



NERVE CONDUCTION STUDY OF MEDIAN SENSORY NERVE IN TYPE 2 DIABETICS WITH CLINICALLY UNDETECTABLE PERIPHERAL NEUROPATHY

Pediatrics

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ABSTRACT

Background: As world is shifting to chronic diseases, type 2 diabetes mellitus (T2DM) is becoming a major health issue. Diabetic neuropathy (DN) is the most threatening complication accounting for 28% of all complications in diabetics. Among different countries in the world India is becoming the leader in the prevalence of T2DM and its complications.

Material & Method: 40 patients with clinically undetectable Peripheral Neuropathy of Type 2 DM and 40 age matched controls were selected for the study.

Results: Significant difference ($p < 0.05$) of Distal latency, Conduction Velocity and Amplitude of median nerve was found in clinically undetectable peripheral neuropathy group as compared to controls which was predominantly axonal type.

Summary - Electrophysiological variables of Median sensory nerve were affected in all subjects. Nerve conduction studies can be used to predict asymptomatic neuropathy in diabetics before the appearance of symptoms & signs.

KEYWORDS

Median nerve, Type 2 Diabetes Mellitus, Nerve conduction studies, Diabetic neuropathy

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is becoming a major international health issue and India is becoming leader in the prevalence of T2DM.² Diabetes mellitus (DM) is characterized by a chronic hyperglycemic resulting from defects in insulin secretion, insulin action or both. Chronic complications of diabetes are divided into vascular and nonvascular complications. The vascular complications consists of microvascular (retinopathy, neuropathy, and nephropathy) and macrovascular complications (coronary artery disease, peripheral arterial disease, cerebrovascular disease). Infections, gastroparesis etc are included among nonvascular complications. In a follow up study, by J. Pirarat over 4400 patients between 1947 and 1973 the incidence of neuropathy was found to be increased from 7.5% on admission to 50% in 25 years.³ Besides Diabetic Peripheral Neuropathy, Diabetic autonomic neuropathy accounts for silent myocardial infarction resulting in death in 25%–50% patients within 5–10 years.^{4,5} Electrodiagnostic assessments are sensitive, specific and are measures of the severity of peripheral neuropathy.⁶

METHODOLOGY

The present study is a case control study conducted in the Department of Physiology, Gandhi Medical College, Bhopal in collaboration with the Department of Medicine, Gandhi Medical College, Bhopal. The biochemical investigations were done in post graduate Biochemistry laboratory of Department of Physiology.

MATERIAL:

On the basis of inclusion and exclusion criteria 40 Type 2 DM patients with clinically undetectable Peripheral Neuropathy and 40 age matched controls were selected. The subjects were introduced Michigan (MNSI)⁷ questionnaire and Michigan examination to screen peripheral neuropathy. The selection for the study and control group is as follow-

STUDY GROUP

On the basis of ADA criteria 2015 diagnosed cases of Type 2 diabetes mellitus in the age group 30-60 years with no known endocrinal and metabolic disorders and who are not undergoing any kind of medical treatment with neurotoxic drugs were selected. On the of DNS and DNE SCORE they were divided into clinically detectable and

clinically undetectable neuropathy.

CONTROL GROUP

40 healthy non diabetic volunteers in the age group 30-60, with no diagnosed neuropathies and no known endocrinal, metabolic, renal or cardiovascular disorder were chosen as controls.

EQUIPMENT: RMS EMG EPMK II was used to record the nerve conduction. All the subjects were asked to report to the physiology lab wearing loose fitting clothes and to avoid chemicals, body oils and lotions over limbs.

PARAMETERS RECORDED:

A detailed Personal, family, present & past illness and drug history was taken. Following which complete clinical examination was done. Fasting, post prandial plasma glucose and HbA1C were estimated.

• Nerve conduction parameters recorded were:

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

STATISTICAL ANALYSIS

All the data were expressed as mean \pm SD. The significance of difference for the variables of median nerve was calculated using unpaired Student's t-test for the comparison between control & clinically undetectable Peripheral Neuropathy group. Statistical analysis was done using SPSS 16.0 (statistical package for social sciences). 5% level of significance was considered.

RESULT

The mean age of the study population were 43.82 \pm 8.37 years and 39.6 \pm 9.1 years for clinically undetectable peripheral neuropathy and control group respectively (age range 30-60 years). The mean values of cardiorespiratory parameters and body mass index were in normal range in the study population. Significant ($p < 0.05$) increase of Distal latency and decrease in Conduction Velocity and Amplitude of Median sensory nerve in cases as compared to control group was found. Axonal type of peripheral neuropathy was predominantly reported in Median nerve (Left Median 27.5% and Right Median 7.5%).

