

Utilization of Nerve Conduction Study for the Detection of Diabetic Polyneuropathy in a Tertiary Care Center in Madhya Pradesh

Aruna Singh¹, Vinit Kumar Tiwari², Brijesh Singh³

¹Associate Professor, Department of Physiology, Shyam Shah Medical College, Rewa, Madhya Pradesh, India, ²Senior Resident, Department of Surgery, Shyam Shah Medical College, Rewa, Madhya Pradesh, India, ³Associate Professor, Department of Surgery, Shyam Shah Medical College, Rewa, Madhya Pradesh, India

Abstract

Introduction: Diabetes mellitus is a group of metabolic disorders that share the phenotype of hyperglycemia. The clinical and economic burden of diabetic polyneuropathy (DPN) stems from its central role in the pathophysiology of foot ulceration and lower limb amputation, reduction in quality of life. Simple screening methods are of limited value in early neuropathy. Nerve conduction studies (NCSs) are the most sensitive and specific DPN detection method.

Material and Method: This study was conducted to detect the sensory-motor neuropathy in type 2 diabetes mellitus by clinical examination and nerve conduction study. In this study, 50 cases of type 2 diabetes were taken.

Results: Majority of patients presented with tingling sensation and followed by burning feet. In 50 patients of type 2 diabetes mellitus on clinical examination, most of the patients had involvement of both upper and lower limbs followed by only lower limb involvement, whereas on NCS, there were more patients with both upper and lower limbs involvement as compared to clinical studies. Maximum patients had symmetrical limb involvement clinically, but on NCS, the number of patients with symmetrical limb involvement was even more.

Conclusion: It was found that patients with diabetes mellitus, diabetic peripheral neuropathy is highly prevalent, but in the majority of patients, it is subclinical. Sensitivity and negative predictive values of the neurological examination are low. Therefore, routine nerve conduction velocity measurement for the assessment of diabetic peripheral neuropathy appears to be warranted in these patients. Thus, the author concluded in this study, detection of neuropathy is earlier and significant with NCS compared to clinical.

Key words: Diabetes mellitus, Diabetic polyneuropathy, Nerve conduction studies

INTRODUCTION

Diabetes mellitus is a group of metabolic disorders that share the phenotype of hyperglycemia. Depending on the etiology, factors contributing to hyperglycemia include reduced insulin secretion, insulin action, decreased glucose utilization, and increased glucose production.^[1] The clinical and economic burden of diabetic polyneuropathy (DPN) stems from its

central role in the pathophysiology of foot ulceration and lower limb amputation,^[2] reduction in quality of life and decreased activities of daily living,^[3] and susceptibility to falls and fractures.^[4] The International Diabetes Federation estimated the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025.^[5] Simple screening methods are of limited value in early neuropathy,^[6] in the presence of neurological comorbidities,^[7] and for the elderly.^[8]

Nerve conduction studies (NCSs) are the most sensitive and specific DPN detection method.^[6]

Aims and Objectives

This study was to detect sensory-motor neuropathy in type 2 diabetes mellitus by clinical examination and nerve

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Corresponding Author: Vinit Kumar Tiwari, Department of Surgery, Shyam Shah Medical College, Rewa, Madhya Pradesh, India.

conduction study and to correlate the clinical features of peripheral neuropathy with nerve conduction study in type 2 diabetes mellitus.

METHODS

Fifty patients of type 2 diabetes mellitus with age more than 40 years and duration of diabetes 5 years or more visiting Shyam Shah Medical College and Sanjay Gandhi Memorial Hospital, Rewa, were taken for the present study excluding type 1 diabetics, chronic alcoholics, and due to other causes of peripheral neuropathy. Detailed history regarding symptoms such as paresthesia, tingling sensation, burning feet, and hyperesthesia was taken. Diagnosis of peripheral neuropathy was based on thorough clinical evaluation and nerve conduction study. All diagnosed Type 2 diabetic patients were subjected to nerve conduction study.

