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Research Article

Studying major amputations in a developing country using Amit Jain's typing and scoring system for diabetic foot complications - time for standardization of diabetic foot practice

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ABSTRACT

Background: Aim of current study was to analyse major amputation occurring in patients with diabetic foot complication through the new principle and practice of diabetic foot.
Methods: A 5 year retrospective study was done in a single surgical unit in department of surgery of St John's medical college, Bangalore, India.
Results: 26 patients were included in this study. 76.9% of the patients who underwent major amputation had type 1 diabetic foot complications. Infected ulcers were the most common cause for major amputation. Most patients who underwent major amputation had a score ranging from 16-20. 11.54% of the patients who underwent major amputation had osteomyelitis with type 3C diabetic foot osteomyelitis being most common.
Conclusions: This unique study for the first time utilizes the new Amit Jain's principle and practice of diabetic foot to study major amputation in diabetic foot. Majority of the patients who undergo major amputation in India has type 1 diabetic foot complication. Most of the patients undergoing major amputation belongs to the high risk category for major amputation.

Keywords: Diabetic foot, India, Major amputation, Scoring

INTRODUCTION

It is estimated that around 347 million people in the world are diagnosed with diabetes mellitus.[1] Indian is one of the country with very high prevalence of diabetes in the world which is predicted to increase to 120.9 million by 2030.[2] It is estimated that approximately 23.6 million people in United States have diabetes mellitus.[3] It is predicted that 1 in 3 American adults will have diabetes by 2050.[4] Diabetes affect 3% of the UK population.[5]

Diabetic foot is one of the most common and distressing complication of diabetes. This devastating complication has major medical, social and economic consequences.[5] Around 15% of diabetic patients will develop foot ulcer during their life time.[6]

Around 6% of hospital admission in people who have diabetes are related to foot ulcers.[7] Every year 5% of the patients with diabetes will develop a foot ulcers.[5] Foot ulcers are known to carry a 25% risk of major amputation. Diabetic foot ulceration is known to precede amputation in 85% of the cases.[8]

Around 40% of the patients presenting to hospital with diabetic foot will require some form of amputation.[9] In

fact in one of the study by Jain et al, around 51.09% of the patients admitted with diabetic foot problems, will require some form of amputation.[10]

In another study from Tanzania [11], around 56.7% of the patients required some form of lower limb amputation.

Major amputations, which is often considered to be an end result of diabetic foot complication, is an unfortunate event in life of a diabetic patient.

It is estimated that approximately 45000 lower limbs are amputated every year in India[11] and the vast majority of these are probably preventable.[11]

This study for the first time aims at analysing major amputation in diabetic foot using the author's new principle and practice of diabetic foot consisting of typing, scoring (Table 1 & 2) etc. that would improvise and standardize the practice of diabetic foot around the developing and under developed country.[12,17]

Table 1: Showing Amit Jain's classification of diabetic foot complications.

Type of complications	Lesions
Type 1 (Infective)	Cellulitis, necrotizing fasciitis, wet gangrene, abscess, etc.
Type 2 (Non-infective)	Non healing ulcers, peripheral arterial disease, entrapment neuropathies, diabetic neuro-osteoarthropathy, etc.
Type 3 (Mixed)	Example - non healing ulcer with osteomyelitis

Table 2: Showing the new Amit Jain's scoring of diabetic foot complication.

