



CORRELATION BETWEEN ELECTROPHYSIOLOGICAL VARIABLES OF SENSORY NERVES WITH DURATION OF DIABETES MELLITUS IN CLINICALLY DETECTABLE PERIPHERAL NEUROPATHY TYPE 2 DIABETIC PATIENTS

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ABSTRACT **Background:** Most common cause of peripheral neuropathy is diabetes, and 30% -90% diabetics suffer from peripheral neuropathy. Chronic hyperglycemia is responsible for the neuropathy in DM. With this reference the present study was done to detect the effect of chronicity of hyperglycemia on nerve conduction variables. **Material & Method:** Nerve conduction study was performed in 40 patients of Type 2 Diabetes Mellitus with clinically detectable Peripheral Neuropathy and 40 age matched controls in Gandhi Medical College, Bhopal. **Results:** Negative correlation between duration of diabetes and amplitude of the cases was found in Left Median, Ulnar, Sural, and Superficial Peroneal Nerves. Nerve conduction velocity of both Ulnar nerves showed negative correlation with duration of diabetes. **Summary:** Amplitude and nerve conduction velocity had negative correlation with duration of Diabetes. Hence management of hyperglycemia can prevent deterioration of electrophysiological variables of sensory nerves..

KEYWORDS : Type 2 Diabetes Mellitus, Peripheral neuropathy, Nerve conduction study.

Introduction

American Diabetes Association (ADA) has defined Diabetic neuropathy as "the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes.² The most common form of diabetic neuropathy is distal symmetric polyneuropathy which presents as distal sensory loss. In India Diabetes is emerging as an epidemic as more than 62 million diabetics has been recently diagnosed with the disease,^{3,4} with prevalence of Diabetes Mellitus in India (4.3%)⁵, compared with the West (1%-2%).⁶ Chronic hyperglycemia plays a causative role in the pathogenesis of diabetic microvascular complications like neuropathy, nephropathy and retinopathy and is strongly supported by studies of DCCT, UKPDS, and Kumamoto.⁷ As diabetic neuropathy progresses hyperesthesia, paresthesia, and dysesthesia like symptoms may develop and physical examination reveals sensory loss, loss of ankle reflexes, and abnormal position sense.⁸

METHODOLOGY

The present case control study was carried out in the Department of Physiology, Gandhi Medical College, Bhopal in collaboration with the Department of Medicine.

MATERIAL:

40 Type 2 DM patients with clinically detectable Peripheral Neuropathy and 40 age matched controls were selected and were introduced Michigan (MNSI)⁹ questionnaire and examination for screening of peripheral neuropathy. The criteria for the selection of the study and control group is as follows-

STUDY GROUP

Diagnosed cases of Type 2 diabetes mellitus in the age group 30-60 years with no known endocrinal and metabolic disorders, not undergoing any kind of medical treatment with neurotoxic drugs were selected and on the basis of DNS¹⁰ and DNE¹¹ Scores they were divided into clinically detectable and clinically undetectable peripheral neuropathy groups.

CONTROL GROUP

40 age matched non diabetic volunteers with no neuropathies and no known endocrinal, metabolic, renal or cardiovascular disorder were taken as controls for the present study.

EQUIPMENT: RMS EMG EP MAK II was used to record the electrophysiological parameters of nerve conduction study. All the cases were briefed about the procedure to be done.

PARAMETERS RECORDED:

A detailed history regarding personal, family, present & past illness and drug was taken and then complete clinical examination was carried out. Blood glycemc indices were estimated.