TABLE 1: Baseline Characteristics Of The Study Population

S. No.	VARIABLES	CONTROLS N=40	CLINICALLY UNDETECTABLE PERIPHERAL NEUROPATHY GROUP N=40
1	Age (years)	43.82 \pm 8.37	39.6 \pm 9.1
2	BMI (Kg/m ²)	24.14 \pm 1.91	24.21 \pm 2.99

3	Pulse (bpm)	78.45±3.84	77.3±3.14
4	SBP (mm Hg)	124.6±7.18	123.55±7.77
5	DBP (mm Hg)	77.8±7.57	76.7±6.8
6	Duration of Diabetes Mellitus(years)	-	2.37±1.57
7	FPG (mg/dl)	83.4±7.26	148.07±29.46
8	PPPG(mg/dl)	123.32±8.79	253.65±41.71
9	HbA1C (%)	-	5.76±0.39

TABLE 2: Comparison Of Median Sensory Nerve Conduction Parameters Between Control And Clinically Undetectable Peripheral Neuropathy Group

Nerve	Electrophysiological variables	Control group(n=40)		Clinically undetectable Peripheral Neuropathy group(n=40)		T I vs III II vs IV
		Right I	Left II	Right III	Left IV	
Median	Distal latency (msec)	1.81± 0.43	1.87± 0.70	2.46± 0.33	2.50± 0.42	7.58 4.88
	SNAP (µV)	54.71±28.23	57.87±30.20	37.84±17.01	33.61±20.16	3.23 4.22
	SNCV (m/s)	61.46±7.09	63.61±11.21	57.55±7.08	57.51±9.13	2.46 2.66

*statistically significant

Figure 1: Comparison of mean distal latency (DL) between cases and controls

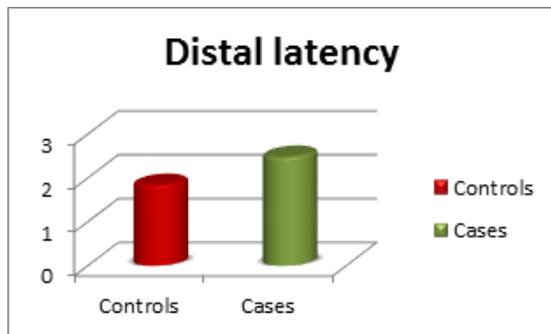


Figure 2: Comparison of mean amplitude (SNAP) between cases and controls

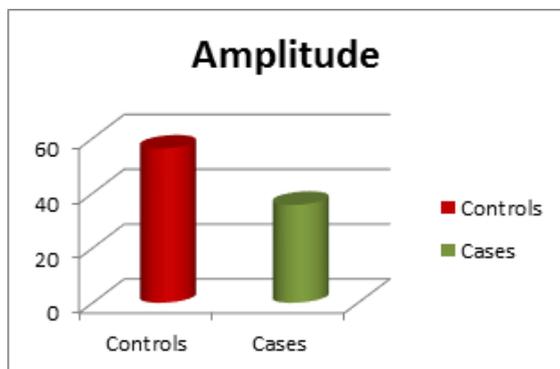
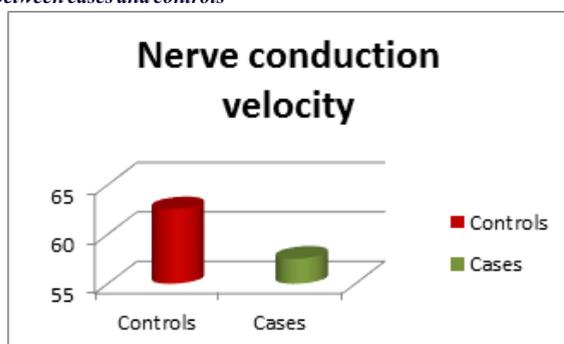


Figure 3: Comparison of mean nerve conduction velocity (NCV) between cases and controls



DISCUSSION

Pathophysiology behind nerve function impairment in people with diabetes show that excess glucose from the blood infiltrate the nerves and interfere with their functioning. Another hypothesis is that the hyperglycemia induce decreased formation of neurotrophin like nerve growth factor (NGF) thus preventing normal axonal regeneration and repair.⁸ Asymptomatic diabetic neuropathy has been defined as the presence of the nerve lesions associated with diabetes mellitus in the absence of abnormal clinical signs and symptoms.⁹ Most studies have suggested that with the early diagnosis and life style modification hazards due to hyperglycemia can be reduced.¹⁰ As nerve conduction studies watch the speed of electrical signals passing through the nerves , it helps in detecting improper nerve functioning.¹¹ In the study by Kakrani AL et al(2014) involvement of median sensory nerve was 46%.¹² But in our study involvement was 52.5% in the cases. He also found that nerve conduction studies are able to detect neuropathy even before signs develop and impaired SNAP are better appreciated by nerve conduction studies.¹² Husain A (2013) noted that in 23% cases significantly low sensory amplitude was found¹³. As seen in the present study . According to Verma A et al (2013) significant decrease in amplitude and conduction velocity of almost all sensory nerves in asymptomatic Diabetics was reported and the most common nerve affected was Median Nerve in upper limb .¹⁴ Zahedali et al (2008) too reported same findings,¹⁵ that is similar to the present study.

CONCLUSION

In the present study the existence of predominantly Axonal sensory peripheral neuropathy in median nerve of both upper limbs in clinically undetectable Peripheral neuropathy patients was reported. As Nerve Conduction Study is able to diagnose Diabetic neuropathy before clinical signs and symptoms appear therefore with its application timely preventative measures or adequate intervention will be able to decrease morbidity caused by Diabetic peripheral neuropathy . Therefore it is better to undergo nerve conduction studies to detect peripheral neuropathy in diagnosed cases of diabetes even when no symptoms & signs present.

Conflict of Interest: None

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