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Original Research Article

Nerve Conduction Studyin Type 2 Diabetic Patients

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Abstract

Nerve conduction velocity (NCV) test measures the speed of conduction of an electrical impulse through a nerve. The NCV test can establish nerve damage and devastation. Nerve conduction studies (NCS) are regularly conducted to identify the neuropathy. This study will help to observe the difference in nerve conduction velocity between non diabetic and type II diabetic individuals. The present study was undertaken for a period of subjects, both males and females aged between 40-50 years, informed written consent was taken from the subjects. The study group consisted of 25 diabetic patients, with history of diabetes for 1-10 years and controls (Non Diabetics) were 30 age and sex matched healthy individuals. Comparison of sensory nerve parameters in Control Group (non diabetics) and diabetics shows there is highly significant slowing of sensory nerves median & ulnar ($p<0.001$) and decrease in amplitude of Median nerve($p<0.05$) in diabetics compared to controls. The study proved neuronal involvement in the diabetes mellitus which is accelerated by poor glycaemic control. Therefore nerve conduction studies should be carried out for the early detection and management of neuropathy in the diabetic patients.

Key words : Nerve Conduction Velocity, Diabetes Mellitus.

Introduction

Diabetes mellitus, the most common endocrine disorder is characterized by metabolic abnormalities and in the long run with micro and macro vascular complications that cause significant morbidity and mortality.[1] Diabetic neuropathy (DN) is one of the most commonly occurring microvascular complications accounting for 28% of all the complications in diabetics.[2] It is a progressive process that has a long asymptomatic stage.[3] It is important to identify neuropathy in the asymptomatic stages as the disease process progresses to the diabetic foot, a highly morbid condition that arises from the infection and the ulceration of the foot, finally leading to amputation.[4] Early identification and glycaemic control are the key factors for preventing DN. The American Academy of Neurology recommends at least one of the five criteria for diagnosing DN: Symptoms, Signs, Electrodiagnostic tests, Quantitative sensory\tests and Autonomic testing.[5] Practically, electrodiagnostic tests are less utilized for the diagnosis or for the follow-up of DN. Nerve conduction studies (NCS) are electrodiagnostic tests which are used to evaluate the ability of the electrical conduction of the motor and the sensory nerves. A nerve conduction study (NCS) is a test commonly used to assess the function, particularly the capacity of electrical conduction of motor and sensory impulses in nerves in human being. Nerve conduction velocity (NCV) is a general measurement made during this test. A nerve conduction velocity test measures how speedily electrical impulses move about along a nerve. It is often done at the same time as an EMG, in order to rule out or identify muscle disorders. Diabetes mellitus (DM) is a mounting public health problem upsetting people worldwide both in developing and developed countries.[6] World Health Organization rates diabetic peripheral neuropathy to be wide spread neuropathy globally. Approximately 45 to 60% of patients with DM will develop manifestation of peripheral neuropathy.[7] Diabetic peripheral neuropathy (DPN) begins in the distal extremities and then travels proximally. The longest axons exhibit symptoms first, with pain being evident to begin within feet, then distal lower extremities, and ultimately the hands.[8] In the presence of moderate to severe disease, conventional nerve conduction studies (NCS) are generally reliable diagnostic methods for diabetic polyneuropathy.[9] Diabetes mellitus, the frequent endocrine turmoil,

is characterised by metabolic abnormality and by longstanding complications like diabetic retinopathy, nephropathy, angiopathy and neuropathy. Diabetic peripheral neuropathy is the existence of symptoms and signs of peripheral nerve dysfunction in people with diabetes after ruling out other causes and often builds up as generalized asymptomatic dysfunction of peripheral nerve fibres.[10,11]

Material and Methods

The present study was undertaken for a period of subjects, both males and females aged between 40-50 years , informed written consent was taken from the subjects. The study group consisted of 25 diabetic patients, with history of diabetes for 1-10 years and controls (Non Diabetics) were 30 age and sex matched healthy individuals.

Criteria For Inclusion: Controls included 40-50 years aged 25 normal healthy individuals without diabetes. Subjects included 40-50 years aged 25 type 2 diabetics under control without complications on oral hypoglycemic drugs with Duration of diabetes 1-10years.

Exclusion Criteria: 1. Duration of diabetes more than 10 years. 2. Alcoholics, hypertensives, smokers, pregnant females. 3. Diabetic subjects having acute diabetic complications, entrapment neuropathy, nutritional deficiency, endocrinal disorders. 4. Muscle weakness, myopathy, neuromuscular diseases inherited neuropathy. 5. Neurovascular complications like stroke.

Nerve Conduction Study (Ncs): Nerve conduction study was done . For motor & sensory nerve study, output range was 20mA,max repeat rate 1Hz,pulse width 0.05ms stimulation with current ranging between 10-20mA was applied with increasing strength until desired response was obtained. Sensory nerves tested were Median, and Ulnar nerve.

Stimulation And Recording Sites Of Sensory Nerves:

Sensory nerve : Median, **Method of stimulation**: Orthodromic, **Stimulation site** : Index finger **Recording site** : Middle of the wrist .

