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Original Research Article

Analysis of the ipsilateral and the contralateral foot in patients admitted with diabetic foot complication through Amit Jain's triple assessment for foot in diabetes

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ABSTRACT

Background: Diabetic foot is a well-known complication of diabetes. The aim of this study was to determine the foot evaluation done in surgical patients admitted with diabetic foot problems and to distribute the components of evaluation through Amit Jain's triple assessment for foot in diabetes.
Methods: A descriptive retrospective analysis was carried out in Department of Surgery of Rajarajeswari Medical College, Bangalore, India. The study was approved by Institutional ethics committee.
Results: 50 inpatients files of surgery patients were reviewed. Majority of patients were males. The most common diagnosis was non-healing ulcer affecting 34% of patients. Around 26% of patients had diagnosis written as just Diabetic Foot without mentioning the pathological lesion. 38% of patients didn't have duration of diabetes mellitus mentioned in records. Although 94% of patients had ipsilateral foot examined, the component distribution like feeling the peripheral pulses and testing sensation for neuropathy was only 42% and 2%. The contralateral foot was examined in only 2% of patients.
Conclusions: Diabetic foot is often neglected by patients and health care professionals. This study that analyzes diabetic foot evaluation through Amit Jain's triple assessment for foot shows that although the ipsilateral foot is inspected in 94% of the patients, only 42% patient's pulses were assessed and only 2% patients' sensation were tested. The contralateral foot wasn't examined in 98% of patients. Amit Jain's triple assessment should be considered a minimum and mandatory evaluation tool for all patients with diabetic foot.

Keywords: Amit Jain, Amputation, Diabetic foot, Triple assessment, Wet gangrene

INTRODUCTION

Diabetic foot is a well-known complication of diabetes.[1] The foot problems in diabetes is known to add economic burden due to excessive expenditure on treatment, loss of productivity, frequent recurrence of the problem and high amputations.[2,3] Diabetic foot as a whole is a triad of neuropathy, infection and ischemia.[4-6] Foot ulcers and other complications in foot are common and are associated with increased morbidity and mortality.[7] In fact, it is estimated that 15 to 20% of diabetic patients will develop an ulcer during their lifetime.[7] Around 56% of diabetic foot ulcers get infected and many of them will end up in some type of lower extremity amputation.[4,9] The plantar ulcers on foot are usually chronic condition affecting the foot. To add the problem are the acute diabetic foot problems like cellulitis, abscess, wet gangrene, etc which are Amit Jain's type 1 diabetic foot

complications.[10] Various recent studies have shown that type 1 diabetic foot complications are more commonly seen in hospitalized patient and are more common cause of amputation.[11-14]

It is thus possible to reduce the foot problems in diabetes patient by regular examination of the feet by the health care professional be it a doctor or a nurse.[15] However, it doesn't happen in practice as suggested. There are data which showed that diabetic foot was adequately evaluated only in 12 to 20% of the time, which means that in 80% of cases foot weren't evaluated properly.[7,16]

We thus conducted this study to determine the foot evaluation done in surgical inpatients admitted with diabetic foot problems by the treating surgeons and also to distribute the components of the evaluation through Amit Jain's triple assessment for foot in diabetics that is considered to be the simplest minimum evaluation tool in diabetic foot.[4,10,16]

METHODS

A descriptive retrospective analysis was done in Department of Surgery at Rajarajeswari Medical College, a tertiary care teaching hospital, Bangalore, India. The following were inclusion and exclusion criteria

Inclusion criteria

- All diabetic foot patients admitted in surgical ward by department of surgery
- Patients operated outside and admitted under surgery department for further management.

Exclusion criteria

- Diabetic foot patients admitted in other department
- Diabetic foot patients admitted in ICU
- Patient with Type 1 diabetes
- Files of inpatients that were not traceable
- Diabetic foot patients with inpatient mortality.

Data analysis[17-20]

Data was analysed using statistical software SPSS 18.0 and R environment Ver.3.2.2. Microsoft word and excel were used to general graphs and tables.

The descriptive and inferential statistical analyses were carried out in this study. Results on continuous measurements are presented on Mean±SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumption on data is made.

Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random. Cases of the samples should be independent.

Chi-square/Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small.

Significant figures

- +Suggestive significance (P value: 0.05<P<0.10)
- *Moderately significant (P value: 0.01<P ≤ 0.05)
- **Strongly significant (P value: P≤0.01).

This study was approved by our institution ethics committee.

