CLINICAL STUDY TO EVALUATE DIABETIC ULCER SEVERITY SCORE (DUSS) IN DIABETIC FOOT ULCER

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ABSTRACT

A number of diabetic foot ulcer classification is in practice for effective categorization of patients and to predict the outcome. Diabetic Ulcer Severity Score is one of the latest simple wound based score, completely a clinical score which needs to be evaluated for its effectiveness in predicting the outcome of foot ulcers in patients with diabetes.

METHODS

A total of 226 diabetic patients with foot ulcers treated as outpatient or admitted patients from 1st January to 31st December 2014 were included in the study and was followed till complete healing of ulcer or amputation or for a minimum period of 6 months. Those patients who lost for followup before 6 months were excluded from study. Necessary data was collected and DUSS was calculated at the start of treatment.

RESULTS AND CONCLUSION

In our study, patients with score 3 had higher risk (40%) for minor amputation and those with score 4 had higher risk (21%) for major amputation overall. Patients with score 4 had 37% risk for minor amputation. Higher the score higher is the risk for amputation and lesser the chance of healing. DUSS scoring system provides an easy diagnostic tool for predicting probability of healing or amputation by combining four clinically assessable wound based parameters namely presence or absence of pedal pulses, probing to bone, wound location and presence or absence of multiple ulcers. Study groups can be stratified depending on severity of ulcers and thus can help provide a simple, streamlined approach in clinical setting without need of any advanced investigative tool, but it does not alter the procedure of wound management. The scoring system can be easily applied to clinical practice.

KEYWORDS

Amputation, Diabetic Foot Infections, Peripheral Neuropathy, Peripheral Vascular Disease.

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INTRODUCTION

Approximately, 177 million people worldwide are diabetic. This number is likely to double by 2030.[1] Diabetes is responsible for every 1 in 20 deaths from all causes and approximately four million annual deaths are because of complications of diabetes, i.e. six deaths every minute or one death every 10 seconds.[1] More than 80 percent of diabetes deaths occur in low- and middle-income countries.[2]

India has been called "the diabetes capital of the world," and "every fifth diabetic in the world is an Indian."[3] The disease currently affects more than 62 million Indians, which is more than 7.1% of India's adult population.[4] The problem of diabetes is not homogenous in India.[5] Currently, 4.0-11.6 percent of India's urban population and three percent of the rural population above the age of 15 has diabetes.[6,7] An estimate shows that nearly 1 million Indians die due to Diabetes every year.[8] The average age of onset is 42.5 years.[8] the prevalence of Impaired Glucose Tolerance Test (GTT) ranges from 3.6–9.1 percent, which indicates a potential of further increase in the prevalence.[6] It is projected to increase to 70 million by 2025.[7]

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Due to these sheer numbers, the socio-economic burden due to diabetes in India is among the highest in the world.[9] The overall direct healthcare costs of diabetes mellitus ranges from 2.5–15 percent of annual health care budgets. This burden is likely to only increase with the projected increase in the number of people with diabetes.[10]

A Diabetic Foot is a foot that exhibits any pathology that results directly from Diabetes or any long-term (or "chronic") complications of Diabetes Mellitus.[11]

It is estimated that 15% of diabetics develop a foot ulcer within their lifetime and up to 70% of all non-traumatic amputations in the world occur in diabetics.[12] Many of these amputations are preventable as 85% are preceded by a foot ulcer. A number of contributory factors work together to cause foot ulceration in patients with diabetes. These include peripheral neuropathy, peripheral vascular disease, foot deformities, external trauma and peripheral edema. With the exception of trauma, it is usually a combination of problems rather than a single risk factor that causes ulceration. One of the commonest combinations causing ulceration is peripheral neuropathy, foot deformity and trauma.[13]

Of longstanding diabetic patients, 20%-40% develop peripheral neuropathy.[14]

As many as 20%-40% of patients with diabetes have peripheral vascular disease and up to 50% of patients with a foot ulcer have signs of PVD.[15]

Foot infections in diabetic patients usually begin skin ulceration.[16] although most infections remain superficial, ~25% will spread contagiously from skin to subcutaneous tissues and or bone. Up to half of those who have foot infection will have another within few years. About 10%-30% of diabetic patients with foot ulcer will eventually progress to an

amputation which may be minor (i.e. foot sparing) or major. Conversely ulcer precedes ~60% of amputation.[17,18,19] making infection most important proximate cause of this tragic outcome. During the followup period, a total of 49% of diabetic individuals with history of foot ulcer died compared with 35.2% of diabetic individuals without a history of foot ulcer.[20]

Since diabetic foot ulcers and amputations account for significant part of diabetic related health care costs.[6,7] several classification systems have been proposed to help to assess the severity of disease. According to International Working Group on Diabetic Foot, a classification system appropriate for clinical practice should facilitate communication between health care providers, influence daily management and provide information about the potential healing of ulcer.[9]

In 1976, Meggit described a wound classification that was further popularized by Wagner in 1981. However, the Meggit-Wagner system exclusively assessed ulcer depth alone without considering comorbidities such as ischemia or pressure load.

