diabetic foot is prevention, early recognition and treatment.

Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Intact skin	Superficial ulcers	Deep ulcer to tendon, bone or joint	Deep ulcer with abscess or osteomyelitis	Forefoot gangrene	Whole foot gangrene

Table 1. The Wagner-Meggitt Classification

The Wagner-Meggitt classification [Table-1], which was developed in the 1970s, has been the most widely accepted and universally recognised grading system for lesions of the diabetic foot. The original system has six grades of lesions. The first four grades (Grade 0, 1, 2 and 3) are based on the physical depth of the lesion in and through the soft tissues of the foot. The last two grades (Grade 4 and 5) are completely distinct, because they are based on the extent of gangrene and lost perfusion in the foot. Grade 4 refers to partial foot gangrene and Grade 5 refers to a completely gangrenous foot.

MATERIALS AND METHODS

The study included the cases of foot ulcers in diabetic patients admitted in the different surgical units of Assam Medical College and Hospital, Dibrugarh and attending Surgery OPDs.

The present study is a hospital-based prospective observational study for a period of one year. It included diabetic patients of 18 years of age and above with foot ulcer, admitted under the different surgical units of Assam Medical College and Hospital, Dibrugarh. It excluded patients less than 18 years of age and foot ulcers of non-diabetic aetiology.

RESULTS

Sixty-five patients of diabetic foot, admitted in the Department of Surgery, Assam Medical College and Hospital, Dibrugarh during the period from July 2015 to June 2016 were studied with regard to Wagner’s classification and the following observations had been made during the study.

Out of the 65 patients with diabetic foot disease, 41 were male and 24 were female with average age being 53 years. The highest incidence of the disease was observed in the 5th and 6th decade of life with maximum number of patients having diabetes for 6 - 10 years (Range < 1 to 20 years) with predominantly type II diabetes mellitus with poor glycaemic control, i.e. raised HbA1c level in the present study.

The predominant site of ulceration was found over toe of foot with slight predisposition for right side of foot. Duration of ulcer varied from 1 week to < 18 weeks. However, most of them were of short duration (< 6 weeks).

Most of the cases presented with history of minor trauma. As per Wagner classification, most of the cases were of Grade-1.

The duration of stay in the hospital ranged from 8 - 50 days with average being 20.73 days.

The main presenting symptoms in this study were ulceration (67.69%), gangrene (20%), gangrene with abscess (10%) and abscess with ulceration (12.3%). Peripheral neuropathy was present in 50 cases (76.92%) and PVD in 2 cases (3.08%) and both in 13 cases (20%). Out of 65 cases in the present study, 25 (38.46%) patients were smoker.

The associated complications include nephropathy (18.46%), retinopathy in (32.31%) and hypertension in (40%).

Radiograph of foot (AP and lateral view) showed osteomyelitis in 18.46% cases, normal study in 75.38% cases, while 6.15% had soft tissue swelling.

Pus culture revealed staphylococcus aureus as the most common single organism (40%). Rest were streptococcus (18.4%), MRSA (3%), pseudomonas aeruginosa (9%) and Klebsiella (8%); 12.30% were polymicrobial.

HbA1c control was found to be poor in a great majority (80%) of these patients.

Glycaemic control was achieved either by OHA or insulin. Antibiotics were used to combat infection in all the cases.

Different surgical interventions were instituted as per individual requirement of the cases which includes debridement and dressing (64.62%), SSG (18.46%), toe amputation (19.85%), transmetatarsal amputation (1.54%) and below-knee amputation (4.62%).

Postoperative complications were minimum. Mortality in our study was zero.

Out of 65 patients, 49 patients could be followed up

regularly. Two patients of grade 1 and 3 patients of grade 2 were readmitted for recurrent ulcer. They subsequently improved with debridement and dressing. 19 out of 21 grade 1 ulcer, 11 out of 14 grade 2 ulcers and all of 6 grade 3, 7 grade 4 and 1 grade 5 improved satisfactorily. The patient with grade 5 underwent below knee amputation and had to use walking aid thereafter. 16 patients were lost for follow-up and their outcome could not be evaluated.