Nerve conduction parameters recorded for median sensory ,ulnar

sensory ,superficial peroneal and sural nerves were:

- i. Distal latency (DL)
- ii. Nerve Conduction Velocity (CV)
- iii. Sensory nerve action potential / Amplitude (SNAP)

TABLE 1: Baseline Features Of The Study Population

S. No.	Variables	Controls N=40	Clinically Detectable Peripheral Neuropathy Group N=40
1	Age (years)	43.82±8.37	49.9±8.19
2	BMI (Kg/m ²)	24.14±1.91	24.79±4.59
3	Pulse (bpm)	78.45±3.84	78.3±3.59
4	SBP (mm Hg)	124.6±7.18	123.4±9.99
5	DBP (mm Hg)	77.8±7.57	77.55±6.33
6	Duration of Diabetes Mellitus(years)	-	10.62±4.8
7	FPG (mg/dl)	83.4±7.26	152.4±19.89
8	PPPG(mg/dl)	123.32±8.79	255.22±41.87
9	HbA1C (%)	-	7.11±1.35

STATISTICAL ANALYSIS

Data collected were expressed as mean ± SD. Statistical analysis was done using SPSS 16.0 and Pearson's correlation coefficient (r) was calculated to find out the correlation between different electrophysiological variables and duration of Diabetes mellitus in clinically detectable peripheral neuropathy group. 5% level of significance will be considered.

RESULT

After the calculation of Pearson's correlation coefficient (r) between duration of diabetes mellitus and various electrophysiological parameters of Median sensory ,Ulnar sensory ,Superficial peroneal and Sural nerves, significant negative correlation was found with the amplitude in Left Median, Left Ulnar ,Left Sural, and Left Superficial Peroneal nerves. Significant negative correlation was found only in ulnar nerve of both upper limbs between duration of diabetes and nerve conduction velocity. No significant correlation was reported with the distal latency of the sensory nerves with the duration of diabetes.

TABLE2: Correlation (r) Of Duration Of Diabetes Mellitus With Electrophysiological Variables Of Sensory Nerves Of The Cases (N=40)

Duration Of Diabetes Mellitus (Years)	Nerve		Distal Latency (ms)	Amplitude (µv)	Conduction Velocity (m/sec)
	Median	Right	Ns	Ns	Ns
		Left	Ns	-0.330 *	Ns
	Ulnar	Right	Ns	Ns	-0.280 *
		Left	Ns	-0.271 *	-0.312 *
	Sural	Right	Ns	Ns	Ns

		Left	Ns	-0.297 *	Ns
	Superficial	Right	Ns	Ns	Ns
	Peroneal	Left	Ns	-0.262 *	Ns

*statistically significant

Discussion-

Prevalence of DPN reported in the world is estimated by researchers from 9.6 to 78%.^{12,13} Dyck et al. introduced the neuropathological criteria for the diagnosis and staging of diabetic polyneuropathy.¹⁵ Longitudinal study on 132 patients performed by Partanen J et al (1995) had shown that nerve conduction abnormalities progressed from 8.3% to 16.7% after 5 years and 41.9% after 10 years. The amplitude of sensory nerve was found to be reduced more than the conduction velocity as in the present study.¹⁶ Abhijeet A et al (2014) and Paul B (1994) reported significant negative correlation between duration of diabetes mellitus with conduction velocity and amplitude of the nerves, consistent with our study.¹⁷ In a Spanish study by Cabezas-Cerrato J the prevalence of peripheral neuropathy was increased from 14% at under five years' duration of diabetes to 44% at duration of more than 30 years of diabetes.¹⁸ Similarly in a study by Rajbhandari SM and Piya MK (2005) in a cohort of 4400 subjects the prevalence of DPN was found to be increased from 7% within 1 year of diagnosis of DM to 50% for those with diabetes for more than 25 years, signifying that with the increase in duration of Diabetes progression of peripheral neuropathy increases and is consistent with the present study findings.¹⁹ Many of the researchers across the world, had shown significant correlation of duration of diabetes with the neuropathy as similar to the findings of the present study.^{12,13,20,21,22,23,24,25,26,27}

Conclusion

The present study has confirmed the significant correlation between duration of Diabetes mellitus and various electrophysiological variables in sensory nerves of both upper and lower limbs in clinically detectable Peripheral neuropathy diabetic patients. Therefore as the duration of diabetes increases patients may undergo nerve conduction studies to detect the degree of nerve functioning impairment. Timely management of diabetes can help to delay the progression of nerve lesion and finally peripheral neuropathy.

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