Characteristics	Involvement of foot			
Presence of ulcer	No ulcer → 0	Forefoot ulcer → 2	Midfoot ulcer → 4	Hindfoot ulcer/ full foot → 6
Osteomyelitis (O.M)	No O.M → 0	Forefoot O.M → 2	Midfoot O.M → 4	Hindfoot O.M → 6
Presence of pus	No pus → 0	Forefoot pus/dorsum → 2	Midfoot pus → 4	Hindfoot pus/beyond it → 6
Gangrene (dry/wet)	No gangrene → 0	Forefoot gangrene → 2	Midfoot gangrene → 4	Hindfoot gangrene/beyond → 8
Peripheral arterial disease	No P.A.D → 0	Mild → 2	Moderate → 4	Severe → 8
Charcot foot	No → 0	Forefoot → 2	Midfoot → 4	Hindfoot/whole foot → 8
Necrosis (skin)	No → 0	Forefoot necrosis → 2	Midfoot necrosis → 4	Hindfoot necrosis/beyond → 8
Associated cellulitis	No → 0	Upto forefoot → 2	Upto midfoot → 4	Upto hindfoot & beyond → 6
Previous amputation	No → 0	Toe amputation → 2	Forefoot amputation → 4	Midfoot amputation → 6
Presence of gas - radiologically	No → 0	Gas in forefoot → 1	Gas in/upto midfoot → 2	Gas in/upto hindfoot → 3
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
Joint involvement	No → 0	Forefoot joint exposure → 2	Midfoot joint exposure → 4	Hindfoot joint exposure → 6
Septic shock	No → 0		Present → 2	Septic shock
Renal failure	No → 0		Present → 2	Renal failure
Smoking (heavy smoker)	No → 0		Present → 2	Smoking (heavy smoker)
Surgeon factor	Qualified podiatric/diabetic foot specialist → 0		Other surgeons → 2	Surgeon factor

METHODS

This retrospective study was carried over 5 years from Jan 2009 to Dec 2013 in a single surgical unit of department of surgery of St John's medical college, Bangalore, which is a tertiary care premiere medical college of high repute in the country that treats patients from more than 4 different states in India. The following were inclusion and exclusion criteria.

Inclusion criteria

1) All major amputation done in diabetic foot patients in surgical unit 3 during this period

Exclusion criteria

1) Major amputation done in other surgical unit
2) Major amputation done in non-diabetics
3) Major amputation in trauma patients
4) Patients with incomplete records

RESULTS

26 patients out of 40 were included in this study as they filled the inclusion and exclusion criteria.

20% patients (76.92%) were males and 6 patients (23.08%) were females. The average age of males was 55 years with a range from 35-85 years whereas the average age for females was 66.33 years with a range of 59-85 years.

A total of 27 major amputation were done in 26 patients. 25 patients (96.15%) had unilateral major amputation whereas one patient had bilateral amputation (3.85%).

Majority of the patients (76.9%) with major amputation had type 1 diabetic foot complications. One patient (3.85%) had type 2 diabetic foot complication and 5 patients (19.23%) had type 3 diabetic foot complication (Table 3).

Table 3: Showing distribution of major amputation according to the Amit Jain's classification diabetic foot complication.

Type of diabetic foot complication	Number	Percentage
Type 1 diabetic foot complication	20	76.9%
Type 2 diabetic foot complication	01	3.85%
Type 3 diabetic foot complication	05	19.23%
Total	26	100%

Below knee amputation (77.78%) was the most common major amputation followed by above knee amputation (18.52%). One patient had hip disarticulation (3.7%). 2 patients (7.4%) with below knee amputation were converted to above knee amputation (Table 4).

Table 4: Showing distribution of cases according to the type of amputation.

Type of major amputation	Number	Percentage
Below knee amputation	21	77.78%
Above knee amputation	05	18.52%
Hip disarticulation	01	3.7%
Total	27	100%

Infected ulcer/non healing ulcers (53.85%) was the most common cause for major amputation (Table 5) in our study followed by gangrene (15.38%). 3 patients had osteomyelitis (11.54%) out of which 2 patients had type 3C and one patient had type 2D osteomyelitis.

Majority of the patients (34.62%) with major amputation had a score ranging from 16-20 belonging to the high risk category followed by 7 patients (26.92%) having a score ranging from 21-25 thereby belonging to very high risk category (Table 6). 6 patients (23.07%) had stump complications.

Table 5: Showing distribution of cases according to the type of lesion.

Lesion	Number	Percentage
Infected ulcer/non healing ulcer	14	53.85%
Gangrene	04	15.38%
Osteomyelitis	03	11.54%
Necrotizing fasciitis	02	07.69%
Gas gangrene	01	03.85%
Charcot foot	02	07.69%
Total	26	100%

Table 6: Showing the distribution of cases according to Amit Jain's scoring for predicting the risk for major amputation.

