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A Study of Motor Component of Median Nerve Conduction in Individuals with Type II Diabetes Mellitus

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ABSTRACT

Background: Diabetes mellitus is a major public health concern that has a significant socioeconomic impact. Diabetic peripheral neuropathy is a common complication in diabetic subjects. Electrophysiological study is commonly used for the assessment of diabetic poly neuropathy.

Aim and Objectives: This study was designed to assess the motor component of median nerve conduction in type II diabetic individuals of more than 5 years duration of illness under regular treatment and also to find out the correlation between the nerve conduction study parameters and the duration of illness.

Subjects and Methods: It is a cross sectional study. The left median nerve conduction study was carried out in 30 type II diabetic subjects in the age range of 40-60 years. The study group includes the diabetics of more than 5 years duration of illness who are regularly attending diabetic outpatient department. The control group includes 30 of age and gender matched healthy volunteers. Nerve conduction parameters like Motor distal latency, Amplitude and Conduction Velocity were measured.

Results: It was observed that the motor distal latency of left median nerve was higher in diabetics than in healthy controls with a statistically significant difference. There was a statistically significant decrease in amplitude and conduction velocity of left median nerve in diabetic subjects than in controls also observed. All the nerve conduction study parameters were found to be correlated with the duration of the illness in diabetics.

Conclusion: The present study insists upon the regular monitoring of nerve function in diabetics to prevent the crippling complications.

Key Words: Peripheral neuropathy, Nerve conduction study, Duration of illness

INTRODUCTION

Diabetes mellitus is a major public health concern that has a significant socioeconomic impact. The long term systemic complications of diabetes are destructive. They are the major cause of morbidity and mortality. They significantly impair the quality of life and also constitute a significant health cost in the society [1, 2].

The International Diabetes Federation has estimated the total number of diabetic subjects in the year of 2006 to be around 40.9 million in India and also reported that this level can be increased to 69.9 million by the year 2025 [3]. Diabetic peripheral neuropathy is a common complication in diabetic subjects. The type of neuropathy occurring in the upper limb and the lower limb is known as the Diabetic Peripheral Neuropathy. Diabetic neuropathy may affect motor, sensory and autonomic nerves. It develops slowly and worsens over time. The advanced stage of diabetic neuropathy can cause serious complications such as diabetic foot ulcer and gangrene resulting in amputation. Therefore, early detection of nerve dysfunction is important to provide appropriate care.

Evaluation of neuropathy is commonly done by electrophysiological measurements [4, 5]. Nerve conduction study investigates the condition of the large myelinated nerve fibres. The test reveals the normal condition of the nerve and also the abnormality which may be due to the axonal injury and the myelin loss. Parameters of nerve conduction study such as latency, amplitude and conduction velocity are sensitive

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indicators of diabetic neuropathy [6]. They are also specific and reproducible measures [7].

The incidence and prevalence of diabetic neuropathy associated with duration of diabetes affects up to 50% of diabetic subjects after 25 years of disease [8].

The present study was designed to study and compare the motor component of left median nerve conduction in type II diabetes mellitus individuals and controls. Also to correlate the parameters of nerve conduction study with the duration of illness.

SUBJECTS AND METHODS

The institutional ethical committee approval was obtained. Statistically adjusted sample size of 60 was enrolled for the study. In this 30 type II diabetes mellitus subjects of more than 5 years duration of the illness on regular treatment in the age group of 40-60 years of both gender were selected as study group from the Diabetic out-patient department. 30 age and gender matched healthy volunteers were selected as controls. The study duration was for the period of six months.

Subjects with Hypertension, Alcoholism, and intake of drugs except oral hypoglycemic drugs, Liver and Kidney diseases, Endocrine disorders were excluded from the study.

After obtaining a written and informed consent from the subjects, questionnaire regarding the personal data and the information pertaining to diabetic status were obtained.

After a complete clinical examination of sensory and motor system, the nerve conduction study was done by using RMS EMG EPII instrument at the neurophysiology laboratory in the department of Physiology. Nerve conduction study was done by the conventional methods with surface electrodes. The action potentials of the motor component of left median nerve were recorded. The nerve conduction study parameters like the distal motor latency (msec), amplitude (microvolt) and conduction velocity (m/sec) were noted. On the basis of duration of illness diabetics were divided into two groups. One group includes diabetics with 5-8 years of illness and the other group 9-12 years of duration illness.

STATISTICAL ANALYSIS

The data was evaluated and analyzed using SPSS version 17. Independent Student's t test was used to compare the mean value of nerve conduction study parameters between diabetics and controls. Pearson`s correlation coefficient was applied to correlate the duration of the illness and the nerve conduction parameters in diabetic individuals. The probability value of <0.05 was considered as significant.

RESULTS

In this study 30 diabetic subjects of more than 5 years duration of illness were compared with 30 healthy subjects of same age group and gender. In both groups, 50% were males and 50% were females. The mean age of diabetic subjects was 56±4 years; this was comparable with the controls of 54±5 years. The mean duration of diabetes was 9 ± 3 years.

On comparison of the nerve conduction study parameters (summarized in Table 1) the distal motor latency was significantly increased in diabetics than controls. The amplitude was significantly decreased in diabetics than in controls. The conduction velocity of left median nerve motor component also significantly decreased in diabetics than in controls.

