IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 2 Ser.15 (February. 2020), PP 12-16
www.iosrjournals.org

Comparative Study of Nerve Conduction Variables in Normotensive and Hypertensive Individuals

Dr. Barkha Rani[1] Dr. Anand Kumar Singh[2]

[1]*Assistant Professor (bonded),Govt. Medical College, Nagpur, Maharashtra, India.*
[2]*Senior Resident, Department of Orthopaedics AIIMS Raipur, Chhattisgarh-492099 India.*
Corresponding Author: Dr. Anand Kumar Singh
Senior Resident, Department of Orthopaedics AIIMS Raipur, Chhattisgarh-492099, India.

Abstract

Background *-Hypertension is the most prevalent cardiovascular disorder that affects many organs of our body. Nerve conduction velocity test is an essential reliable clinical test for the diagnosis of the diseases of peripheral nerves that include peripheral neuropathies. Nerve conduction study measures duration, latency, amplitude and conduction velocity. The present study is carried out to assess latency, amplitude and velocity of motor and sensory nerve conduction variables in median nerve.*

Aimsand Objectives-The aim of the study was to evaluate the motor and sensory conduction latency, amplitude and velocity of median nerve in patients with essential hypertension.

Material and Methods *-The study was conducted in the Department of Physiology. The study protocol was approved by the Institutional Ethical Committee. A written informed consent was obtained from each participant. The study was done in 50 hypertensive patients and 50 normotensive subjects between the age group of 40-60 years. Statistical Analysis-The data analysis will be done using the"MedCalc". NCV measures were expressed as mean ± SD.Student paired "t- test " and chi –square test was used forcomparison of the values between hypertensive andnormotensive group, p value< 0.05 was consideredstatistically significant .*

Results-*Motor components of median nerve in hypertensive show latency (7.26±0.71), amplitude (6.88±1.90) and velocity (58.46±4.57) when compared with normotensive shows latency (7.27±0.70), amplitude (7.14±2.03) and velocity (59.3±4.28). Sensory components of median nerve in hypertensive show latency (2.91± 0.58), amplitude (33.13 ± 10.51) and velocity (58.3±3.52) when compared with normotensive shows latency (2.85±0.53), amplitude (35.5±12.5) and velocity (58.1±3.15). Hence, when compared, these findings motor and sensory nerve conduction latency, amplitude and velocity in normotensives and hypertensive were not statistically significant (p> 0.05).*

Conclusion-*Hypertension may produce axonal degeneration, but may not be affecting the myelination thus preserving nerve conduction velocity. Thus, hypertension itself may not affect the nerve conduction variables. Extensive studies are required to study the effect of hypertension in nerve conduction taking into consideration the duration, age, BMI and severity.*

Keywords- *Nerve Conduction Study, Hypertension, Peripheral Neuropathy.*

Date of Submission: 07-02-2020 Date of Acceptance: 22-02-2020

I. Introduction

Hypertension is a major contributor to the global disease burden. It poses an important public health challenge to both economically developing and developed countries, including India(1). Hypertension defines itself as a sustained elevation of blood pressure >140/90 mm of Hg. Diagnosis is easy and simple to treat with surplus availability of medications, but sometimes it remains undetected, untreated and sometimes the treatment is not adequately effective(2).

Nerve conduction velocity test is an essential reliable clinical test for the diagnosis of the diseases of peripheral nerves that includes peripheral neuropathies(3,4). Nerve conduction study involves a non-invasive electrical stimulation of a peripheral nerve at one site and its non-invasive measurement of the evoked response at second site over the muscle innervated by the nerve (motor nerve conduction).Nerve conduction study measures duration, latency, and amplitude and conduction velocity. Conduction velocity and latency denote the speed of nerve impulse propagation. They are altered in disease, which cause demyelination. Amplitude denotes the number of functioning fibres and it is altered in diseases causing axonal degeneration (5).

II. Methods and Materials

The study was conducted in the Department of Physiology,Grant Govt. Medical College Mumbai, Maharashtra. The study protocol was approved by the Institutional Ethical Committee. A written informed consent was obtained from each participant. The study was done in 50 hypertensive patients and 50 normotensive subjects between the age group of 40-60 years, which included both males and females.

Inclusion Criteria: The criteria of considering patient hypertensive was BP >140/90 mm of Hg based on the average of 2 readings with a duration of less than 5 years on medication. The controls were healthy volunteers with BP <120/80 mm of Hg[(6)].

Exclusion Criteria: The subjects with any associated diseases like diabetes, peripheral vascular diseases, pregnancy, alcohol, tobacco, smoking, terminally ill hypertensive patients, leprosy or other conditions, which are known to cause peripheral neuropathy were excluded from the study.

