DOI: https://doi.org/10.53350/pjmhs22161211

ORIGINAL ARTICLE

Deranged Blood Sugar Levels in Type 2 Diabetics induced impairment of nerve conduction

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ABSTRACT

Background: One of the complications of diabetes is Peripheral neuropathy that becomes the source of frailty and indisposition. Metabolic malfunction is the root cause in diabetes that target nerve damage.
Aim: To evaluate electrophysiological case research with respect to effect of diabetics on nerves and to link it along with blood sugar
Methods: Assessment of nerves related to of upper limb was carried out for motor nerve by aid of computerized system and surface electrodes in 40 male individuals suffering from type 2 and 40 healthy males. The ulnar and median nerve was selected for case research. Parameters that were being discussed included conduction velocity and distal latency
Results: Diabetics have increased distal delay and reduced conduction velocity. These variables were linked to blood sugar levels in diabetics.
Conclusions: There is affect to nerves in case of diabetes as shown by poor motor nerve function and depicted via testing electro physiologically. Increase in sugar blood levels is associate with damage to nerves.
Keywords: Electrophysiological tests, Conduction velocity, Peripheral neuropathy, Diabetes,

INTRODUCTION

There has been increased rate of diabetes suffers through the world and its increasing by leaps and bounds by every passing day. It has been estimated that its rate is going to be double the era from 2000 to 2030. Increase in complications due to diabetes is being expected due to its worldwide rapid incidence. Mal functioned metabolism is the main culprit of complications that occurred due to diabetes. One of the noteworthy complications due to diabetes is peripheral neuropathy since it involves all somatic nervous system linked with hands and feet. Usually it makes progress silently and gradually.

In order to measure nerve function Nerve conduction studies (NCS) are carried out that give quantitative measure of how nerves are functioning. NCS help us to diagnose neuropathies related to peripheral nervous system and also aids in evaluation of neuropathy progression, that is why it is been used on regular basis in order to know status of peripheral nerve normal functions. The existing case research aimed at detection of early peripheral nerves malfunctions via using NCS.

MATERIALS AND METHODS

After taking permission by ethical committee, a case research was carried out involving 40 male patients suffering from diabetes type 2 for more than two and half duration 6 and 40 sound individuals (that were also male). Peripheral nerves mainly Ulnar and Median from upper limb was evaluated for conduction of motor nerve via aid of electrodes and computerized EMG/ NCV/EP Mark II system windows based software (Neuro perfect). This case research was done in the of Physiology department on candidates suffering from Type 2 diabetes and visiting outpatient department. The study design was cross-sectional. All the participating individuals were evaluated in great detail. Any candidate with chronic illness, nephropathy, retinopathy, alcoholic, neuropathic case, smokers and myopathy were removed from case research. All the individuals were demonstrated about case research and informed consent was taken from every individual. The weight and height was evaluated of every individual and samples of blood was taken to evaluate blood sugar. Left ulnar and Left median nerves of the individuals were selected for conduction for motor nerve study. Stimulation of Peripheral nerves was carried out electrically via stimulation supra maximally and compound muscle action potentials (CMAP) was evaluated and noted from muscles supplied by these two nerves. Instrument calibrations for sake of record purpose were: sensitivity: 2-5 mV/mm, low frequency filter: 2-5 Hz, high frequency filter: 10 KHz and sweep speed: 1-2 ms/mm. The nerves from both sides were stimulated i-e proximal and distal site and latencies were being evaluated in milliseconds. Proximal and Distal latency were taken and used in order to evaluate conduction velocity. In case of median nerve motor conduction study, stimulation was firstly given in the middle area of the wrist (distal stimulation) after that, stimulation was given over the brachial artery pulse at the area of elbow in the anterior cubital fossa (proximal stimulation). In between recording and stimulating electrode, ground electrode was placed. The length between elbow and wrist was evaluated in terms of millimeters. Estimation of nerve Conduction velocity was done by that distance dividing with the difference among two latencies and written in terms of meters/second. In case of ulnar nerve, on medial aspect, stimulation was given distally with respect to wrist and at elbow level, stimulation was given proximally little over the groove of ulnar. The Recording was taken via the abductor digitorum V muscle of belly. Analysis of data was carried out statistically via aid of t test and SPSS version 23 was used. Evaluation of Correlations was done via aid of Pearson correlation coefficient.

