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RESEARCH ARTICLE

A study on the effect of duration of Type 2 diabetes mellitus on nerve conduction velocity

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ABSTRACT

Background: Diabetic polyneuropathy, the most common type of neuropathy observed results from microvascular injury leading to damage of the nerve. Diabetic neuropathy depends on both duration as well as on the level of control of blood sugars. It depends more on the duration of diabetes. **Aims and Objectives:** This study was done to see the effect of duration of Type 2 diabetes on median nerve conduction velocity (NCV). **Materials and Methods:** A total of 100 subjects were taken, 50 patients of Type 2 diabetes mellitus with duration of 5 years or more and another 50 patients with duration of diabetes being <5 years. The entire recording was done using a four channel ADInstrument and compound muscle action potential were recorded using the LabChart software in both the groups. **Results:** We found that there was a significant ($P < 0.05$) decrease in the NCV among the diabetic population 5 years or more (45.01 ± 17.18) compared to the <5 years (51.55 ± 15.52). There was a non-significant change in the amplitude ($P > 0.05$) among the diabetic population 5 years or more (487.35 ± 60.74) compared to <5 years (536.19 ±63.88). There was a non-significant change in the distal latency ($P > 0.05$) among the diabetic duration of 5 years or more (0.00475 ± 0.0015) compared to <5 years of diabetes (0.004602 ± 0.0015). **Conclusion:** Thus, from our study we would like to conclude that there is a link between the duration of diabetes and NCV.

KEY WORDS: Diabetes Mellitus; Nerve Conduction Velocity; Neuropathy

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia and disturbances in carbohydrate, fat, and protein metabolisms due to either lack of insulin secretion or decreased sensitivity of the tissues toward insulin. It is mainly of two types, Types 1 and 2; however, Type 2 is common among them.[1] The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[2] Due to sedentary lifestyle, altered food habits, and increased waist-to-hip ratio, the prevalence of diabetes is increasing in Indian population. Total number of people with diabetes in India estimated to be 40.9 million, predicted to rise to 69.9 million by 2025.[3]

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After the advent of oral hypoglycemic agents and insulin, the mortality rate of Type 2 DM has decreased, but the morbidity rate has increased due to chronic complications. Among the chronic complications of Type 2 DM, microvascular and macrovascular complications are more common. Among the microvascular complications, diabetic polyneuropathy is the most commonly observed complication. Due to microvascular injury, nutrient and oxygen supply for the

neuron gets affected. Hyperglycemia induces oxidative stress in diabetic neurons and results in activation of multiple biochemical pathways which ultimately leads to nerve injury.[4]

Most commonly the patients come to clinic with the complaints of burning type of pain in their feet, numbness, and tingling sensations in the distal extremities. Later on, due to loss of sensations in their foot ultimately develop chronic leg ulcers, gangrene, and diabetic foot. Due to loss of sensations in their foot ultimately develop chronic leg ulcers, gangrene and diabetic foot which often leads to amputation of foot. To prevent the long-term complications, early detection of neuropathy is important. Symptoms of neuropathy are subjective complaints. To quantify the symptoms and to see the prognosis, nerve conduction velocity study (NCV) has a significant role. To quantify the symptoms of neuropathy and to see the prognosis, nerve conduction velocity study (NCV) plays a significant role.[5] Chronic complications of Type 2 DM depend on the duration of diabetes and also on the glycemic control as well. It depends more on the uncontrolled diabetes for long duration.[6]

Prevention is always better than cure. To prevent the long-term complications like neuropathy, early detection by nerve condition studies is essential. Hence, in our study, we aimed to see the effect of different duration of uncontrolled Type 2 diabetes on median NCV.

MATERIALS AND METHODS

This study was undertaken in the Department of Physiology, ESIC Medical College, Hyderabad, after approval from the Research and Ethical Committees. A total of 100 subjects were taken, 50 patients of Type 2 DM with duration of diabetes 5 years or more, with a fasting blood sugar level ≥126 mg/dL and postprandial blood sugar level ≥200 mg/dL, visiting ESIC Hospital and another 50 patients suffering from Type 2 DM with duration of diabetes being <5 years. Detailed history regarding symptoms such as paresthesia, tingling sensation, burning feet, and hyperesthesia was taken, history of weakness and gait abnormality were noted. All Type 2 diabetic patients diagnosed in such a manner, were subjected to the nerve conduction study.

