



The New Scoring System for Predicting the Risk of Major Amputations in Patient with Diabetic Foot Complications

Amit Kumar C Jain

Department of surgery, St. John's Medical College and Hospital, John Nagar, Sarjapur Road, Bangalore, India

Abstract

The incidence of diabetic foot problems is increasing all around the world with increase incidence of diabetes. Various classifications and scoring system exist for diabetic foot problems. Each has its own merits and demerits, but the basic aim of them is to improvise the practice of diabetic foot. Majority of these classifications and scorings are based on either on diabetic foot ulcer and healing or on neuropathy. The author proposes a new scoring system for diabetic foot complication with the aim of improvising and standardizing the practice of diabetic foot management. This new scoring system for the first time includes the entire spectrum of all the common complications of the diabetic foot disorders which was lacking in almost all the scoring system till date. Importantly, this scoring system takes into account clinical, radiological and surgical factors. The new scoring system shall help in predicting the risk of major amputations in patient with diabetic foot complications.

Key Words: Diabetic foot, Amit Jain's, new scoring, amputations

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Corresponding Author: Department of surgery, St. John's Medical College and Hospital, John Nagar, Sarjapur Road, Bangalore, India

E-mail: dramitkumarcj@yahoo.in

Introduction

The global prevalence of diabetes mellitus was estimated to be around 2.8% in 2000 and it was predicted to increase to 4.4% by 2030, which means that there will be more than 366 million people with diabetes by that year [1]. In India, which was once regarded as the diabetic capital of the world, it was estimated that in 2000, there were around 32 million people with diabetes which was predicted to increase to nearly 80 million by 2030 [1], whereas in England there are 3.1 million people with diabetes and it is likely to rise to 4.6 million by 2030 [2].

In many developing and underdeveloped countries, diabetic foot disease is a neglected entity both by the physicians and the patients. In fact, a few years ago, in most of the developing countries including India, podiatry/ diabetic foot surgery as a speciality or profession was non-existent [3,4]. Since last few years there has been a growing interest in this speciality.

Most of the data and concepts on diabetic foot are taken from western countries like U.S.A where this speciality is well recognized, standardized and valued.

The author being one of the few handful of qualified and specialist podiatric surgeon in India, has proposed various newer concepts in diabetic foot like a newer classification of diabetic foot complications [5] and a new grading system [6] for surgical debridement in diabetic lower limb, in order to improvise and standardize the diabetic lower limb salvage.

In this unique article, the author proposes a new scoring system for diabetic foot complications, in order to improvise the diabetic foot practice.

Need for the New Scoring System

There are many scoring systems in diabetic foot. Each has its own merit and demerits, but most of them aimed at improving diabetic foot care and to have a common language. Some of the scoring systems are DEPA scoring system [7] for healing diabetic foot ulcers, DUSS (diabetic ulcer severity score) for diabetic foot ulcers [8], Saint Elian wound score system [9], Toronto clinical scoring system [10] for diabetic polyneuropathy, etc. These scoring systems basically concentrate on either healing of diabetic foot ulcers or on neuropathy.

There is yet no scoring system that addresses all the diabetic foot complications. This new scoring system (Table 1 and 2) for the first time includes the clinical, radiological and surgical

findings to predict the risk of major amputation in diabetic foot. The primary advantage (Table 3) of this scoring system is its simplicity, practicality and inclusion of majority of the common complications of the diabetic foot disease.

Table 1. Showing the new Amit Jain’s scoring of diabetic foot

Sl no	Characteristics	Involvement of foot			
1]	Presence of ulcer	No ulcer → 0	Forefoot ulcer → 2	Midfoot ulcer → 4	Hindfoot ulcer/ full foot → 6
2]	Osteomyelitis [O.M]	No O.M → 0	Forefoot O.M → 2	Midfoot O.M → 4	Hindfoot O.M → 6
3]	Presence of pus	No pus → 0	Forefoot pus/dorsum → 2	Midfoot pus → 4	Hindfoot pus/beyond it → 6
4]	Gangrene [dry/wet]	No gangrene → 0	Forefoot gangrene → 2	Midfoot gangrene → 4	Hindfoot gangrene/beyond → 8
5]	Peripheral arterial disease	No p.a.d → 0	Mild → 2	Moderate → 4	Severe → 8
6]	Charcot foot	No → 0	Forefoot → 2	Midfoot → 4	Hindfoot/whole foot → 8
7]	Necrosis [skin]	No → 0	Forefoot necrosis → 2	Midfoot necrosis → 4	Hindfoot necrosis/beyond → 8
8]	Associated cellulitis	No → 0	Upto forefoot → 2	Upto midfoot → 4	Upto hindfoot & beyond → 6
9]	Previous amputation	No → 0	Toe amputation → 2	Forefoot amputation → 4	Midfoot amputation → 6
10]	Presence of gas -radiologically	No → 0	Gas in forefoot → 1	Gas in/upto midfoot → 2	Gas in/upto hindfoot → 3
11]	Myonecrosis	No → 0	Myonecrosis involving single muscle group → 2	Myonecrosis involving more than one group → 4	Myonecrosis of entire foot muscle with extension to leg → 8
12]	Joint involvement	No → 0	Forefoot joint exposure → 2	Midfoot joint exposure → 4	Hindfoot joint exposure → 6
13]	Septic shock	No → 0		Present → 2	
14]	Renal failure	No → 0		Present → 2	
15]	Smoking [heavy smoker]	No → 0		Present → 2	
16]	Surgeon factor	Qualified Podiatric/diabetic foot specialist → 0		Other surgeons → 2	

