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Original Research Article

Reliability of diabetic neuropathy symptom and diabetic neuropathy examination scoring system for the diagnosis of diabetic peripheral neuropathy in type 2 diabetes mellitus patients

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ABSTRACT

Background: This study aims to evaluate the reliability of the Diabetic Neuropathy Examination Score (DNE), 10-g Semmes-Weinstein Monofilament Examination and Quantitative Sensory Testing by Vibration Perception Threshold (VPT) in the diagnosis of diabetic polyneuropathy and seek a cost effective and reliable screening method in diabetic OPD and IPD against the gold standard of NCV.
Methods: This study was carried out in 50 confirmed type 2 diabetic patients matched for age, sex, duration and ABI >0.9 irrespective of the presenting complaints. Patients with either limb amputation, other reasons for peripheral neuropathy, ABI <0.9, critical and comatose were excluded. A complete neurological assessment using a symptom questionnaire, Semmes Weinstein monofilament, vibration and thermal threshold perception analyzer was done and recorded. A score was given out of 20. The patients were retrograde subjected to NCV by a blinded technician and the readings were then compared to the scores.
Results: The level of significance between the total neuropathy score and the presence of neuropathy (by NCV) was very significant ($p<0.0001$) with an association of 0.932. In patients with a mean total neuropathy score of 3.28,10.80 and 15.37, there was no, mild and severe levels of neuropathy in NCV respectively.
Conclusions: There is correlation between the total neurological scores and NCV. Therefore, it can be used to screen all diabetic patients for earliest signs of diabetic neuropathy with sustainable results.

Keywords: Bio esthesiometer, Diabetic neuropathy symptom score, Diabetic neuropathy examination score, Nerve conduction studies, Semmes-Weinstein monofilament examination

INTRODUCTION

Diabetic Polyneuropathy (DPN) is the most common of the heterogeneous group of diabetic neuropathies and contributes to 50 to 70% of nontraumatic amputations.[1] It is defined as signs and symptoms of peripheral nerve dysfunction in a patient with Diabetes Mellitus (DM) in whom other causes of peripheral nerve dysfunction have been excluded. There is a higher prevalence of DM in India (4.3%) compared with the West (1%-2%).[1,2] The incidence of DN in India is not well known but in a study from South India 19.1% type II diabetic patients had peripheral neuropathy.[3,4] According to an estimate, two thirds of diabetic patients have clinical or subclinical neuropathy. The diagnosis of subclinical DN requires electrodiagnostic testing and quantitative sensory and autonomic testing. All types of diabetic patients can develop neuropathy. The prevalence of neuropathy increases with the duration of diabetes mellitus. In a study, the incidence of neuropathy increased from 7.5%

on admission to 50% at 25 years follow up.[5] Screening for diabetic polyneuropathy improves foot care and prevents morbidity. Current level of evidence for optimal screening method is limited. The disease process of diabetes causes alterations in the normal nerve functions which can be reflected either when performing neurological examination or during electrophysiological testing of the patient. The neurological scores and the electrophysiological studies both are used for the diagnosis of the sensorimotor neuropathy. Early screening of diabetic peripheral neuropathy is thereby the corner stone in improving quality of life in diabetics.

METHODS

Among 50 patients were selected by purposive sampling between January 2007-January 2008.

Inclusion criteria

- Age >35 years, irrespective of the duration of illness
- ABI >0.9.

Exclusion criteria

- Critically ill were excluded
- Comatose
- Central nervous disorders
- Congenital deformities
- Either foot amputation
- ABI <0.9
- All other causes of peripheral neuropathy.

Detection and grading of neuropathy were done according to Diabetic Neuropathy Symptom score (DNS) and Diabetic Neuropathy Examination score (DNE). For the nerve conduction studies, amplitudes, velocities and latencies of 3 sensory (sural, ulnar, median) and 3 motor (peroneal, ulnar, tibial) nerves were checked by a blinded technician. If the patient had 2 or more than two abnormal findings in any of the nerve, he was labeled to have peripheral sensorimotor neuropathy. Severity was ascertained and classified as mild, moderate and severe. Later the correlation between the total neurological score was statistically calculated taking nerve conduction studies (NCV) as the gold standard.

