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Original research article

Detection of peripheral neuropathy among grade 3 hypertension using sensory nerve conduction variables of upper limb

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Abstract

Background: Hypertension is one of the health issue in India. Eventhough there are more availability of medications, certain times it remains undetected of its complications. One of the most important complication is the peripheral neuropathy.

Aims and Objectives: This study was aimed to detect peripheral neuropathy among Grade 3 Hypertension using Sensory Nerve Conduction Variables of upper limb.

Materials and Methods: The protocol of the study was approved by the Institutional Ethics Committee. A written informed consent was taken from each participant. This study was done in 50 Grade 3 hypertensive pateints and 50 normotensive subjects with age group 45-60 years which included both males and females.

Statistical Analysis: Unpaired 't' test was used to find the statistical significance between both groups. The data was analysed using the Microsoft excel software. Group statistics was done and expressed as Mean ± SD.

Results: The Nerve Conduction test of the right and left median sensory nerve was performed and the following changes are seen: increased Distal Latency, reduced SNCV, and decreased SNAP as compared to normal values.

Conclusion: Hypertension creates axonal degeneration, but may not be influencing its myelination. Thus protecting nerve conduction speed. Hypertension itself may not affect the Nerve Conduction Variables. More studies related to oxidative stress and hypertension may be required to know whether Grade 3 hypertension affect the sensory Nerve conduction velocity.

Keywords: Nerve conduction study, hypertension, peripheral neuropathy, median nerve

Introduction

Hypertension is one of the health issue in India. Next to Diabetes Mellitus, hypertension will be the higher Public health issue. Hypertension is defined as the elevated BP > 140/90 mm Hg. Even though there are more availability of medications, certain times it remains undetected of its complications. One of the most important complication is the peripheral neuropathy. Nerve conduction is the best electrophysiological test to detect and characterize any neuromuscular or nerve diseases.

Nerve conduction study involves electrical stimulation of peripheral nerve at one site and measurement of evoked potential at second site in a nerve (sensory or mixed nerve conduction), or on the muscle innervated by the nerve (motor nerve conduction). By nerve conduction study, the latency, amplitude and conduction velocity can be measured [1].

Several studies on Nerve conduction have been done among normal individuals with Body mass index, age and hypertension as cofactors. But not many studies are done across the world in sensory nerve conduction in Grade 3 hypertension. Hence a need to look into the sensory parameters of nerve conduction to avoid or prevent complications arising as an outcome of hypertension.

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Nerve conduction study is the most sensitive and specific assessment in identifying the severity of peripheral neuropathy [2]. Hence the study was planned for early detection of sensory neuropathy in upper limb.

Methods

The study was conducted in the department of physiology in collaboration with department of Medicine. The protocol of the study was approved by the Institutional Ethical committee. A written informed consent was taken from each participant. The study was done in 50 Grade 3 hypertensive patients and 50 Normotensive subjects with age group 45-60 years which included both males and females.

Selection of subjects

The participants with SBP ≥ 180 and DBP ≥ 110 mm of Hg were taken as Grade 3 hypertensive group and the subjects with Blood pressure < 120/80 mm of Hg were taken as controls [3]. Based on the average of 2 readings.

Exclusion criteria

Subjects with associated illness like diabetes mellitus, peripheral vascular disease, leprosy, alcohol were excluded from the study.

Establishment of blood pressure status

Blood pressure measurements were done in both control and hypertensive patients. After making the subjects sit comfortably in a chair, blood pressure cuff was tied to the upper arm. The cuff was inflated to the pressure level above which the radial pulse could no longer be felt. The stethoscope was placed over the brachial artery and mercury column was immediately allowed to fall at the rate of 2 mm Hg per second. The perception of the sound heared first was taken as the systolic pressure and then the mercury was allowed to lower further till the sound ceased to be fully muffled, tapping in quality and finally disappeared. The level at which it disappears was taken as the diastolic pressure. The cuff was then deflated to zero pressure. The measurement was repeated twice with a gap of five-minute interval and then average is taken for accuracy.

