International Surgery Journal
Narayana SRP. Int Surg J. 2020 Nov;7(11):3762-3764
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20204686

Original Research Article

Study to assess neuropathy severity in patients with diabetic foot problems

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Received: 02 October 2020
Revised: 16 October 2020
Accepted: 17 October 2020

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ABSTRACT

Background: Diabetic neuropathy is the most common complication of diabetes affecting 50% of the patients with type 1 and type 2 diabetes. Its late sequelae which include foot ulceration, charcot neuroarthropathy and occasionally amputation, should in many cases be preventable. Biothesiometry is a device which can measure the vibration perception threshold and guide the treatment as well as prevent further foot problems in such patients.
Methods: In this study we included 65 patients with diabetic foot symptoms by random sampling technique between the age group of 40-75 years. All these patients were subjected to biothesiometer testing. The response was measured as vibration perception threshold (VPT). The variation of VPT in different conditions was established.
Results: Among 65 patients, 40(61%) patients had painful sensation, VPT ranging from 16 V to 25 V, 6 (0.09%) patients had callus, dry foot or pigmentation with VPT 25-35 V, 12 (18.4%) patients had callus ulcer with VPT 36-45 V, 3 (0.046%) patients had both ulcer and skin changes with VPT 45-50 V and 4 (0.06%) patients presented with deformity and VPT 50 V.
Conclusions: The study concluded that risk of ulceration is high with increased VPT. Hence, early detection of raised VPT would help the clinicians not only to guide the patients about the high risk of ulceration but it as well will help in educating the patient and emphasizing the need for proper glycemic control, proper footwear and foot care.

Keywords: Biothesiometry, Diabetic neuropathy, Vibration perception threshold

INTRODUCTION

Incidence of diabetes is increasing every year. The annual population-based incidence of foot ulcer ranges from 1.0 to 4.1% and the prevalence ranges from 4 to 10%, in persons with diabetes mellitus, which suggests that the lifetime incidence may be as high as 25%.[1] Hence, screening and early identification of neuropathy in the patient with diabetes help them to actively modify the course of glycemic control to recommended targets, and to implement improved foot care before the onset of significant morbidity.

The chronic peripheral neuropathy associated with diabetes represents an insidious and progressive process, the pathological severity of which is poorly linked with the development of symptoms.[2,3] It is the component cause that initiates the pathophysiological pathway to leg ulceration and amputation, and by itself it is sufficient cause for painful paresthesia, sensory ataxia, and Charcot deformity.[4] Screening and the early identification of the neuropathic process offers a crucial opportunity for the patient with diabetes to actively alter the course of suboptimal glycemic control and to implement improved foot care before the onset of significant morbidity. The diabetes control and complications trial demonstrated that intensive insulin therapy in type 1 diabetes reduced the risk of developing clinical and electrophysiological deficits of diabetic neuropathy by 61%; similarly, the U.K.[5] Prospective diabetes study reported a relative risk

of 0.60 (95% CI 0.39-0.94, p=0.0052) for neuropathy as measured by a biothesiometer for a mean of 15 years of follow-up in the intensive policy group.[6]

This study tries to identify the severity of neuropathy based on biothesiometry test so that patients are educated to take early testing and follow foot care precautions to prevent the forthcoming complications of diabetes.

METHODS

This was a cross sectional study conducted in OPD of Sri Muthukumaran medical college and Hospital between September 2020 and October 2020. A total of 65 patients were included in the study after taking consent and explaining about the test. Sampling was done by convenient sampling method. Data collection was done by direct interviewing the patient and direct observation for the biothesiometry test.

Inclusion criteria

Diabetic patients with neuropathy symptoms.

Exclusion criteria

Patients who had large foot ulcers with infection, patients on dialysis. All the patients were diabetic and had symptoms and signs of diabetic neuropathy like numbness, tingling, pain, itching, callus or ulcer.

Demography of these patients was taken and also in history duration of diabetes was included. All these patients were subjected to biothesiometry.

Biothesiometry is a simple, sensitive and comfortable method for daily screening. It is sufficiently sensitive for detection and evaluation of peripheral neuropathy. Principle is a vibrating probe, vibration amplitude can be changed by voltage adjustment. It is used in diagnostics of peripheral neuropathies with impaired vibratory perception threshold. The test result is given as VPT (vibration threshold perception) which is measured in volts ranging from 0-50 V. In each patient VPT was measured and the condition of their foot was noted by the clinician for clinical features of neuropathy. VPT ranges in different conditions were correlated with the severity of neuropathy. During recording, the voltage was increased from 0 to 50 volts. Grading of VPT was recorded as follows- normal VPT was from 0 to 15 volts, grade I was 16 to 25 volts and 26 to 50 volts was graded as grade II. The results were evaluated by descriptive and inferential statistics.