DNS score

All subjects were questioned regarding the presence or otherwise of symptoms suggesting the presence of neuropathy. The questionnaire is adopted from that designed by Meijer.[2] One point was given if a symptom occurred more times a week during the last 2 weeks or 0 point if not. Questions included symptoms of unsteadiness in walking/gait, presence of burning, aching pain or tenderness, pricking sensations, places of numbness, similar complains in upper limb and weakness in any of the limbs.

Maximum score: 6 points; 0 points- PN absent; 1-6 points - PN present

(PN = Peripheral neuropathy)

DNE score

A thorough neurological examination was carried out and the neurological signs were scored following a DNE score, which is a modification of the Neuropathy Disability Score of Dyck.[1] The DNE score consists (a) muscle relaxes: Ankle and Knee: absent (1), sluggish (0) or present (0) (b) Sensory test scores included vibration perception (cut off at frequency >20 Hz), pin prick sensation perception, temperature perception (perceive a temperature above 42ºC) by using a hand held bio esthesiometer, light touch by using Semmes-Weinstein monofilament examination and joint position sensation.[6,9]

A score of 1 was given to abnormal findings for each foot. 0 was awarded to normal results. Maximum score was 14. A total was given out of 20. The t test was applied for the means of the scores for groups without neuropathy, and those with neuropathy, with a high level of significance.

RESULTS

There were only 3 patients with evidence of neuropathy in NCV studies but a total neurology score of less than or equal to 10. In none of the patients with a score of more than 10, was the NCV normal (Table 1). Of the 29 patients with a score of more than 10, 26 had severe and 3 had mild neuropathy. Using the asymptotic standard error in null hypothesis, it was found that the level of significance between the total neuropathy examination score of more than 10/20 and the presence of neuropathy determined by nerve conduction studies was very significant, with an association of 0.932.

Table 1: Association between the total score and the presence or absence of neuropathy.

Total score	No. evidence of neuropathy	Mild neuropathy	Moderate neuropathy	N
<OR = 10	18	2	1	21
>10	0	3	26	29

Table 2: T test for group with average mean neuropathy with mild and severe neuropathy.

Neuropathy	N	Mean	SD	Std. error mean
0	18	3.28	3.064	0.722
1	5	10.8	3.421	1.530
2	27	15.37	3.553	0.684

Those with a mean score of 3.38 had mild neuropathy. Those with a mean score of 10.8 had moderate

neuropathy and those with mean scores of 15.37 had severe neuropathy (Table 2). The t test was applied for the means of the scores for groups without neuropathy, and those with neuropathy, with a high level of significance. All data was recorded on a pre-designed questionnaire performa.

DISCUSSION

Diagnosis of diabetic neuropathy is done through many methods including neurological examination and electrophysiology to detect and evaluate the disease at its earliest stage. Early detection or diagnosis of neuropathy enables the clinician to give appropriate drugs to control it or at least decreasing its progress. It is also important to educate the patient to take care of his illness vigilantly. Neuropathy is a debilitating and crippling problem if not controlled at an early stage. Optimal treatment at this time requires good control of blood sugar, managing symptoms, and fastidious attention to foot care.[7-9] American Academy of Neurology has issued a report in which it has compared major studies evaluating the methods of diagnosing DPN. Authors aim was to use the results of this study to establish the neuropathy examination and symptom scoring as a reliable, easy and cost-effective method of detecting peripheral neuropathy in the OPD.

According to American Diabetic Association, most common among the neuropathies are chronic sensorimotor DPN and autonomic neuropathy. Results of late commencement of pharmacological means to control diabetic peripheral neuropathy are disappointing and result in loss of fruitful years and large incurrence of financial aid. The present study uses the Symptom Score (DNS), and Examination Score (DNE), which were designed by Meijer and Dyke.[1,2] These scores are simple, reproducible, fast and easy to perform. The construct validity of these scores in relation to SWME and VPT were studied earlier.[2] The correlation between the DNS and DNE scores and NCS was significant (rho = 0.62 for DNE and 0.51 for DNS).[9,10] As compared to corresponding studies, study showed significant correlation between total neuropathy scores of more than 10/20 and positive NCV studies. These validated scores are reproducible and reliable and cost effective. In developing countries such as India, such means of screening and diagnosis can be used with sufficient consistency in results.

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