Risk of major amputation	Number	Percentage
Low risk	03	11.54%
Moderate risk	02	07.69%
High risk	09	34.62%
Very high risk	07	26.92%
Amputation almost inevitable	05	19.23%
Total	26	100%

2 patient had Charcot foot (infected) and there scores were 10 and 22. 2 patients out of 5 belonging to type 3 diabetic foot complications had underlying peripheral arterial disease (Figure 1).

There was one mortality (3.85%) occurring in above knee amputation and this patient had a score of 22, belonging to very high risk category.

Figure 1: Showing non healing ulcer (ischaemic) in a diabetic along with gangrene affecting left foot s/p debridement and amputation done elsewhere. The current score for this patient is 22 (ulcer 4 + gangrene 4 + osteomyelitis 2 + previous toe amputation 2 + severe peripheral arterial disease 8 + smoking 2). This patient belonged to a very high risk for major amputation and underwent the below knee amputation. Whether treated by specialist (score 22) or non-specialist (score 24), the patient belongs to a very high risk category according to Amit Jain's scoring.

DISCUSSION

Amputation is a marker not just of disease but also of disease management.[18] Individuals with diabetes have 30 fold higher lifetime risk of underlying lower extremity amputation compared to those without diabetes.[19] The risk of lower extremity amputation increases by a factor of 8 once an ulcer develops.[20] The most important factors related to development of foot ulcers are peripheral neuropathy and foot trauma. The other component is impaired wound healing related to reduced blood flow.[21]

The rate of major amputations varies from 9-24% in literature.[19] In India, various studies shows that major amputation ranges from 10.5% to 48%.[9,22,23]

In Suliman et al. series,[24] 74% had below knee amputation which was the commonest major amputation. In our study also below knee amputation was the most common amputation.

In India, the most common cause for both major and minor amputation was found to be infection in as many as 90% of the cases.[25] In one of the limb salvage centre of India,[22] the most common cause for Below knee amputation was non healing ulcers in 29.41% cases whereas 20.6% of patients with above knee amputation had necrotising fasciitis.[22]

In this study, type 1 diabetic foot complication were the most common cause for major amputation.

The unique aspect of this study was assessing the major amputation using the Amit Jain's scoring system for diabetic foot complication. Most major amputation were done in patients with score of 16 and above and less than 20% of major amputation were done in patients with scores less than 16.

The mortality in this series was low (3.85%) whereas the early mortality in literature is stated to be 20% or above.[26] The reason for this low mortality could be our small sample size and also we studied the patients only during their hospitalization during major amputation.

CONCLUSION

Most of the major amputation occurs in type 1 diabetic foot complication accounting for 76.9% of the cases. Infected/non healing ulcer (53.85%) was the most common cause for major amputation followed by gangrene. Simultaneous bilateral amputation is required in 3.85% of the patients. Around 7.4% of cases required conversion of major amputation from below knee to above knee amputation. Majority of our amputation were done in patients with score in between 16-20 thereby belonging to high risk category. 11.54% had underlying osteomyelitis out of which type 3C was the commonest type of diabetic foot osteomyelitis as per Amit Jain's classification of diabetic foot osteomyelitis. 3.85% of the patients had mortality in this study and it had a score of 22, which belongs to high risk for major amputation category.

This study of major amputation in diabetic foot is the first of its kind that utilizes a new classification system for its detailed analysis thereby improving and standardizing the diabetic foot practice.