Grade	Description
0	Pre-ulcerative lesion, healed ulcers, presence of bony deformity
1	Superficial ulcer without subcutaneous tissue involvement
2	Penetration through the subcutaneous tissue without abscess or osteomyelitis
3	Deep ulcer with abscess or osteomyelitis
4	Gangrene of fore foot
5	Gangrene of entire foot

Presently Meggit-Wagner system is widely used.

University of Texas classification improved ulcer classification by including ischemia and infection.

Diabetic Ulcer Severity Score as described by Beckert et al. is one such new wound based classification system with score ranging from 0 to 4 using palpable pedal pulses, probing to bone, ulcer site and presence of multiple ulcers which needs to be validated.

Classification of various diabetic foot surgeries into major or minor amputations.[21]

Amputation Level	Distal or Minor Amputation	Proximal or Major Amputation
Fore foot	Toe Disarticulation Ray Transmetatarsal	
Mid foot	Lis franc Chopart	
Hind foot	Syme Boyd Pirogoff Modified Pirogoff	
Transtibial		Below the knee
Through the knee		Gritti stokes
Transfemoral		Above the knee
Hip		Hip disarticulation

METHODS AND METHODOLOGY

The clinical study was conducted in Bowring and Lady Curzon Hospital from 1st January to 31st December 2014 attached to Bangalore Medical College and Research Institute.

A total of 226 diabetic patients with foot ulcers were studied during the period, which included both inpatient and outpatients based on inclusion and exclusion criteria. Consent was obtained from each patient after explaining study in detail.

Inclusion Criteria

1. All patients were diagnosed with Diabetes having foot ulcers.
2. Ulcers below the level of ankle.

Exclusion Criteria

1. Foot ulcers in Non-Diabetic patients.
2. Ulcers above the level of ankle.
3. Venous ulcers.

Four clinically defined parameters namely palpable pedal pulses, probing to bone, ulcer site, number of ulcers were assessed initially and Diabetic Ulcer Severity Score was calculated at the start of the study. Patients were followed up for 6 months or until healing or amputation. Those patients who lost for followup before 6 months were excluded from study.

DUSS SCORING SYSTEM

Parameters	Score 0	Score 1
Palpable pedal pulse	Yes	No
Probing to bone	Yes	No
Ulcer site	Toes	Foot
Ulcer number	Single	Multiple

The infected ulcers were swabbed for culture and sensitivity and appropriate antibiotic therapy started as per culture and sensitivity. Surgical debridement and dressing done with either with saline gauze, povidone-iodine, hydrogel, collagenase, human recombinant derived growth factor. Patients with gangrenous tissue underwent appropriate amputations. Skin grafting done for infection free ulcers covered with healthy granulation tissue, which did not heal completely. Adequate glycemic control maintained during treatment.

OBSERVATION

Baseline demographic details	
Patients	
Sex	Male 139; Female 87
Age (years)	62 (34-84)
Number of visits	7(3-48)
Time of follow up (days)	62(10-82)
Hospitalization	132
Wounds	
Wound history (days)	30(15-170)
Wound area (cm^2)	9(1-126)
Multiple ulcers	76
Soft tissue infections	88
In initial visits	
Probing to bone	58
Ulcer location Toe-89/ Foot-	137
Palpable pedal pulses	143
Wound grading	
Grade 1	81
Grade 2	62
Grade 3	08
Grade 4	15
Grade 5	58
Surgery	
Sharp debridement	226
Minor amputation	30
Major amputation	11

DUSS	No. of Patients	Debridment	Major Amputation		Minor Amputation	
			Yes	%	Yes	%
0	87	87	0	0	0	0
1	51	51	0	0	0	0
2	23	23	0	0	5	21
3	22	22	2	9	9	40
4	43	43	9	21	16	37

In our study of 226 patients, 139 were male and 87 were female, mean age of presentation being 62 years. All patients required debridement. Patients with score 0 and 1 required debridement only. Of 23 patients with score 2, 5(21%) underwent minor amputation and no major amputation was done in these patients; 2(9%) major amputation and 9(40%) minor amputation were performed among 22 patients with score of 3. Of 43 patients with score 4, 9(21%) required major amputation and 16(37%) required minor amputation.

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