Sensory nerve : Ulnar , **Method of stimulation**: Orthodromic ,**Stimulation site** : Little finger , **Recording site** : Medial wrist

Sensory nerve conduction study was done:

Parameters Assessed:

1. Sensory nerve action potential (SNAP) Amplitude.

2. Sensory nerve conduction velocity.

Statistical Analysis: Statistical analysis was done using SPSS version18 (software statistical package social science).students unpaired t test was used to compare Nerve conduction parameters between the study and control groups . p value was calculated.

P Value <0.001 - Highly Significant.

P Value <0.05 – Significant.

P Value >0.05 - Not Significant.

Results :

Table 1: Comparison of Blood Sugar Levels in Study and Control Group

Blood sugar	**Non diabetics n=25** mean±SD	**Diabetics n=25** mean±SD	**P value**
FBS (mg/dl)	84.36±7.2	110.82±14.8	<0.001
PMBS(mg/dl)	116.24±7.28	190.48±24.14	<0.001

Table-1 depict FBS and PPBS levels in controls and diabetics. FBS, PPBS was significantly higher in diabetics (P<0.001) than controls.

Table 2: Comparison of Sensory Nerve conduction parameters in Controls and Diabetics

Nerve conduction parameters	**Non diabeticsn=25**	**Diabeticsn=25**	**P value**
Median nerve			
SNCV(m/s)	60.28±4.18	45.16±5.01	<0.001
AMP(ms)	21.98±4.22	17.68±4.31	<0.05
Ulnar nerve			
SNCV(m/s)	61.82±4.82	46.28±4.78	<0.001
AMP(ms)	20.84±3.84	18.42±4.64	>0.05

AMP -amplitude, SNCV-sensory nerve conduction velocity.

Table-2 shows Comparison of sensory nerve parameters in Control Group (non diabetics) and diabetics there is highly significant slowing of sensory nerves median & ulnar (p<0.001) and decrease in amplitude of Median nerve(p<0.05) in diabetics compared to controls.

Discussion

Diabetes is a major health problem in developing countries. This study will help determine the change in nerve conduction velocity, which indicates microvascular damage in patients with

DM type 2. Value of life is compromised due to a common complication of diabetes mellitus which being diabetic neuropathy with high morbidity. A challenging treatment of neuropathy at the sub clinical level lessens the hazard of neuropathy. For this reason; there is a requirement of a process to make out the at-risk diabetic patients for neuropathy.[12] There is a direct relationship between the prevalence of neuropathy and the progression of diabetes mellitus [13]. The neuropathy is caused by the presence of signs and symptoms of peripheral nerve disorders in diabetic patients. Nerve damage in diabetic patients has various features and the change in nerve conduction velocity is one of its symptoms. The position and characteristics of the nerve fibers, the severity of diabetes and demographic characteristics (such as age, duration of disease, and gender) are of the factors playing a key role in the severity of sensorimotor neuropathy. As mentioned earlier, such complications are common in diabetics, and somewhat predictable, but they have a wide range of changes and potency, which have been the subject of research by researchers. For example, Soivers et al (2004) have conducted a research in order to perform the clinical and electroneurographic study of peripheral nerve involvement in diabetic patients. Nerve conduction changes associated with diabetic neuropathy include declining response amplitude and conduction velocity. In the present study, a significant difference was found between the NCS parameters of cases and controls. Smaller amplitude and slower conduction velocity was found in all the nerves in both sensory and motor NCS of neurologically asymptomatic diabetic patients. Smaller amplitude reflects axonal loss and slowing of conduction velocity could be the result of a combination of segmental demyelination, loss of fastest conducting axons, and metabolic alterations.[14,15] Diabetic neuropathy is a common complication of diabetes mellitus with severe morbidity, compromising the quality of life. An intensive treatment of neuropathy at the sub clinical level decreases the risk of neuropathy.[8] Therefore, there is a need of methods to identify the at risk diabetic patients for neuropathy. Nerve conduction studies are one of the important methods for assessing nerve functions in DN. In this study, it was observed that the nerve conduction velocity progressively decreased from the controls (non diabetics) to the diabetics These findings are in accordance with those of previous researchers.[16] Bansal et al (2006) have suggested that the slowing of NCV indicates the ongoing damage to the myelin sheaths and they are also of the opinion that the amplitude decreases with the rising blood sugar levels, thus suggesting the onset of axonopathy.[17] Therefore, the monitoring of diabetic patients with NCS may help in predicting the onset of DN. [18]

Conclusion

There is a progressive neuronal involvement in the diabetic process which is accelerated by poor glycaemic control. Therefore, nerve conduction studies can be employed for testing and for the early indication of neuropathy in diabetic patients. We observed progressive decline in sensory conduction velocity with the duration of the disease. This shows that poor metabolic control causes early onset and rapid progression of neuropathy. We conclude the study with the observation that nerve conduction study can be used as a screening tool to diagnose neuropathy in subclinical stages and overweight diabetics should be considered at risk category for aggressive glycemic control by diet, drugs and life style modification to prevent progression of neuropathy.

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