



REVIEW ARTICLE

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Super modern diabetic foot surgery

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Abstract

Significant developments have taken place in field of diabetic foot over past few years. This was considered to be a neglected condition both by the patients and the treating clinicians. Owing to the fact that diabetic foot can lead to amputation which may cause debilitation of the patient, awareness of this condition has been on raise over past decade. Diabetic foot being a complex disease often has many difficulties in understanding it and also there have been treatment dilemmas. Recently, a new principle and practice was laid down for this condition from India, known as Amit Jain's system of practice, which is now the modern diabetic foot surgery. There has been addition of various new eponymous works by the author to this new system, thereby taking a leap into super modern diabetic foot surgery system. This brief article highlights on few of these new eponymous works of the author on super modern diabetic foot surgery.

Keywords: Diabetic foot, Amit Jain, modern, super, surgery, India

Introduction

It is projected that by 2045, there will be around 629 million people living with diabetes [1]. This chronic non communicable disease has become a major health problem around globe [2]. One such known complication of diabetes is diabetic foot, which is known multi-factorial in nature [3].

Treatment of diabetic foot is associated with high cost, apart from increased morbidity and mortality [4]. Studies have shown that the 5-year mortality of a new foot ulcer is 43 to 55% [5].

It is often believed that for a good outcome in diabetic foot, preventive strategies can play most important role. Often, multidisciplinary approach is advisable for favorable outcome [6].

One can observe that various new concepts have evolved in this field on different aspect of diabetic foot over past few years that have improved our understanding of this complex disease and also our approach towards it. One such new concept is the Amit Jain's principle and practice for diabetic foot [7]. This modern diabetic

foot surgery system was developed and pioneered by Amit Jain, a diabetic foot surgeon from India [8].

Table 1 shows various concepts of Amit Jain's system in this modern diabetic foot surgery. Recently, many more new concepts were added to this system, thereby this system had now taken a leap to super modern diabetic foot surgery [9]. The following are some of the eponymized new concepts of this super modern diabetic foot surgery [9].

Table 1. showing the modern diabetic foot surgery

SL no	Modern diabetic foot surgery
[1]	Amit Jain's universal classification for diabetic foot complications
[2]	Amit Jain's surgical scoring system for diabetic foot
[3]	Amit Jain's grading for debridement
[4]	Amit Jain's staging for cellulitis
[5]	Amit Jain's diabetic foot ulcer classification
[6]	Amit Jain's diabetic foot ulcer coding system
[7]	Amit Jain's screening tool (triple assessment)
[8]	Amit Jain's offloading system
[9]	Amit Jain's offloading classification
[10]	Amit Jain's diabetic foot laws

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Amit Jain's Linear Foot Test Scoring

In modern diabetic foot surgery system [8], a new screening tool known as Amit Jain's triple assessment for foot was proposed that addressed the triopathy in diabetic foot efficiently and it has 3 components namely the Look component, the Feel component and the Test component.

In further extension to this screening tool, a scoring and a coding

were added that today places them in the super modern diabetic foot surgery concept [9, 11]. According to this new scoring system, patients who had score of 0 & 1 belonged to low risk category and those with AJ score of 2 and 3 belonged to high risk category [12]. This scoring system (Table 2) was recently validated and it had sensitivity 100% [12]. In lines similar to TNM staging concept (Tumor, Node, Metastasis), the LFT screening tool (Linear Foot Test) can also be coded [11].

Table 2. Amit Jain's LFT Scoring

PARAMETERS	DESCRIPTION	SCORE	
LOOK	Any infection/ulcer or pre-ulcer causing pathologies like callus	No	0
		Yes	1
FEEL	Pulses of the foot –Palpable or not	Yes	0
		No	1
TEST	Sensation of the foot- Present or not	Yes	0
		No	1
Total Score is 3			

Amit Jain's Diabetic Foot Ulcer Scoring

A new scoring system was developed and added to the author's diabetic foot ulcer classification (SCC classification) and coding system (SAC). The minimum scoring is 3 and the maximum scoring is 9 [13]. Currently, a validation study is being done by author on this new screening system.

Amit Jain's Classification Of Problems In Diabetic Foot

This latest classification divides the problems in foot into 6 categories namely, preponderant, current, concurrent, recurrent, subsequent and supplement [14]. Table 3 shows the 6 categories and examples of the problems. Based on this classification, Amit Jain coined a term 'Diabetic Foot Storm' [15]. If the patient has any of the 5 problems or more, then he is considered to have gone through a diabetic foot storm [16,17].