Predisposing Factors	Number of Cases	Percentage (%)
Peripheral Vascular Disease	2	3.08
Peripheral Neuropathy	50	76.92
Both	13	20.00
Total	65	100.00

Table 2. Showing Predisposing Factors

Grade of Wound

Grade	Number of Cases	Percentage (%)
Grade 0	0	0.00
Grade 1	26	40.00
Grade 2	18	27.69
Grade 3	8	12.31
Grade 4	10	15.38
Grade 5	3	4.62
Total	65	100.00

Table 3. Showing different Grades of Ulcer at Presentation

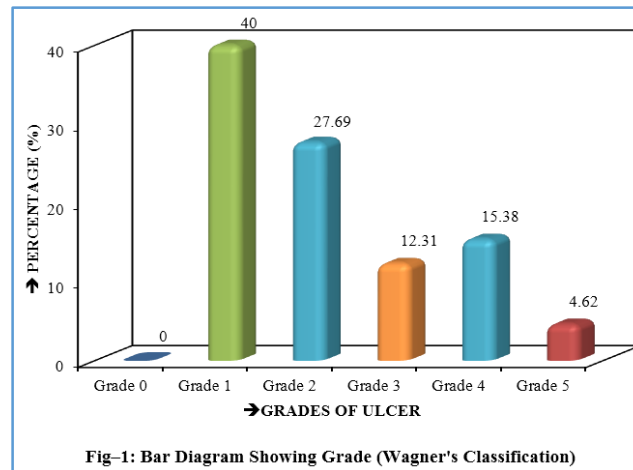


Fig-1: Bar Diagram Showing Grade (Wagner's Classification)

Management

Surgery	Grade (Wagner's Classification)					Total	
	1	2	3	4	5	n	%
Dressing and Debridement	25	12	4	0	0	41	63.08
SSG	1	5	4	2	0	12	18.46
Fasciocutaneous Flap	0	1	0	0	0	1	1.54
Toe Amputation	0	0	0	9	0	9	13.85
Transmetatarsal Amputation	0	0	0	1	0	1	1.54
Below Knee Amputation	0	0	0	0	3	3	4.62

Table 4. Showing different Surgical Modality with Number of Patients and Grade

Condition	Number of Cases	Percentage (%)
Improved	44	67.69
Not Improved	5	7.69
Lost for follow-up	16	24.62
Developed New Ulcers	0	0.00
Total	65	100.00

Table 5. Showing Condition at Follow up

Follow-Up Results	Glycaemic Status			Local Healing		New Ulcer/Abscess	
	Good	Poor	Fair	Satisfactory	Unsatisfactory	Present	Absent
After 2 weeks	15	25	25	44	5	0	49
After 4 weeks	18	22	25	47	2	0	49
After 2 months	14	18	33	49	0	0	49
After 6 months	19	18	24	34	0	0	34

Table 5. Showing Condition at Follow-Up

Results and Inference

The course of illness, mode of intervention and outcome of all the 65 patients with foot ulcer were studied with respect to grade of ulcer (Wagner’s classification).

For grade 1 ulcers, 25 patients recovered with debridement and regular dressing alone. One patient required split skin graft. They had a hospital stay ranging from 8 to 26 days. On follow-up at 1 month, 2 patients presented with re-ulceration. They were readmitted and treated with antibiotics, debridement and dressing. 4 patients of grade 1 were lost for follow-up and could not be evaluated thereafter. Among the grade 2 ulcers 12 recovered with debridement and dressing alone, 5 required split skin graft and 1 patient had to be treated with fasciocutaneous flap cover. They had a hospital stay of 12 to 45 days. 3 patients showed signs of infected ulcer at follow-up at 1 month and were readmitted and treated with antibiotics and local dressing and debridement. On subsequent follow-up, they showed signs of improvement. 4 patients of grade 2 ulcers did not report back for follow-up. Regarding grade 3 ulcers debridement and multiple dressings were required in 4 patients, another 4 received split skin grafting. They had a hospital stay of 18 to 50 days. 6 patients had satisfactory improvement at follow-up. 2 patients of grade 3 were lost for follow-up. Of grade 4 ulcers 7 patients had to be subjected to toe amputation, 2 patients to toe amputation followed by split skin graft and one patient had to undergo transmetatarsal amputation. They had a hospital stay of 24 to 44 days 3 patients of grade 4, lost for follow-up and outcome could not be evaluated. Of grade 5 ulcers, all three underwent below knee amputation. Post-operative recovery was satisfactory in two of the patients, whereas one patient developed stump site wound infection. After control of infection, secondary

suturing was done after 2 weeks. The patients had a hospital stay of 30 to 50 days. They had to use walking aid thereafter but had reasonable mobility for day-to-day activities.