RESULTS

A Total of 50 patients were included in this study. There were 35 males (76%) and 12 females (24%) (Figure 1).

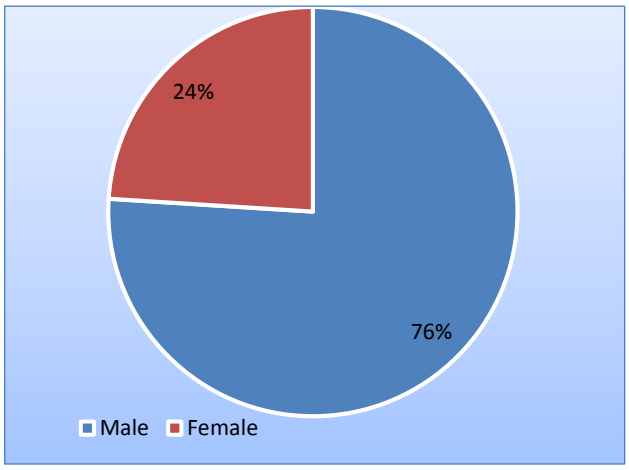

Figure 1: Gender distribution of patients studied.

Majority of the patients (90%) were between 40 to 70 years of age (Table 1). Only 6% of patients were less than 40 years old and 4% of them were above 70 years of age.

Table 1: Age distribution of patients studied.

Age in years	No. of patients	%
<40	3	6.0
40-50	15	30.0
51-60	15	30.0
61-70	15	30.0
71-80	2	4.0
Total	50	100.0

The left foot (Table 2) was involved in 28 patients (56%) whereas 22 patients (44%) were having the right foot involved.

21 patients (42%) had diabetes mellitus of less than 10 years duration. Around 38% of the patients didn't have duration of diabetes mentioned in the case file (Figure 2).

16 % of patients had diabetes between 10 to 20 years and 4% of patients had diabetes of more than 20 years duration.

Table 2: Side distribution of patients studied.

Side	No. of patients	%
Right	22	44.0
Left	28	56.0
Total	50	100.0

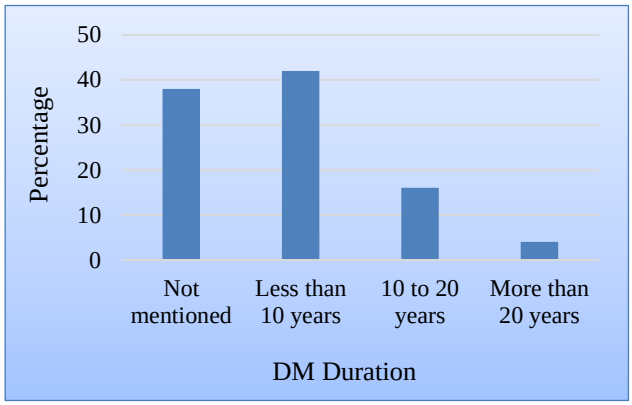

Figure 2: DM Duration distribution of patients studied.

The most common diagnosis that was entered in the file was non-healing ulcer accounting for 34% (Table 3). In 26% of the cases, the diagnosis that was entered was just "Diabetic foot" without mentioning the pathological lesion. Wet gangrene was present in 18% of cases whereas dry gangrene was present in only 6% of cases.

Table 3: Diagnosis distribution of patients studied.

Diagnosis entered in case files	No. of patients	%
Diabetic foot	13	26.0
Wet gangrene	9	18.0
Abscess	6	12.0
Non-healing ulcer	17	34.0
Cellulitis	2	4.0
Dry gangrene	3	6.0
Total	50	100.0

Table 4: Surgical procedures done on diabetic foot patients.

Surgery	No. of patients	%
Debridement	23	46.0
Toe amputation	17	34.0
TMT	4	8.0
BKA	2	4.0
AKA	3	6.0
SSG	1	2.0
Total	50	100.0

The commonest surgical procedure (Table 4) done was debridement (46%) followed by toe amputation (34%). 10% patients had major amputation (below knee amputation + above knee amputation).

Table 5: Amputation (minor + major) distribution of patients studied.

Amputation done	No. of patients	%
Yes	26	52.0
No	24	48.0
Total	50	100.0

The overall amputation (minor and major) accounted for 52% of the cases (Table 5). Wet gangrene was the most common cause of amputation accounting for 34.62% (Table 6, P = 0.013*).

Table 6: Distribution of diagnosis in relation to amputation done.