RESULTS

In this study, 50 cases of type 2 diabetes were taken, and we found that out of 50 patients, there were 60% of females and 40% of males. The age of patients varied from 40 to 70 years. The mean age was found to be 52.70 years. The duration of diabetes varied from 5 to 20 years. The maximum numbers of patients were in the duration of 5–15 years comprising 80% of the total. About 57% of patients presented with tingling sensation and 39% presented with burning feet. Hyperesthesia and foot ulcers were presenting complaints in only 6% of patients each. About 45% of patients had loss of ankle jerk, 43% had loss of vibration, 31% had loss of light touch, 29% had loss of joint position, and 16% had loss of superficial pain.

In 50 patients of type 2 diabetes mellitus on clinical examination, 40% had involvement of both upper and lower limbs followed by only lower limb involvement in 14% of patients. Isolated upper limb involvement was seen in 2% of cases but on NCS, 56% had involvement of both upper and lower limbs followed by only lower limb involvement in 16% of patients. Isolated upper limb involvement was seen in 6% of cases. About 22% were found normal on NCS [Table 1].

Table 2 shows that 47% of patients had symmetrical limb involvement clinically and 31% had asymmetrical limb involvement but on NCS, 61% of patients had symmetrical limb involvement and 22% had asymmetrical limb involvement.

Table 1: correlation of limb involvement clinically and on NCSs

Limb involvement	Clinically	On NCSs
Both upper limb and lower limb	20	28
Lower limb only	07	08
Upper limb only	01	03
Normal	22	11
Total	50	50
<i>P</i>		0.03

NCSs: Nerve conduction studies

Table 2: correlation of the pattern of neuropathy clinically and on NCSs

Type of neuropathy	Clinically (%)	On NCSs (%)
Symmetrical	47	61
Asymmetrical	31	22
Normal	22	17
Total	100	100

NCSs: Nerve conduction studies

DISCUSSION

Diabetic neuropathy is one of the common microvascular complications in diabetics. Therefore, it is necessary to identify the “at-risk diabetic patients” for neuropathy. NCSs are one of the important methods for assessing nerve functions in diabetic neuropathy. Hyperglycemia causes nerve damage by various mechanisms. Hyperglycemia leads to elevated intracellular glucose and cellular toxicity in the endothelial cells of the capillaries associated with peripheral nerves.^[9]

The present study has detected types of neuropathy in type 2 diabetes and correlated clinical features of peripheral neuropathy with nerve conduction study. In this study, the mean age of patients who are enrolled is 52.7 years. Prasad *et al.* conducted a similar study to test the hypothesis of alteration in electrophysiologic parameters of nerve before actual manifestations of neuropathy in type 2 diabetic patients, in which the mean age of patients was found to be 55.72 ± 7.12 years.^[10]

In the present study, tingling sensation is the most common presentation of diabetic neuropathy followed by burning feet then hyperesthesia and foot ulcers. Kakrani *et al.* did a study on total of 50 diabetics. NCSs were performed. About 92% presented with complaints of tingling sensation and 64% had burning feet.^[11]

The most common signs are loss of ankle jerk followed by loss of vibration then light touch and joint position. Shehab *et al.* conducted a study to assess the performance characteristics of ankle reflex in detecting diabetic peripheral neuropathy. Taking NCS as the gold standard,

ankle reflex yielded the highest sensitivity and specificity, closely followed by that of vibration sense.^[12]

In the present study, it is found that the detection of neuropathy is earlier and significant with NCS compared to clinical examination ($P < 0.05$). Höliner *et al.* conducted a study to evaluate the prevalence of diabetic peripheral neuropathy in patients with diabetes mellitus and examined whether the neurological examination validly diagnoses diabetic peripheral neuropathy as compared with the gold standard of nerve conduction velocity in these patients and found similar results as compared to our study. It was found that patients with diabetes mellitus, diabetic peripheral neuropathy is highly prevalent, but in the majority of patients, it is subclinical. Therefore, routine nerve conduction velocity measurement for the assessment of diabetic peripheral neuropathy appears to be warranted in these patients.^[13]

CONCLUSION

Thus, the author concludes that the detection of neuropathy is earlier and significant with NCS compared to clinical ($P < 0.05$).