In our study, it was observed that the higher-grade ulcers were the ones with poorer glycaemic control as compared to early or low-grade ulcers. Also, the higher grade ulcers had a prolonged hospital stay and could not be managed with dressing and debridement alone. Grade 4 and grade 5 ulcers invariably required amputation. Grade 5 required major amputation and needed life-long walking aid. A good glycaemic control and prompt intervention at early stages of ulcer prevented progression to higher stages, thereby averting the need for amputation and preventing disability.

DISCUSSION

The cases had been studied with respect to the incidence of age, sex, different modes of clinical presentation, investigations, presence of peripheral neuropathy, investigations required, glycaemic control, treatment, complications and follow-up, keeping in mind the grade of the ulcers according to Wagner’s classification.

The mean age of presentation in our series was 53.03 yrs. In the study of Deerochanawong et al (1992),² the average age reported was 68.7 (57 - 81) years. In another study by Chalya et al (2011),³ the mean age at presentation was 54.32 years. The mean age of presentation in our series was lesser than other studies.

The duration of diabetes in our study group ranged from < 1 to > 10 years with an average duration of 8.15 years. Deerochanawong et al (1992) in their study of 48 cases reported the average duration of 7 years with the range of duration of diabetes from 0 - 27 years. Duration of diabetes >10 years has been mentioned as risk factor for foot ulcer (ADA 2002, Helfand AE et al (1994)⁴ and Lavery et al (1998).⁵ Chalya et al (2011) reported the mean duration of diabetes mellitus to be 8 years. The mean duration of diabetes mellitus in our study was almost similar to other studies.

Series	Site		
	Forefoot (Toe, Ball of Foot)	Midfoot	Hindfoot (Heel)
Boulton AJM et al (1990)	77.8%	11.9%	10.3%
Gayle E Reiber et al (2001)	51.7%	30.8%	6.6%
Chalya et al (2011)	60.3%		
Present Series (2015 - 16)	83.07%	---	16.92%

Table 6. Showing distribution of Site of Diabetic Foot in different Series

In most of the studies including the present study, the most common site of ulcer was found to be the toes or forefoot.

Incidence of Peripheral Neuropathy

Deerochanawong (1992)	64%
Kim SS et al (2014)	33.5%
Present Series (2015 - 16)	76%

Table 7. Showing Incidence of Peripheral Neuropathy in different Series and present Series

In the present series, evidence of peripheral neuropathy was noted in 50 cases (76.92%). Deerochanawong et al (1992) reported the prevalence of peripheral neuropathy to be 64%. Kim SS et al (2014)⁶ in his study found the incidence to be 33.5%. The incidence of peripheral neuropathy in our series was found to be higher than in other studies.

Incidence of PVD

Series	Percentage (%)
Pendsey (India) (1997)	3.8
Walters et al (UK) (1992)	23.5
Chalya et al (2011)	30.8
Present Series (2015 - 16)	3.08

Table 8. Showing Incidence of PVD in different Series and present Series

In the present series, evidence of peripheral vascular disease was noted in 2 cases (3.08%). Pendsey et al (1997)⁷ and Mohan et al (1995)⁸ from India reported the prevalence of peripheral vascular disease to be 3.8% and 3.9% respectively. Walter et al (UK, 1992)⁹ reported the prevalence to be 23.5%. Chalya et al (2011) found the prevalence of PVD to be 30.8%. These findings suggest that peripheral vascular disease is not very common in India as compared to the western countries.

In the present series, none had previous history of lower limb amputation.