Nerve conduction study evaluation

Nerve conduction study on median nerve of both upper limbs was done on RMS EMG machine.

Sensory median nerve conduction procedure

The procedure was explained clearly to each subject to make sure maximum comfort and compliance. The median nerve on both sides were done. The tests were done on an electromyograph. The following are the acquisition parameters: Filter settings at 3 Hz to 2 kHz, sweep speed of 20 ms, and gain of 10 microvolt (μV)/division. Upper limb temperature was recorded at the wrist and was maintained at 30°C. The temperature was measured before, during, and after the recording. Nerve conduction parameters such as latency, amplitude and nerve conduction were recorded. All control and hypertensive subjects were investigated by a electrophysiological study of the median nerve, both limbs by the RMS-EMG machine.

Statistical analysis

The data was analyzed using the Microsoft excel software. Unpaired 't' test was used to find the statistical significance between both groups. Group statistics was done and expressed as Mean ± SD.

Table 1: Effect of hypertension on Sensory Median Nerve conduction study variables controls and hypertensives

Grouping	Sensory Nerve	Duration	Amplitude	Latency	Conduction Velocity	P value
Control group	Median	0.423± 0.0007	14.77 ± 0.085	13.78 ± 0.076	32.27 ± 0.12	<0.0001*
Hypertensive group	Median	0.2184 ±0.0006	13.61 ± 0.076	12.64 ± 0.065	32.18 ± 0.12	<0.0001*

*Statistically significant, SNAP: Sensory nerve action potential, SNCV: Sensory nerve conduction velocity

Results

The Nerve Conduction test of the right and left median sensory nerve was performed in the study population, and the following changes are seen : increased Distal Latency, reduced SNCV, and decreased SNAP as compared to normal values. Student 't' test was done by comparing the two groups and the difference was found to be statistically significant (p<0.05) (Table 1).

Discussion

Detection of nerve conduction at an early stage can decrease the risk or hazards of peripheral neuropathy, along with diagnosis, treatment and life style modifications [4]. Dyck *et al.* [5] introduced diagnosis and staging of peripheral neuropathy based on clinical and neuropathological criteria [6]. The relationship between hypertension and peripheral neuropathy was done by Dhafir I.EI Yassin *et al.* [7] and found out that there is statistical significance of (p<0.05). A reduction in Nerve conduction velocity in

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hypertensives was seen in a study done by viskoper *et al*. [8] because of vasospasm of blood vessels supplying the nerves. The strongest measure of neuronal problems is the amplitude (axonal neuropathy) and is studied by Asad *et al*. which is also similar to the present study [9]. The studies done by sathiamoorthy *et al*. [10], Sepat and Wasnik [11] and Aruna and Haragopal [12] shows the findings of axonal neuropathy in ulnar nerve.

However, our study showed that there is not much effect on the myelination of nerves but little axonal degeneration is produced.

Certain studies showed that hypertension is associated with increased vascular oxidative stress. Montezano. C *et al*. suggested that in hypertension, oxidative stress promotes endothelial dysfunction, inflammation and endothelial dysfunction which leads to vascular damage [13] Extensive studies such as, studies related to oxidative stress and hypertension may be required to know whether Grade 3 hypertension affect sensory nerve conduction velocity.

Conclusion

This study shows that Hypertension creates axonal degeneration, but may not be influencing its myelination. Thus, protecting nerve conduction speed. Hypertension itself may not affect the Nerve Conduction Variables. More studies related to oxidative stress and hypertension may be required to know whether Grade 3 hypertension affect the sensory Nerve conduction velocity. Results of reduced nerve conduction velocity in hypertensive patients should alert the clinician for the possibility of associated diseases such as, alcoholism, diabetes mellitus and peripheral vascular diseases.

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