Establishment of Blood Pressure Status: All control volunteers and hypertensive patients underwent blood pressure measurements. Standard mercury sphygmomanometer with appropriate cuff size was used to measure blood pressure. The subject was asked to sit relaxed in a chair with her/his arm supported comfortably and the pressure cuff was applied closely to the upper arm. The cuff was rapidly inflated to pressure above the level at which the radial pulse could no longer be felt. The stethoscope was placed lightly over the brachial artery and the mercury column was immediately allowed to fall at the rate of 2 mmHg per second. The first perception of the sound was taken as the systolic pressure and then the mercury was allowed to fall further till the sound ceased to be tapping in quality, became fully muffled and finally disappeared. The level where it disappeared was taken as the diastolic pressure. The cuff was then deflated to zero pressure. The measurement was repeated twice with five minute interval and the average taken for accuracy.

Recording of Nerve Conduction Velocity: The study was done using NEURO – MEP –NET Machine equipped for EMG/NCV/EP manufactured by NEUROSOFT TM. The apparatus works on a computer with windows 98 operating system having MS Office 97 package.

Motor and sensory conduction variablesof median nerve weremeasured. Instrument setting-

a) For motor studies: Sensitivity: 2-5mv/mm, Low frequency filter: 2-5Hz, High frequency filter: 10 KHz

b) For sensory studies: Sensitivity: 10-20microv/mm, Low frequency: 5-10Hz, High frequency filter: 2-3 KHz sweep speed: 1-2 ms /mm.

Motor Median Nerve Conduction Procedure-

Electrodes	Position
Recording electrode	Placed on the motor point of Abductor Pollicis Brevis i.e. midway between the distal wrist crease and the first metacarpophalangeal joint.
Reference electrode	Placed 3 cm distal to recording electrode at the first metacarpophalangeal joint .
Ground electrode	Placed on the dorsum of hand .
Stimulating electrode	• Distal stimulation point: placed 3 cm proximal to distal wrist crease near the tendon of Palmaris longus . • Proximal stimulation: placed at the elbow near the volar crease of the Brachial Artery pulse.

Sensory Median Nerve conduction procedure-

Electrodes	Position
Recording electrode	Placed 3 cm proximal to the distal wrist crease slightly radial to the tendon of Palmaris longus.
Reference electrode	Placed 3cm proximal to recording electrode
Ground electrode	Placed on thenar eminence
Stimulating electrode	• Cathode: placed at proximal interphalangeal joint of the second digit (index finger). • Anode: placed 3cm distal to the cathode

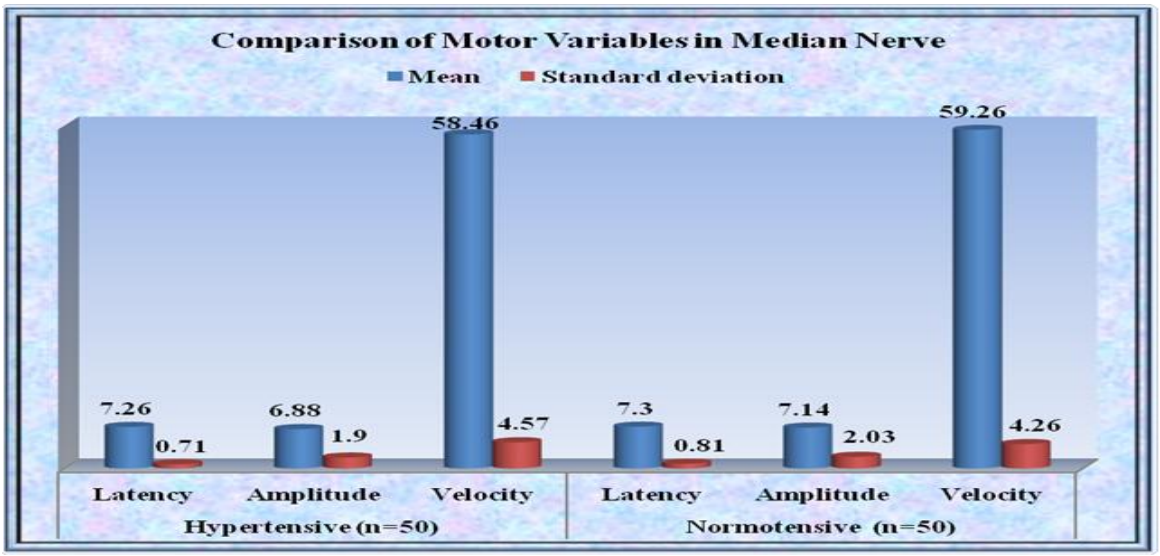
Photo 1- Median nerve stimulation at wrist

III. Results

The results of motor nerve conduction variables were not statistically significant between normotensive and hypertensive group (P >0.05).