In the present series of 65 cases of diabetic foot, 21 cases (32.31%) presented with retinopathy, 12 cases (18.46%) had nephropathy and 26 cases (40%) had hypertension. William et al (1990)¹⁰ in their study of 39 cases reported from Nottingham, 39.4% cases with retinopathy, 13.5 - 14.7% cases with nephropathy and 17.9% cases presented with hypertension. Kim SS et al (2014) found the incidence of retinopathy and nephropathy to be 21% and 15.7%.

Investigations

Pus Culture and Sensitivity

In the present series Staph. Aureus- 26 cases (40%), Streptococci- 12 cases (18.4%), Pseudomonas aeruginosa- 9 (13.84%), Klebsiella- 8 (12.30%), MRSA- 2 (3%) and Mixed- 8 cases (12.30%). Lipsky et al (1990)¹¹ and Wheat et al (1986)¹² in their studies have found that infection in the diabetic foot is polymicrobial with three to six organisms typically isolated per infection. Chalya et al (2011) found single organisms in 12.5% and mixed organisms in 87.5% cases. Most common organism was Staph. aureus in 50.0% cases.

Management

Besides glycaemic control by insulin or oral hypoglycaemic agents and antibiotic coverage to combat infection, different surgical interventions were instituted as per the requirement of the cases.

Surgical Interventions

Interventions	Deerochanawong (1992) No. of Pts. 48	Chalya et al (2011)	Present Series (2016) No. of Pts. 65
Debridement and dressing	-	37%	63.08%
Skin grafting	-	6%	18.46%

Fasciocutaneous flap	-	-	1.54%
Toe amputation	31%	51.4%	13.85%
Transmetatarsal amputation	6%	6.9%	1.54%
Below-knee amputation	46%	34.7%	4.62%
Above knee amputation	17%	6.9%	Nil

Table 9. Showing Incidence of different Surgical Interventions in different Series

In the present series, surgical interventions instituted were debridement and dressing in 41 cases (63.08%). Skin grafting in 12 cases (18.46%), fasciocutaneous flap in 1 case (1.54%), toe amputation with dressing in 9 cases (13.85%), transmetatarsal amputation in 1 case (1.54%) and below-knee amputation in 3 cases (4.62%).

In our series, most of the patients (63.08%) with diabetic foot infections were treated with debridement and dressing followed by toe amputation (13.85%). The need for higher levels of amputation was relatively less as compared to studies of earlier years. Awareness of the patients about possible foot infections, advancement in surgical care and easier access to medical care might be the reason behind this.

CONCLUSION

From the present study of diabetic foot carried out in Department of General Surgery, Assam Medical College and Hospital, Dibrugarh during the period from 1st July 2015 to 30th June 2016, the following conclusions have been drawn-

1. Diabetic foot is a common health problem in this region. Males of 6th decade were found to be more frequently affected. Type II diabetes mellitus with poor glycaemic control, i.e. raised HbA1c levels were common causative factors of foot ulceration.
2. Peripheral neuropathy and infection were seen to be the commonest associated risk factors. The association of ulceration with PVD is not common in India and that holds good for this region too. Smoking was found to have a strong association with diabetic foot. Trauma was the other leading cause of non-healing ulcer in diabetes.
3. Ulceration and infection of the diabetic foot poses a big problem with regard to bed occupation in surgical wards owing to requirement of longer duration of stay.
4. HbA1c control was found to be poor (> 8%) in a very high percentage of patients confirming the risk relation between glycosylated haemoglobin and diabetic foot infections.
5. The treatment of diabetic foot should be expectant and early with an attempt to contain the pathological as well as clinical progression of the disease. This requires a multidisciplinary team approach. Tight control of hyperglycaemia, rest, antibiotics, correction of anaemia if any and surgical intervention as and when necessary constitute the mainstay of diabetic foot management.
6. Individuals at high risk for lower limb amputation must be identified, evaluated and treated according to the risk status.
7. Due to poor socio-economic status, majority of the patients cannot afford to bear the cost burden incurred in the management of diabetic foot which is otherwise a preventable problem.

8. Incorporation of other factors affecting healing in the classification system may further enhance its role in predicting the outcome of diabetic foot ulcer. However, Wagner's classification is a clinical classification easy to comprehend and apply. It needs minimum resources. It has a definite role in predicting/ assessing the outcome of diabetic foot ulcers and thus is still relevant.

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