Tingling sensation is the most common presentation of diabetic neuropathy followed by burning feet then hyperesthesia and foot ulcers. The most common signs are loss of ankle jerk followed by loss of vibration then light touch and joint position.

Simultaneous involvement of both upper and lower limbs is significantly more than single limb involvement by both NCS ($P < 0.05$) and clinical examination ($P < 0.05$) followed by only lower limb involvement.

Distal symmetrical polyneuropathy is the most common form of diabetic neuropathy as compared with other forms

of sensory/motor neuropathy as detected by both NCS and clinically ($P < 0.05$).

Sensory-motor type of neuropathy is the most common type of neuropathy in type 2 diabetics detected on both NCS and clinically ($P < 0.05$).

REFERENCES

- Ozougwu JC, Obimba KC, Belonwu CD, Unakalamba CB. The pathogenesis and pathophysiology of Type 1 and Type 2 diabetes mellitus. *JAPI* 2013;4:46-57.
- Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. *JAMA* 2005;293:217-28.
- Vinik EJ, Hayes RP, Oglesby A, Bastyr E, Barlow P, Ford-Molvik SL, *et al.* The development and validation of the Norfolk QOL-DN, a new measure of patients' perception of the effects of diabetes and diabetic neuropathy. *Diabetes Technol Ther* 2005;7:497-508.
- Schwartz AV, Hillier TA, Sellmeyer DE, Resnick HE, Gregg E, Ensrud KE, *et al.* Older women with diabetes have a higher risk of falls: A prospective study. *Diabetes Care* 2002;25:1749-54.
- Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of Type 2 diabetes: Indian scenario. *Indian J Med Res* 2007;125:217-30.
- Perkins BA, Olaleye D, Zinman B, Bril V. Simple screening tests for peripheral neuropathy in the diabetes clinic. *Diabetes Care* 2001; 24:250-6.
- Perkins BA, Bril V. Diabetic neuropathy: A review emphasizing diagnostic methods. *Clin Neurophysiol* 2003;114:1167-75.
- Watanabe T, Ito H, Morita A, Uno Y, Nishimura T, Kawase H, *et al.* Sonographic evaluation of the median nerve in diabetic patients: Comparison with nerve conduction studies. *J Ultrasound Med* 2009;28:727-34.
- Buse JB, Polonsky KS, Burant CF. Type 2 diabetes mellitus. In: Larsen PR, Henry M, Melmed S, Kenneth S, editors. *Williams Textbook of Endocrinology*. 10th ed. Philadelphia, PA: Saunders; 2003. p. 1427-83.
- Prasad N, Pisharody IK, Karandikar MS, Diwanji SA, Raghav PR. Comparative analysis of electrophysiological parameters of median nerve in normal and diabetic subjects. *Indian Med Gaz* 2013;147:261-4.
- Kakrani AL, Gokhale VS, Vohra KV, Chaudhary N. Clinical and nerve conduction study correlation in patients of diabetic neuropathy. *J Assoc Physicians India* 2014;62:24-7.
- Shehab DK, Al-Jarallah KF, Abraham M, Mojiminiyi OA, Al-Mohamedy H, Abdella NA. Back to basics: Ankle reflex in the evaluation of peripheral neuropathy in Type 2 diabetes mellitus. *QJM* 2012;105:315-20.
- Höliner I, Haslinger V, Lüttsch J, Müller G, Barbarini DS, Fussenegger J, *et al.* Validity of the neurological examination in diagnosing diabetic peripheral neuropathy. *Pediatr Neurol* 2013;49:171-7.

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