Parameters	Hypertensive (n=50) Mean ± s.d.	Normotensive (n=50) Mean ± s.d.	p-value
Latency	7.26 ± 0.71	7.27 ± 0.70	0.9436
Amplitude	6.88 ± 1.90	7.14 ± 2.03	0.5100
velocity	58.46 ± 4.57	59.3 ± 4.28	0.3451

Table 1: Motor Nerve Conduction Variables in Normotensive and Hypertensives.

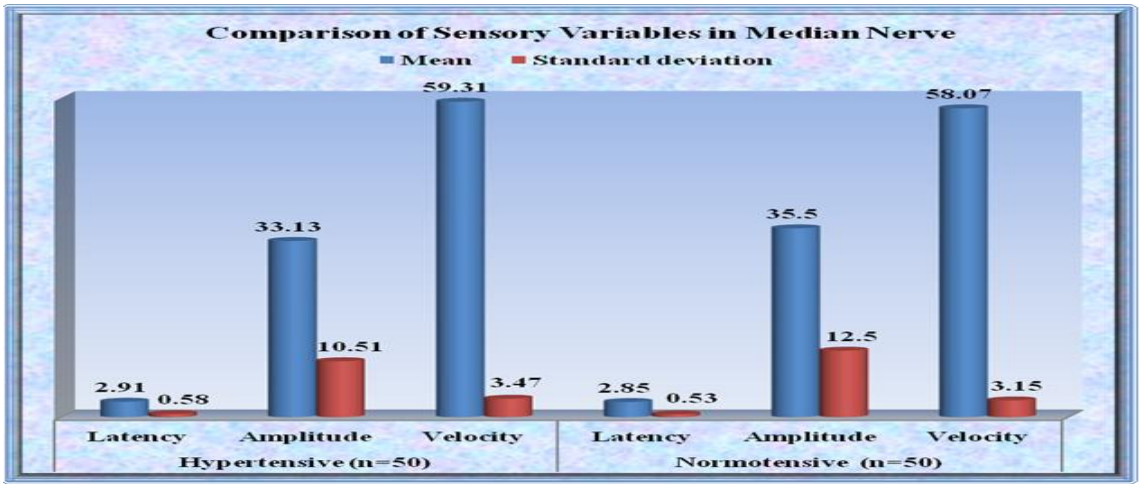


Graph 1:Motor Nerve Conduction Variables in Normotensive and Hypertensives.

The results of sensory nerve conduction variables were not statistically significant between normotensive group and hypertensive group (P >0.05).

Parameters	Hypertensive (n=50) Mean ± s.d.	Normotensive (n=50) Mean ± s.d.	p-value
Latency	2.91 ± 0.58	2.85 ± 0.53	0.5904
Amplitude	33.13 ± 10.51	35.5 ± 12.5	0.3073
Velocity	58..3 ± 3.52	58.1 ± 3.15	0.7653

Table 2: Sensory NerveConduction Variables in Normotensive and Hypertensives.



Graph 2: Sensory Nerve Conduction Variables in Normotensive and Hypertensives.

IV. Discussion

This study aimed to investigate the effect of motor and sensory nerve conduction variables in patients with hypertension. No statistical significant differences were found in sensory and motor nerve conduction velocity of hypertensives as compared to normotensives.

A study was done by Dhafir I. EI-Yassin et al[7] to assess the relationship between hypertension and peripheral neuropathy. The study assessed nerve conduction variables of sensory nerve function, motor nerve function and also Fwave measurement. They observed statistical significance of ($p < 0.05$) for the association between hypertension patients and sensory nerve conduction that presented deterioration. However, the motor nerve conduction studies (Median, Ulnar, Tibial) did not show much changes; whereas, in their F-wave parameter assessment, the latency of the slowest Fwave was observed in the common peroneal nerve, which was prolonged. From their results, they interpret that smallest fibres were affected in hypertension.

Legrady P et al[8] presented that nondiabetic hypertensive patients also present the complications presented in diabetes. Patients who presented hypertension were undergoing antihypertensive therapy. In the study done by Viskoper et al[9],there is a reduction in nerve conduction velocity in hypertensives. This is because hypertension causes vasospasm of blood vessels supplying the nerves. Popvtzer MM et al[10] showed that motor nerve conduction velocity is reduced in hypertensives when compared with controls. The result of our study is in accordance with the study done by Shubhangi D et al[11] who failed to demonstrate the effect of hypertension on nerve conduction velocity. Another study done by Negler et al [12]also showed similar results of our study, which showed that there is no effect of hypertension on nerve conduction. They proposed that hypertension maybe producing axonal degeneration, but not affecting myelination there by preserving nerve conduction velocity. Crowley SD[13] and Yasunari K et al[14] have proved clinically that oxidative stress is an outcome of chronic inflammation in hypertensive subjects. The onset of oxidative stress in hypertensive subjects depletes the levels of nitric oxide via the formation of peroxynitrite. This mechanism has been clinically proved by Moriel P et al[15]

But, our study is in relation with the study done by Negler et al and Shubhangi D et al, which showed a negative correlation between nerve conduction and hypertension.