Table 3. Amit Jain's classification of problems in diabetic foot

Categories of problems	Type	Examples
Category 1	Preponderant	Diabetes mellitus
Category 2	Current	Abscess, Gangrene, Ulcer, etc
Category 3	Concurrent	Hypertension, Ischemic heart disease, Chronic kidney disease, etc
Category 4	Recurrent	Re-amputation, Re-ulceration, Re-admissions, etc
Category 5	Subsequent	Mortality, Major amputations, etc
Category 6	Supplement	Loss of job, Financial issues, etc

Amit Jain's Diabetic Foot Surgery Classification

This is the new classification for diabetic foot surgeries [18]. This is classification is based on the author's 'SCC' classification system [19]. This descriptive classification divides surgeries in the foot

into 3 categories as shown in Figure 1. Category 1 surgeries consist of simple procedures like debridement, amputation skin grafting, etc. Category 2 consists of complex procedures like osteotomies, arthroplasties, etc. Category 3 consists of complicated procedures like bypass procedure, arthrodesis, etc [19]. Studies are being conducted by the author on this new classification.

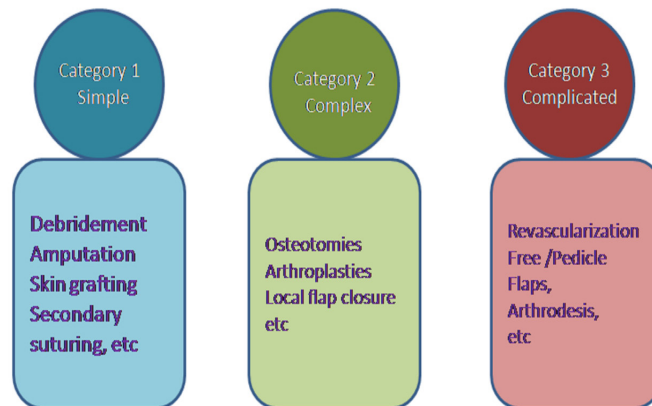


Figure 1. Amit Jain's Diabetic foot surgery classification

Amit Jain's Rule Of '3' For Diabetic Foot

This new rule proposed by the author consists of all the common 3's seen in diabetic foot [20]. This is an open rule wherein any new '3's in diabetic foot (Table 4) can be added in this rule of '3' [21]. This is one of the largest rules in medicine [21,22].

Amit Jain's Diabetic Foot Pentagon

This new innovative acronym, which is an excellent teaching model, was recently proposed by the author [23]. It serves as a simple, easy to remember teaching tool that briefly covers entire framework of diabetic foot [24]. Here, P stands for pathology, E- Etiology, N-Novel dressings, T- Therapeutic footwear, A-Amputations, G- General condition, O-Offloading, N-Never give up [23].

Table 4. Amit Jain's rule of 3

"3" cuneiform bones
"3" phalanx in lesser toes
"3" arches in the foot
"3" parts of foot
"3" plantar interossei
"3" muscles in 3rd layer of foot
"3" major form of foot
"3" main leg arteries supply foot
"3" main causes (Triad)
"3" neuropathy (Sensory, Motor, Autonomic)
"3" components in Amit Jain's screening (Triple assessment)
"3" main types of diabetic foot complications (Amit Jain's Type 1, Type 2, Type 3 complications)
"3" sites for abscess (Dorsum, Plantar, Interdigital)
"3" types of gangrene (Wet gangrene, Dry gangrene, Gas gangrene)
"3" common bone problems (Osteomyelitis, Toe deformities, Charcot foot)
"3" common sagittal plane lesser toe deformities (Hammer toe, Claw toe, Mallet toe)
"3" new classes of ulcers (Amit Jain's Class 1, Class 2, Class 3 diabetic foot ulcers)
"3" components in Amit Jain's ulcer coding (Size, Anatomical area, Class)
"3" components in Amit Jain's debridement classification (Grading, Extent, Repetition)
"3" commonest amputation done (Toe amputation, Transmetatarsal, Below knee amputation)
"3" types of offloading (Amit Jain's Type 1, Type 2, Type 3)
"3" monthly follow up (At risk foot)
"3" laws in diabetic foot (Amit Jain's law's)
"3" types of diabetic foot Classifications
"3" arthrodesis in diabetic Charcot foot (Triple arthrodesis)
"3" types of callus (Amit Jain's Type 1, Type 2, Type 3)
"3" types of Charcot foot (Amit Jain's Type 1, Type 2, Type 3)
"3" classes of toe deformities (Amit Jain's Type 1, Type 2, Type 3)
"3" types of foot amputations (Amit Jain's Type 1, Type 2, Type 3)
"3" types of Diabetic footwear (Amit Jain's Type 1, Type 2, Type 3)
"3" Categories of Diabetic foot surgeries (Amit Jain's Category 1, Category 2, Category 3)