Received on 17-07-2021
Accepted on 22-12-2021

RESULTS

Summary of the conclusion of the case research is as follows. Table 1 depicted sugar blood levels as well as anthropometric measurements of all individuals. Mean age in case of diabetic individual group was noteworthy greater as compared to members control group. Table 2 depicted examination and evaluation of conduction of motor nerve study. In case of diabetic individuals, noteworthy greater distal latencies of nerves ($p< 0.001$) were seen whereas lower conduction velocities ($p< 0.001$) of nerves were observe in case of group suffering from diabetics depicted negative relationship of conduction velocity and positive relationship of Distal latency with sugar blood levels.

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Table 1: Anthropometric and blood sugar data of diabetics and non-diabetics

Characteristics	Diabetics (Mean±SD)	Controls (Mean±SD)	p value
Subjects	40	40	
Age(years)	54± 2	50.1±3	0.002
Fasting plasma glucose (mg%)	145± 12.32	95± 7.62	0.0000
2-hour plasma glucose (mg%)	210± 20	124.01± 08.42	0.0000

Table 2 Nerve conduction study parameters

Parameters	Nerves	Diabetics (Mean±SD)	Controls (Mean±SD)	p value
Distal Latency(ms)	Median	3.1 ± 0.5	2.1+0.6	0.001
	Ulnar	1.3± 0.2	1.1± 0.4	0.007
Conduction velocity(m/s)	Median	50.1+3	55+5.2	0.001
	Ulnar	51.2+8	61.4+7	0.000

DISCUSSION

In case of diabetic individuals, increase in distal latency and reduction in conduction velocities of the nerves were seen . Distil latency increment and decline in conduction velocity is one of the main characteristics of demyelination. This case reseach also depicted a correlation of distal latency positively and correlation with respect to conduction velocity negatively with sugar blood levels in case of individuals suffering from diabetics. When case research on diabetic individuals was done by Sultana S et.al, he found that motor nerves decline in conduction velocity same as our case research .6 Decline in conduction velocity in case of nerves of lower limbs nerves were also reported in diabetic individuals .More over also documented increment in latency in case of nerves of lower limb in diabetic individuals . There is spike in the flux of molecules of sugar via polyol pathway because of increased sugar levels in case of diabetic individuals ,due to which sorbitol gets clumped inside cells and eventually results in osmotic stress. The osmotic stress and advanced glycation end products (AGE) formation are one of the root cause of microvascular complications in case of diabetic individuals . Due to hyper glycemia, The accurate damage to the peripheral nerves is still not confirmed but is liked to phenomenon's such as injury from AGEs polyol accumulation, and oxidative stress probably .9However many case researches have associated dyslipidemia as the significant root cause in causing neuropathy. Abnormal lipid serum levels might play a role in causing nerve infarction via embolism of fat or via lipid encouraged aggregation of platelet. Suggestions are also put forward that link neuropathy in case of diabetic individual to neuronal insulin resistance / deficiency and is not glucocentric only.In current case research , mean age of individuals suffering from diabetics were highly noteworthy as compared to members of control group. One of the prominent risk factor for diabetic neuropathy is age, independent of the glycemic control and duration that individual suffers from diabetes . Biologically, many changes takes place during the process of aging process which is responsible for causing diabetic neuropathy.The case researches have documented via their researches that in legs the longest nerve fibers become affected because of diabetes mellitus.Mostly case reaches are targeted to lower limbs area whereas nerves related to Upper limbs were evaluated less and hence it is need of time to carry out advance examination of these nerves . Few corns of the studies were seen such as no attempt was made to relate nerve conduction parameters with dyslipidemia. Furthermore diabetic neuropathy has affect on both motor and sensory nerves , so recording action potentials of sensory nerve accompanied by compound muscle action potentials would have proved to be more beneficial in assessment of function of nerve. Detection of the early changes in nerves in case of diabetes mellitus is important and helpful in diagnosis. Thus, current case research will aid to make diagnosis early in case of diabetic neuropathy that will further aid in managing disease better as well as help us to attain fruitful prognosis of disease.

Conclusions: There is affect to nerves in case of diabetes as shown by poor motor nerve function and depicted via testing electro physiologically. Increase in sugar blood levels is associate with damage to nerves.

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