V. Conclusion

The following conclusion can be drawn from this study –

- Hypertension may produce axonal degeneration, but may not be affecting the myelination, thus it is preserving nerve conduction variables.
- Hypertension itself may not affect the nerve conduction variables. Associated factors such as age, BMI and other diseases may cause variations in nerve conduction defects. Extensive studies are required to study the effect of hypertension in nerve conduction taking into consideration the duration, age, BMI and severity of the disease.
- Finding of reduced nerve conduction velocity in hypertensive patients should alert the physician to the possibility of associated diseases like diabetes mellitus, alcoholism or concomitant peripheral vascular diseases.
- Extensive studies are required to study the effect of hypertension aloneon nerve conduction velocity, taking into consideration the severity, duration and treatment of hypertension.

Acknowledgement

We sincerely thank, Dr. Sachin H. Mulkutkar Professor and Head of Department of Physiology, we also thank teachers and staff members of Department of Physiology & Department of Medicine, Grant Government Medical College, Mumbai for their support.

References

[1]. Esam MS, Husain AS. Bareilly, National journal of medical research 2012, 2(3):291-294.Prevalence of prehypertension and hypertension in rural.
[2]. Lloyds A, Subhash S, Swornila DL et al. Effect of hypertension on motor nerve conduction variables. J. Evid. Based Med. Healthc. 2016; 3(75), 4091-4093. DOI: 10.18410/jebmh/2016/874.
[3]. Fransen H, Van den Bergh PY. Nerve conduction studies in peripheral neuropathy: practical physiology and patterns of abnormality. ActaNeurol Berg 2006;106(2):73-81.
[4]. Kimura J. Principles and pitfalls of nerve conduction studies. Ann Neurol 1984;16(4):415-429.
[5]. Kong X, Lesser EA, Potts FA, et al. Utilisation of nerve conduction studiesfor the diagnosis of polyneuropathy in patients with diabetes. J Diabetes SciTechnol 2008;2(2):268-274.
[6]. Chobanian AV, Bakris GI, Black HR, Cushman WR, Green LA, Izzo JL. Jr., et al The Seventh Report of the Joint National Committee on Hypertension. Reducing the global burden of blood pressure related cardiovascular diseases. J hypertension 2000, 18:83-6.
[7]. Yassin DIE, Shamma YMA, AjeenaIM.Electrophysiological study of peripheral nerves inhypertensive patients. Kurfa Med Journal 2009;12(1):367-379.
[8]. Legrady P, Bajcsi D, Lengyel C, et al. Investigation of cardiac autonomic and peripheral sensory neuropathy in diabetic and nondiabetic patients with hypertension. ClinExpHypertens 2013;35(6):465-469.
[9]. Viskoper RJ, Chaco J, Aviram A. Nerve conduction velocity in assessment of hypertension. Arch Intern Med 1971;128(4):574-575.
[10]. 10.Popvtzer MM, Rosenbaum BJ, Gordon A, et al. Relief of uremic polyneuropathy after bilateral
[11]. nephrectomy. N Engl J Med 1969;281:949-950.
[12]. Shubhangi D, Jaya M, Khan ST, et al. A prospective,randomized parallel control study to evaluate the nerve conduction velocity in patients with essential hypertension. International Journal Recent Trends in Science and Technology 2013;7(3):127-128.
[13]. Negler W. Motor nerve conduction velocity in systemic diseases JAMA 1972;219(12):1632.
[14]. Crowley SD. The cooperative roles of inflammation and oxidative stress in the pathogenesis of hypertension. Antioxid Redox Signal 2014;20(1):102-120.
[15]. Yasunari K, Maeda K, Nakamura M, et al. Oxidative stress in leukocytes is a possible link between blood pressure, blood glucose, and C-reacting protein. Hypertension 2002;39(3):777-780.
[16]. Moriel P, Sevanian A, Ajzen S, et al. Nitric oxide, cholesterol oxides and endothelium-dependent vasodilation in plasma of patients with essential hypertension. Braz J Med Biol Res 2002;35(11):1301-1309.

Dr. Anand Kumar Singh, "Comparative Study of Nerve Conduction Variables in Normotensive and Hypertensive Individuals." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(2), 2020, pp. 12-16.