Diagnosis	Amputation done		Total (n=50)	P valu
	Yes (n=26)	No (n=24)		
Diabetic foot	3 (11.54%)	10 (41.67%)	13 (26%)	0.013*
Wet gangrene	9 (34.62%)	0 (0%)	9 (18%)	
Abscess	4 (15.4%)	2 (8.3%)	6 (12%)	
Non-healing ulcer	7 (26.9%)	10 (41.7%)	17 (34%)	
Cellulitis	0 (0%)	2 (8.3%)	2 (4%)	
Dry gangrene	3 (11.5%)	0 (0%)	3 (6%)	

*Significant

Of the 50 in-patients, the same side foot (ipsilateral) was examined (Figure 3) in 47 patients (94%) whereas the opposite foot (contra lateral) was evaluated in just 2% of the cases with 98% of patient's contra lateral feet going unexamined (Figure 4).

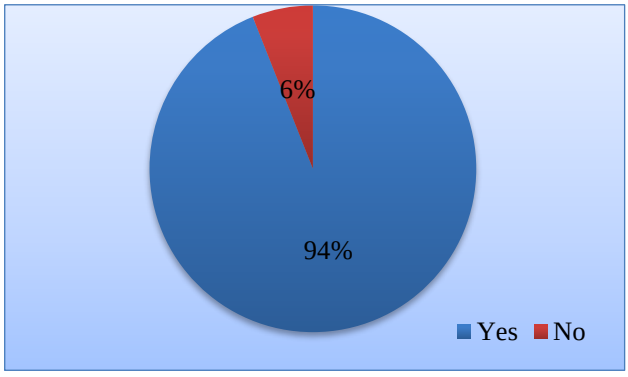

Figure 3: Distribution of patients having ipsilateral foot examined.

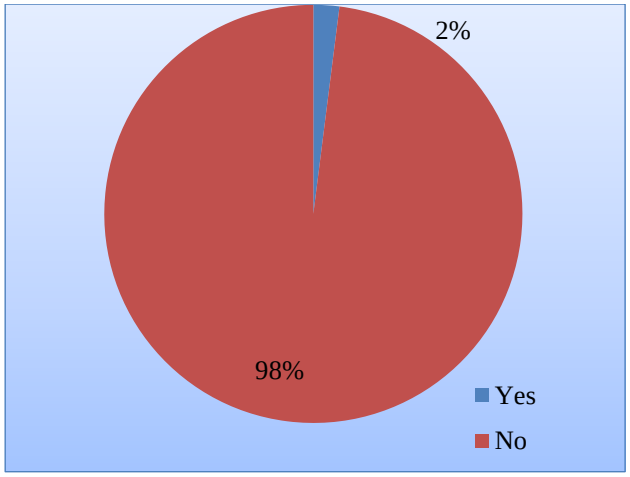

Figure 4: Distribution of patients having contralateral foot examined.

In component distribution of evaluation of the ipsilateral foot (Table 7), 94% of the affected foot had some inspection findings (look component) whereas 6% of the cases there was no inspection findings. Only 42% of the ipsilateral foot had at least one of the pulses checked (feel component) whereas 58 % of cases had no records of any foot pulses and only 2% of the patient's ipsilateral foot sensation were tested or documented (test component) with 98% of cases having no record about sensation of the foot.

Table 7: Distribution of components of examination on Ipsilateral side of foot.

Ipsilateral	No. of patients (n = 50)	%
Look		
Yes	47	94.0
No	3	6.0
Feel		
Yes	21	42.0
No	29	58.0
Test		
Yes	1	2.0
No	49	98.0

There was no statistical significance (Table 8) in regard to whether ipsilateral foot was examined in patients with amputation in comparison to those who didn't have amputation (P = 1.000).

Table 8: Same side foot examined in relation amputation done.

Ipsilateral foot examined	Amputation done		Total
	Right	Left	
Yes	24 (92.3%)	23 (95.8%)	47 (94%)
No	2 (7.7%)	1 (4.2%)	3 (6%)
Total	26 (100%)	24 (100%)	50 (100%)

P = 1.000, Not significant, Fisher Exact test

On the opposite foot (contra lateral foot), only 1 patient (2%) foot had some inspectory findings (look component) and one patients contra lateral foot had the pulse checked (feel component).

None of the contra lateral foot had sensation checked or documented (test component) (Table 9).

Table 9: Distribution of components of examination on contra lateral side of foot.