Table 2. Showing the major amputation risk assessment using Amit Jain's scoring system.

Sl no	Scoring	Major amputation risk	Percentage
1]	< 5	No amputation	0%
2]	6 – 10	Low risk	< 25%
3]	11 – 15	Moderate risk	25% - 49%
4]	16 – 20	High risk	50% - 74%
5]	21 – 25	Very high risk	75% - 99%
6]	>26	Amputation inevitable	100%

Table 3. Showing the advantages of the Amit Jain's scoring system

Sl no	Advantages
1]	It is simple
2]	Easy to understand
3]	Practical in clinical practice
4]	It includes clinical, radiological and surgical findings in the diabetic foot which is unique and first of its kind in diabetic foot scoring system
5]	It includes most of the complications of diabetic foot disorder
6]	Useful as a teaching tool
7]	It can be used for research purpose
8]	It can be used as a chart or a case sheet to maintain the records
9]	It can help in predicting the outcomes in diabetic foot
10]	It can also be helpful in medicolegal cases
11]	This scoring system can also be applied in non diabetics

The only disadvantage of this scoring system is difficulty in remembering it especially by the other specialists. Just the way a general surgeon remembers Ranson's score for pancreatitis and Alvarado's score for appendicitis, an oncosurgeon remembers TNM staging, a neurosurgeon remembers the Glasgow coma scale in their practice, the author believes that this scoring can assume the same status in the field diabetic foot practice where specialist treating this condition can use the scoring system like the above thereby standardizing the practice.

Understanding the Scoring System

Figure 1-19 are some examples of diabetic foot complications with possible scoring that helps one to understand how to score. The scoring system has both an initial scoring and later modification of the score after the surgery to arrive at a final scoring for predicting the risk of major amputation. A retrospective analysis of it also can be done if appropriate records are maintained.

It is essential that the treating surgeon should be treating most of the common cases of diabetic foot complications when analyzing the scoring system so that there is uniformity and no bias exist thereby confusing the scoring system. Patients with lesions predominantly in leg or thigh, sparing the foot, are not included in this scoring system.

This scoring system for the first time gives weightage to the surgeon and his speciality. Podiatric/Diabetic foot surgeons [surgeons with authentic training or work on diabetic foot or qualifications like DPM/Postdoctoral fellowships/diplomas or equivalent in field of Podiatric surgery] are scored 0 whereas all other surgeons are given a score of 2. Studies have shown that diabetic foot complications treated by the specialist podiatric surgeons/diabetic foot surgeons have an excellent outcome [11]. Infact, if one looks at the figures with examples, certain diabetic foot conditions if treated by the specialist surgeon can actually downstage the scoring system and reduces the risk of major amputation. This is quite important in today's scenario where huge number of doctors are being produce with substandard training [12, 13] and non authentic experience gained from poor/substandard medical colleges [14].



Figure 1. Scoring for this patient with non healing ulcer and slough is as follows – ulcer 6 + surgeon factor 2 = 8 which is low risk for major amputation. If there was underneath osteomyelitis then the score would be 8 + 6 = 14 which would place the patient under moderate risk for major amputation. Now if there is presence of moderate P.A.D, then score would be 18 which is high risk and if there is severe P.A.D, the score would be 22 which is very high risk for major amputation.



Figure 2. Showing a patient with ulcer over transmetatarsal stump. The scoring for this patient would be forefoot ulcer 2 + previous transmetatarsal amputation 4 + surgeon factor 2 = 8 which places him under low risk for major amputation.



Figure 3. Showing a patient with non healing ischemic ulcer [abi - 0.56]. His scoring would be mod P.A.D 4 + forefoot ulcer 2 + surgeon factor 2 + previous great toe amputation 2 = 10 which is low risk for major amputation.



Figure 4. The scoring would be - ulcer 6 + pus 3 + surgeon factor 2 = 11 moderate risk. If podiatric surgeon deals with it, then the score is 9, which means it becomes low risk for major amputation.



Figure 5. Showing a case of charcot foot with ulcer. Surgeon factor 2 + ulcer hindfoot 6 + charcot 6 = 14 moderate risk.