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REFERENCES

1. Singh S, Pai DR, Yuhnui C. Diabetic foot ulcer-Diagnosis and management. Clin Res Foot Ankle. 2013;1:3.
2. Blount MH, Cullen M, Nester CJ, William AE. The assessment and management of diabetes related lower limb problems in India: an action research approach to integrating best practice. J Foot Ankle Res. 2014;7:30.
3. Pino AE, Taghva S, Chapman C, Bowker JH. Lower limb amputations in patients with diabetes mellitus. Orthopedics. 2011;34(12):885-92.
4. Dipreta JA. Outpatient assessment and management of the diabetic foot. Med Clin N Am. 2014;98:353-73.
5. Shah SF, Hammed S, Khawaja Z, Abdullah T, Waqar SH, Zahid MA. Evaluation and management of diabetic foot: a multicentric study conducted at Rawalpindi, Islamabad. Ann Pak Inst Med Sci. 2011;7(4):233-7.
6. Shahi SK, Kumar A, Kumar S, Singh SK, Gupta SK, Singh TB. Prevalence of diabetic foot ulcer and associated risk factors in diabetic patients from North India. J Diab Foot Comp. 2012;4(3):83-91.
7. Plummer ES, Albert SG. Diabetic foot management in the elderly. Clin Geriatr Med. 2008;24:551-69.
8. Clayton W, Elosy TA. A review of the pathophysiology, classification and treatment of foot ulcers in diabetic patients. Clin Diabetes. 2009;27(2):52-8.
9. Singh G, Chawla S. Amputation in Diabetic Patients. Med J Armed Forces India (MJAFI). 2006;62:36-9.
10. Jain AKC, Viswanath S. Distribution and analysis of diabetic foot. OA Case Rep. 2013;2(21):117.
11. Pendsey S. Clinical profile of diabetic foot in India. Int J Low Extrem Wounds. 2010;9:180-4.
12. Jain AKC. A new classification of diabetic foot complications: a simple and effective teaching tool. J Diabet Foot Comp. 2012;4(1):1-5.
13. Jain AKC, Joshi S. Diabetic foot classifications: review of literature. Med Sci. 2013;2(3):715-21.
14. Jain AKC. The new scoring system for predicting the risk of major amputations in patient with diabetic foot complication. Med Sci. 2014;3(1):1068-78.

15. Jain AKC. A new classification (Grading system) of debridement in diabetic lower limb. An improvisation and standardization in practice of diabetic lower limb salvage around the world. Med Sci. 2014;3(1):991-1001.
16. Jain AKC. A new classification of diabetic foot osteomyelitis. OA Case Rep. 2013;2(3):121.
17. Kalaivani V, Vijayakumar HM. Diabetic foot in India- Reviewing the epidemiology and the Amit Jain's classifications. Sch Acad J Biosci. 2013;1(6):305-8.
18. Jeffcoate WJ, Harding KG. Diabetic foot ulcers. Lancet. 2003;361(9368):1545-51.
19. Adam MA, Hamza AA, Ibrahim AE. Diabetic septic foot in Omdurman teaching hospital. Sudan JMS. 2009;4(2):129-32.
20. Ngim NE, Ndifon WO, Udosen AM, Ikpeme IA, Isiwele E. Lower limb amputation in diabetic foot disease: experience in a tertiary hospital in Southern Nigeria. Afr J Diabetes Med (AFDM). 2012;20(1):13-5.
21. Eskelinen E, Eskelinen A, Alback A, Lepantalo M. Major Amputation incidence decreases both in non-diabetic and in diabetic patients in Helsinki. Scand J Surg. 2006;95:185-9.
22. Jain AKC, Varma AK, Mangalanandan, Kumar H. Major amputation in diabetes: an experience from diabetic limb salvage centre in India. J Diabet Foot Comp. 2012:4(3):63-6.
23. Solanki K, Parmar H, Gohil K, Shah S. The surgical management of diabetic foot. NJIRM. 2010;1(4):40-2.
24. Suliman MO, Slim OEFH, Ahmed ME. Major lower limb amputation in diabetics. Khartoum Med J. 2012;5(1):694-8.
25. Viswanathan V, Kumpatla S. Pattern and causes of amputation in diabetic patients: a multicentric study from India. J Assoc Physicians India. 2011;59:1-7.
26. Robert WZ, Frank TP, Brajesh KL, Peter JP. When is a more proximal amputation needed? Clin Pod Med Surg. 2005;22:429-46.

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