Amit Jain's 'Diabetic Foot' Acronym

This is new simple acronym, which is easy to remember, consist of all lesions seen in diabetic foot [24,25]. It is believed to be one of the conditions in surgical field wherein the acronym is formed on the disease itself (Table 5) where the letters of acronym represent the pathological lesions seen in the condition [24].

Table 5. Amit Jain's DIABETIC FOOT acronym

D	Dry gangrene
I	Infective gangrene
A	Abscess
B	Bullosis diabeticorum
E	Erysipelas, Entrapment neuropathy
T	Trophic ulcer
I	Ischemic ulcer
C	Cellulitis, Callus, Clostridial myonecrosis
F	Flesh eating disease, Fungal infections
O	Osteoarthropathy (Neuropathic)
O	Osteomyelitis
T	Toe deformities (Hammer, Claw, Mallet, etc)

Amit Jain's Extended Scc Classifications

The author had expanded and extended the 'SCC' classification that was initially applied to diabetic foot ulcer [19]. It was subsequently applied to Charcot foot, callus, toe deformities, therapeutic footwear, etc [19,26]. Distinct original studies were conducted on them subsequently [27-30].

Amit Jain's Destructive/Amputation Ladder

Akin and antonymous to reconstructive ladder and its variant is the Amit Jain's destructive ladder (Figure 2) and its variants [31]. This ladder is for limb amputation and provides variety of options available. It is always advisable to prefer as distal rung as possible in this ladder for successful limb salvage and one should climb the ladder only when one cannot achieve the salvage [31]. The variants to the amputation ladder are the elevator, amputation pyramid, clock, etc [31].

**Figure 2.** Amit Jain's Destructive/Amputation Ladder

Amit Jain's Triangles For Diabetic Foot

The author had proposed various new eponymous triangles for diabetic foot, many of which serve as excellent teaching tool and few of them guide in management of the particular conditions. Some of the well known triangles the author had proposed were triangle of foot amputation, triangle of offloading, triangle of therapeutic footwear, etc [31,32]. Recently, the author also proposed triangle of diabetic foot ulcer classification (Figure 3) and triangle of diabetic foot screening [11,13].

Amit Jain's Triangle of ulcer classification

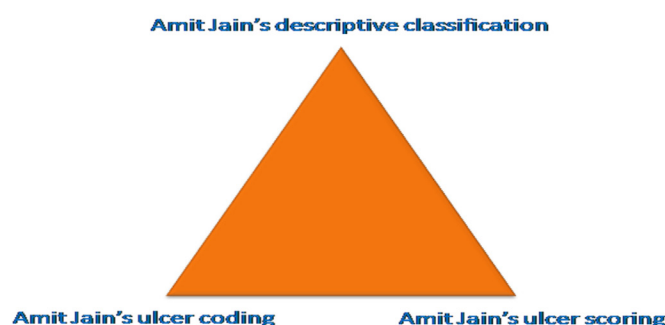


Figure 3. Amit Jain's Triangle of Diabetic foot ulcer classification

Amit Jain's Quote For Diabetic Foot

One of the popular quotes of the author for diabetic foot was obtained from the 'SCC' classification [20]. It is as follows- *"Diabetic foot is a complex disease with many complications and every effort should be made to understand and treat it in as simple way as possible"* [20].

This SCC concept quote was extended to hernia [20] and can be used for hemorrhoids also, these 2 being common surgical conditions.

Conclusion

Excellent advances have taken place in diabetic foot field. Amit Jain's system of practice for diabetic foot, which is a Modern diabetic foot surgery system, is one such new advance. Addition of various newer concepts has made his new system to leap into super modern diabetic foot surgery system.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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