Figure 6. Showing a case s/p debridement and amputation. Note the wound is still infected. Surgeon factor 2 + forefoot amputation 4 + ulcer 6 = 12, rendering patient to moderate risk for amputation. Presence of pus makes it high risk that is 12 + 6= 18. Presence of O.M = 18 + 4 midfoot = 22. In such cases major amputation is almost for sure. If podiatric surgeon treats it, then also score is 20. It is high risk for major amputation, but salvage still possible with his expertise.



Figure 7. The scoring would be surgeon factor 2 + midfoot amputation 6 + ulcer 4 = 12, moderate risk amputation. If there is moderate P.A.D, then 4 = 16 which is high risk for amputation. If podiatric surgeon treats it then score is 14, that is foot becomes at moderate risk for amputation.



Figure 8. The scoring would be surgeon factor 2 + forefoot ulcer 2 + involvement of forefoot and midfoot charcot 4 = 8 , rendering it for low risk for major amputation. Presence of pus upto midfoot 4 = 12 renders to moderate risk amputation. Presence of even forefoot O.M 2 = 14 still renders him to moderate risk for major amputation. How ever presence of O.M in midfoot 4 = 16, renders it to high risk for major amputation.



Figure 9. Showing a patient with charcot foot and ulcer. His score would be midfoot charcot 4 + surgeon factor 2 + forefoot ulcer 2 = 8 which is low risk for major amputation. If there is presence of pus and underlying osteomyelitis the score would be 12 which would place him under moderate risk. If this case is managed by expert podiatric surgeon then it is down scored to 10, which means it would become low risk for major amputation.



Figure 10. Showing a patient with necrotising infection over the left foot. His score would be necrotic patch 4 + surgeon factor 2 + cellulitis 6 = 12 which is moderate risk. If treated by podiatric surgeon then it is downscored to 10 which renders it to low risk for major amputation. Presence of pus would render it to moderate risk for amputation even if treated by podiatric surgeon as score would become 12 [14 if other surgeons treats].



Figure 11. Showing a patient with forefoot gangrene and ulcer over midleg with pus. He had this for last 3 months. His score would be pus 6 + surgeon factor 2 + forefoot gangrene 2 + ulcer over leg 6 = 16 which is high risk for major amputation. If treated by podiatric surgeon, it is downscored to 14 which renders it to moderate risk for major amputation.



Figure 12. Scoring is surgeon factor 2 + ulcer 6 + expose ankle joint 4 + pus 6 = 18 high risk for major amputation. If O.M then 6 = 24. Almost requires amputation as it is very high risk case.



Figure 13. The scoring is surgeon factor 2 + gangrene 2 + ulcer 6 + cellulitis 6 = 16 high risk for major amputation. If treated by podiatric surgeon, then score would be 14, down scoring it to moderate risk for major amputation.



Figure 14. The scoring is surgeon factor 2 + amputation 2 + P.A.D 8 + ulcer 2 + smoking 2 = 16, rendering it to high risk for major amputation. Patient with this scoring has high risk for major amputation [50 - 75% amputation risk]. One should understand that this scoring is meant for all types of diabetic foot lesions and not isolated problems like this one. This is actually is not a diabetic foot. Patient is a chronic smoker with prolong history of claudication, having ileofemoral lesion. He was a known diabetic.



Figure 15. The scoring is surgeon factor 2 + midfoot amputation 6 + moderate P.A.D 4 + gangrene 4 + ulcer 4 + smoking 2 = 22. This foot is at very high risk for major amputation.



Figure 16. The scoring is surgeon factor 2 + smoking 2 + P.A.D 8 + Osteomyelitis 8 + ulcer 6 + gangrene 8 = 34, major amputation inevitable [100%].



Figure 17. The scoring is surgeon factor 2 + ulcer 4 + toe amputation 2 = 8. The foot is at low risk for major amputation.



Figure 18. The score is surgeon factor 2 + toe amputation 2 + P.A.D 8 + pus 4 + gangrene 2 + ulcer 4 + smoking 2 + forefoot joint exposure= 26. In this case major amputation is inevitable. Patient underwent major amputation.



Figure 19. The scoring for it is surgeon factor 2 + gangrene 2 + necrotizing infection 2 + cellulitis 2 = 8. Low risk for major amputation. This lesion looks very scary but has low major amputation rate.

Conclusion

Diabetic foot is a neglected entity both by physicians and the patients even today. Last decade has seen evolvement of the various newer concepts and techniques in the management of the diabetic foot. This new scoring system is one such new concept that will undoubtedly help in improvisation of diabetic foot practice. The validity of this new scoring system would be determined by future studies/trials. Being the first scoring system that includes all the common complications of diabetic foot, this scoring system definitely would have its important place in practice of diabetic foot, especially in underdeveloped and developing countries like the Indian subcontinent, where podiatric surgery is still not an established speciality even today and most of the concepts are taken from the west where it is an well established speciality.

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