On arrival of the patients, the details of the study were explained and written informed consent was obtained. The height and weight of the patients were noted. The entire recording was done using a four channel ADInstrument. The compound muscle action potential was recorded using the LabChart software. The difference between the onset latencies was noted. Distance was measured between the two stimulation points and the velocity was calculated using the formula:

Velocity = Distance travelled/time taken.

Latency, amplitude, and NCV were assessed. The data were summarized to test the difference in the mean values between the Groups 1 and 2 using the Student's *t*-test; $P < 0.05$ was taken as the level of statistical significance.

RESULTS

The study included total of 100 subjects, 50 patients of Type 2 DM with duration of diabetes 5 years or more, with a fasting blood sugar level ≥126 mg/dL and postprandial blood sugar level ≥200 mg/dL, visiting ESIC hospital and another 50 patients suffering from Type 2 DM with duration of diabetes being <5 years. Both the groups were aged between 40 and 70 years Table 1. We found that there was a significant ($P < 0.05$) decrease in the NCV among the diabetic population 5 years or more (45.01 ± 17.18) compared to the Type 2 DM with duration of diabetes being <5 years (51.55 ± 15.52) [Table 2]. There was a non-significant change in the amplitude ($P > 0.05$) among the diabetic population 5 years or more (487.35 ± 60.74) compared to the Type 2 DM with duration of diabetes being <5 years (536.19 ± 63.88). There was a non-significant change in the distal latency ($P > 0.05$) among the diabetic population 5 years or more (0.00475 ± 0.0015) compared to the Type 2 DM with duration of diabetes being <5 years (0.004602 ± 0.0015).

DISCUSSION

In this study, we compared the NCV of 50 Type 2 diabetic patients with duration of diabetes being 5 years or more (mean age 54.14 ± 8.36 years) and 50 Type 2 diabetic patients with duration of diabetes being <5 years (mean age 52.62 ± 7.90 years). In our study, we found there was a significant

Table 1: Age (in years) comparison between study group and control group

Group	*n*	Mean±SD	*P*-value
Type 2 DM with diabetes 5 years or more	50	54.14±8.36	*P*=0.35
Type 2 DM with diabetes of <5 years	50	52.62±7.90	

Unpaired *t*-test, *P*>0.05, DM: Diabetes mellitus, SD: Standard deviation

Table 2: Comparison of Right Median Motor Nerve conduction Parameters in the two groups

Variable	Duration of Type 2 DM		*P*-value
	5 years or more	<5 years	
	Mean±SD		
Amplitude (μV)	487.3596±60.74	536.1984±63.88	0.354
Distal latency (s)	0.004755±0.00159	0.004822±0.00135	0.821
NCV (m/s)	45.016±17.183	51.55±15.52	0.048*

Unpaired *t*-test *significant, NCV: Nerve conduction velocity, SD: Standard deviation, DM: Diabetes mellitus

($P < 0.048$) decrease in median NCV in Type 2 diabetic patients with a longer duration of diabetes.

The decrease in the median NCV found in our study is in accordance with the study done by Zaidi *et al.*[7] In their study, they found a significant decrease in NCV median, ulnar, superficial peroneal, and sural with the increase in duration of diabetes. Yet, another study also correlates with our findings which implies there will be a decrease in NCV in diabetics with a good glycemic control to the diabetics with a poor glycemic control.[8] Likewise in a study done by Sultana *et al.* with relatively longer duration of diabetes, some of the sensory nerve conduction parameters were affected. Among them, sensory NCV and sensory nerve action potential were significantly reduced in diabetic group with relatively longer duration of diabetes.[9] Our study is supported by the findings of Farheen and Malipatil. NCV progressively decreased from the controls to diabetics with good glycemic control, to the diabetics with poor glycemic control.[6]

Hence, from our study, it is clear that as the duration of uncontrolled Type 2 DM increases the chronic complications like neuropathy will increase. Nerve conduction is a better tool for detecting the early changes of neuropathy. The limitation of the present study was that small number of diabetic patients was covered. Hence, in the future studies, large number of diabetic population can be included with the follow-up of patients to see the effect of the treatment on NCV.

CONCLUSION

The study was conducted on 100 subjects, among which 50 were Type 2 diabetic with duration of diabetes being 5 years or more and the rest were Type 2 diabetic with the duration of diabetes being <5 years. There was a comparatively significant decrease in NCV among the patients with the duration of diabetes being >5 years. Thus from our study, we would like to conclude that there is a link between the duration of diabetes and NCV. A more detailed study involving more number of patients with Type 2 DM of different duration is warranted to come to a definite conclusion.

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