Contra lateral	No. of patients (n = 50)	%
Look		
Yes	1	2.0
No	49	98.0
Feel		
Yes	1	2.0
No	49	98.0
Test		
Yes	0	0.0
No	50	100.0

Table 10: Ipsilateral look in relation to contra lateral look of patients studied.

Ipsilateral look	Contra lateral look		Total
	Yes	No	
Yes	1 (100%)	46 (93.9%)	47 (94%)
No	0 (0%)	3 (6.1%)	3 (6%)
Total	1 (100%)	49 (100%)	50 (100%)

P = 1.000, Not significant, Fisher Exact test

Table 11: Ipsilateral feel in relation to contra lateral feel of patients studied.

Ipsilateral feel	Contra lateral feel		Total
	Yes	No	
Yes	1 (100%)	20 (40.8%)	21 (42%)
No	0 (0%)	29 (59.2%)	29 (58%)
Total	1 (100%)	49 (100%)	50 (100%)

P = 0.420, Not significant, Fisher Exact test

Table 12: Ipsilateral test in relation to contra lateral test of patients studied.

Ipsilateral test	Contra lateral test		Total
	Yes	No	
Yes	0 (0%)	1 (2%)	1 (2%)
No	0 (0%)	49 (98%)	49 (98%)
Total	0 (0%)	50 (100%)	50 (100%)

P = 1.000, Not significant, Fisher Exact test

There was no statistical significance in regard to Ipsilateral foot being Look (Table 10) in relation to contra lateral look (P = 1.000), ipsilateral feel (Table 11) in relation to contra lateral Feel (P = 0.420) and ipsilateral test (Table 12) in relation to contra lateral test (P = 1.000).

DISCUSSION

Diabetic foot problems are frequent cause of lower limb amputation and a good foot care and foot examination are important preventive strategies for complications and amputations.

Various studies have shown that foot care among diabetes were inadequate.[21] Further, the foot examination by health care professional also has been poor. Of the various factors in diabetes care, the foot examination was found to be the least with only 22% having been examined.[3]

In one survey in Canada, it was seen that only 40% of patients (4 in 10) reported having their feet examined by a doctor less than once a year.[21] In another study from Asia, around 61.9% of patients said that their feet were never examined by physician or a nurse. In another study from Africa, only (27.5%) of patients reported their feet being examined by a doctor.[6,22]

It is well known that physician's encounter diabetic foot problems in earlier stage as compared to surgeons who are often found to admit these diabetic foot patients presenting in later stages.[8] Hence it becomes imperative for them to evaluate foot thoroughly.

The author divided the evaluation tool in diabetic foot into screening and examination.[10] The commonly available methods are In low's 60 second tool, 3 minute examination, etc.[10] Amit Jain's triple assessment for foot in diabetes is one such evaluation too from India. Amit Jain's triple assessment has 3 components namely the LOOK, FEEL and TEST that basically addresses the triad of diabetic foot namely infection, ischemia and neuropathy effectively.[4,10,16]

This evaluation is the most simple, basic, practical and easy to remember tool that can be used by any healthcare professional. The advance triple assessment can be done by the specialist.[10]

In this study, we found that affected foot was inspected in 94% of the cases. However, 58% of the affected foot pulses were not checked and in 98% of cases neuropathy assessment was not done. In a study by Ismail et al done on inpatient hospitalization for diabetic foot, the examination of foot pulses and sensation was found to be quite poor like that in the present study. It was seen in Ismail et al study that none of the inpatients foot were evaluated for neuropathy and only 6 out of 24 had peripheral pulses documented.[23]

Present study also found that many patients diagnosis was termed just 'Diabetic foot' and many didn't have any mention of duration of diabetes mellitus which are essential recordings. Another important and unique finding was that the opposite foot was examined in just 2% of the cases.

CONCLUSION

Diabetic foot is a devastating complication of diabetes and is well known to be neglected both by the patients and by the treating healthcare professionals leading to amputation. This unique study done for the first time from Indian subcontinent on surgical patients through Amit Jain's triple assessment for foot, which is the simplest and basic evaluation tool, showed that many of the essential components of evaluation like checking the pulses and assessing the neuropathy were not done in large number of patients with diabetic foot who had undergone operation. Further, the examination of contra lateral foot was found to be extremely low. The authors recommend that Amit Jain's triple assessment should be done by every health care professional be it a physician or a surgeon dealing with diabetic foot and it should be considered as a minimum mandatory evaluation for diabetic foot worldwide in view of its simplicity and specificity in addressing the triad of diabetic foot clinically with minimum resources.

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