When compared the nerve conduction velocity with duration of illness showed in Table 2 the conduction velocity significantly decreased with increasing duration. Regarding duration of illness the diabetic subjects grouped in 9-12 years of duration showed a statistically significant reduction of the conduction velocity than subjects with 5- 8 years of illness. All the parameters were found to be correlated with duration of illness in diabetics as shown in Table 3.

DISCUSSION

The aim of the study was to study and compare the motor component of left median nerve conduction among the type II diabetes mellitus individuals of more than 5 years duration and healthy volunteers and also to correlate the parameters of nerve conduction study with the duration of illness.

Diabetic neuropathy is one of the commonest long term complications of type II diabetes mellitus. Diabetic neuropathy is defined as`` the presence of symptoms and signs of peripheral nerve dysfunction in people with diabetes after exclusion of other causes`` [9]. In the study by Dyck PJ et al reported that more than 8% of diabetics attending the diabetic clinic for the first time had peripheral neuropathy [10]. When the duration of diabetes increases the presence of peripheral neuropathy also increases [11].

The Electrophysiological abnormalities occur in the following order, median nerve (59%), ulnar nerve (28%), peroneal nerve (28%) and sural nerve (8%) [12]. Causes of median nerve involvement are, the metabolic factor (hyperglycemia) and entrapment in carpal tunnel. In diabetic subjects entrapment of median nerve is more common due to connective tissue stiffness and repetitive shear force [13].The sorbitol accumulation in nerve tissues due to hyperglycemia may lead to axonal loss [14]. We can delay the progression of diabetic neuropathy if detected early. The proper treatment given in early stages can provide a good outcome. In case of severe or well advanced stage, the treatment offers partial recovery

by promoting myelination and axonal regeneration of nerve fibers [15].

The prevalence of diabetic neuropathy varies widely from 10% to 90% on the basis of criteria and methods defining neuropathy. In our study, we observed 73.3% prevalence of neuropathy among the diabetic subjects. The same result was also observed in the previous studies done by Tai TY et al and Kawano et al [2, 16]. In our study the higher prevalence rate may be due to the selection of study group from the specialty diabetic outpatient department and also due to the fact that the nerve conduction study is more sensitive and specific method in diagnosis of neuropathy. Zahed Ali et al observed in his study that the median nerve has the highest electro diagnostic abnormalities in diabetic subjects with early neuropathy [17].

In our study, the amplitude and the conduction velocity of the motor component of left median nerve was significantly reduced in the study group when compared with healthy controls. The distal motor latency was significantly increased in diabetics than controls. The same findings was also observed in previous studies done by P Noel et al and Cerizza et al [18, 19].Our study findings are in accordance with the findings of Neelambala Prasad et al [20].They carried out the bilateral median motor nerve conduction study in 40 male diabetics and 40 healthy male volunteers. In their study they have also concluded the result as reduced amplitude and conduction velocities of median nerve in diabetics than controls.

We also observed when the duration of illness increases the conduction velocity of motor component decreases. Mythili et al in their study found out the prevalence of neuropathy was 63% in those with duration less than 5 years to 90% in those with duration more than 10 years [21]. In our study we observed a strong negative correlation between the duration of illness, the amplitude and the conduction velocity. As the duration of diabetes increases the conduction velocity and the amplitude decrease. We also observed a strong positive correlation between the duration of illness and the distal motor latency.

CONCLUSION

The present study shows that the motor component of left median nerve conduction study parameters altered in diabetic subjects. Our study also proves that the subjects with long duration of illness have increased risk of developing neuropathy in spite of attending regular diabetic clinic. Thus our study validates the need for the regular screening of peripheral nerve function in diabetics for the prompt intervention to reduce the morbidity.

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Table 1: Comparison of left median nerve conduction study parameters between the diabetics and controls

Parameters	Diabetic Subjects (N=30) Mean ±SD	Controls (N=30) Mean ±SD	p value
DISTAL MOTOR LATENCY(MSEC)	3.4 ± 1.4	2.5±0.9	< 0.05*
AMPLITUDE (MV)	8.3±3.6	16.1±3.3	<0.001**
CONDUCTION VELOCITY(M/SEC)	44.4±6.8	53.6±4.9	<0.001**

*P <0.05 significant ** p 0.001 highly significant

Table 2: Comparison of duration of illness with the left motor nerve conduction velocity

Parameter	Component	Duration Of Illness (Years) Diabetic Subjects (n=30)		
		5 – 8 years n=19 Mean ±SD	9-12 years n=11 Mean ±SD	p value
CONDUCTION VELOCITY(M/SEC)	MOTOR	46.5±7.4	39.9±4	<0.001**

*P <0.05 significant ** p 0.001 highly significant

Table 3: Correlation between Nerve conduction study parameters and duration of illness

Parameters	Duration of Illness	
	r VALUE	p value
DISTAL MOTOR LATENCY(MSEC)	0.15	<0.001**
AMPLITUDE (MV)	0.07	<0.05*
CONDUCTION VELOCITY(M/SEC)	0.08	<0.001**

*P <0.05 significant ** p 0.001 highly significant