RESULTS

In our study population, we had total 65 patients of which 34 were male and 31 female. These patients belonged to the age group of 40- 75 years (Figure 1).

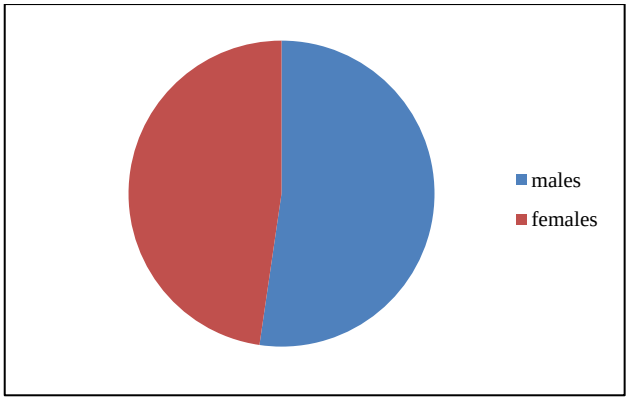

Figure 1: Gender distribution.

Among 65 patients, 40 (61%) patients had painful sensation, VPT ranging from 16 V to 25 V, 6 (0.09%) patients had callus, dry foot or pigmentation with VPT 25-35 V, 12 (18.4%) patients had callus ulcer with VPT 36-45 V, 3 (0.046%) patients had both ulcer and skin changes with VPT 45-50V and 4 (0.06%) patients presented with deformity and VPT 50 V (Table 1).

Table 1: VPT wise symptoms.

VPT	No. of patients	Symptoms
16-25	40	pain
25-35	6	Callus, dry foot
36-45	12	Callus ulcer
45-50	3	Ulcer and skin changes
50	4	deformity

When correlated with the duration of diabetes, 40 had duration of 5-10 years, 6 had du ration of 11-15 years, 12 had duration of 16-20 years, 3 had duration of 21-25 years and 4 had duration of 26-30 years (Table 2).

Table 2: Duration of diabetes.

Duration of diabetes	Number of patients
5-10 years	40
11-15 years	6
16-20 years	12
21-25 years	3
26-30 years	4

The results are clearly revealing that the duration of diabetes is directly related to increase in severity of neuropathy and the complications of foot associated with it. As the values of VPT are increasing, worse are the complications of foot.

DISCUSSION

The findings of the study are correlating with other studies stating the longer duration of diabetes, the more severe is the neuropathy. VPT values shown in the study

are pointing towards worsening foot problems with the severity of the neuropathy.

In an observational study in patients with type 2 diabetes it was found that painful symptoms had an occurrence of 26% in patients without neuropathy and 60% of patients with severe neuropathy.[7] DPN (diabetic peripheral neuropathy) is one of the commonest causes of foot complications like amputation and disability in ambulation and it is also the most common cause of non-traumatic amputation.[8,9] In India there had been a small number of trials to screen the current status for DPN, among them a study estimated an overall prevalence of neuropathy as 19.1% in south Indian type 2 diabetic patients.[10] Another study by Dixit et al, found poor awareness levels among Indian diabetic population and authors asserted the need to bridge the discrepancies in self-management of foot problems.[11] A study by Vishwanath et al, reported primary intervention like education to be superior to secondary management of DPN.[12] A prospective study reported that older people with severe bunion, toe deformity, ulcer, and deformed nails have a two-fold increased risk of falling when compared with the healthy counterparts. Approximately 10-20% of falls result in fractures, thereby DPN contributes to age-related frailty, restricted mobility and pain, increased probability of fall in elderly, and reduced quality of life.[13]

Limitations of the study was that the sample size was small which could have an implication on the results although care was taken to be precise in selection criteria, larger sample with more robust statistical analysis would be appropriate in future to support the findings of the study.

CONCLUSION

In conclusion, there is a need for early detection of neuropathy and educating the patients on the complications of the diabetic foot if foot care is not done regularly. In this way we can reduce the number of amputations due to foot complications and save not only the economy but give a healthier life to a diabetic patient.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Narayana SRP. Study to assess neuropathy severity in patients with diabetic foot problems. Int Surg J 2020;7:3762-4.