

Comparison of Motor Nerve Conduction in Upper Limbs of Young Healthy Male and Female Medical Students in Bathinda District - An Institutional Study

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ABSTRACT

Introduction: Normative data of Nerve conduction study (NCS) are used to evaluate Nerve conduction study of patients presenting with signs and symptoms of peripheral nerve disease. The Nerve conduction velocity depends on age, gender, temperature and nerve diameter. The study was done to observe the effect of the cerebral dominance if any on the motor nerve conduction velocity by recording nerve conduction velocity of both right and left sides in upper limb.

Material and Methods: The nerve conduction study was done on 100 medical students (50 male and 50 female) studying in Adesh Institute of Medical Science and Research, Bathinda. Motor nerve conduction for Median nerve was done using computerized software Octopus EMG/NCV/EP. Amplitude, duration and conduction velocity of Median Nerve were measured for both the upper limbs.

Results: Motor nerve conduction velocity of Median Nerve was found to be greater in right limb (56.87 ± 3.6 m/s and 57.5 ± 3.35 m/s) as compared to left limb (56.33 ± 3.53 m/s and 56.97 ± 3.48 m/s) in both male and female students but the results were statistically non-significant ($p > 0.05$). The latency of median nerve conduction was less in females (2.65 ± 0.24 ms and 2.75 ± 0.32 m/s) than in males (2.71 ± 0.27 ms and 2.78 ± 0.32 m/s) on both sides.

Conclusion: Motor nerve conduction velocity was found to be greater in right limb as compared to left limb in both males and females. Motor nerve conduction velocity was found to be more in female students as compared to male students.

Keywords: Nerve Conduction Velocity, Gender, Latency, Amplitude, Students

nerve conduction velocity is the speed at which an electrical stimulus passes through the nerves fibres. Conduction velocity of the nerves depends on the diameter, degree of myelination and internodal distance of the nerve fibres.¹ Nerve Conduction Velocity (NCV) test is being used as a simple non-invasive technique for diagnosis, monitoring and prognostic evaluation of nerve injuries and neuropathies.² Normal values for distal nerve conduction measures are needed for clinical evaluation of individual patients and as control data for epidemiologic studies of work-related peripheral nerve compression disorders such as carpal tunnel syndrome. Several factors may influence nerve conduction studies such as temperature, age, sex, height, weight, BMI and laboratory conditions which should be taken into consideration while recording to increase sensitivity and specificity of NCV study.³ Various authors have compared the data among different ages and gender.⁴ Males have greater velocity but lesser amplitude compared to females.⁵ Since the body composition of different population varies with demographic profile, every population should have its own normative data to identify any abnormality in subjects.⁶ Using the same reference data in patients with different gender may result in errors in reporting and hence need to have separate reference data for both sexes for clinical purpose.^{7,8}

The present study was therefore designed to gather reference data for healthy male and female students in Bathinda district, by doing nerve conduction study medical students of Adesh Institute of Medical Sciences and Research Bathinda, having no exposure to forceful or repetitive hand exertions, or segmental vibration. While some studies have excluded subjects with peripheral nerve disease,^{9,10} but no study has specified the occupations of their subjects or excluded population with low exposure to known occupational

INTRODUCTION

The Nerve Conduction Study is used to assess the function of the peripheral nerves by recording evoked responses to electrical stimulation of peripheral nerves. With the advancement in the techniques to study the nerve conduction it has become a valuable clinical tool in the hands of neurologists, orthopaedicians and physiologists.

Routine nerve conduction study includes assessment of compound muscle action potential (CMAP) and sensory nerve action potentials (SNAP) of accessible peripheral nerves. Commonly measured parameters of CMAP include latency, amplitude, duration, conduction velocity and late response, e.g. F-wave. The time in milliseconds (ms) for the electrical impulse to travel from the stimulation site to the recording site is called the latency. The size of the response called the amplitude and is measured in millivolts (mv). The

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risk factors for carpal tunnel syndrome such as force, repetitiveness, and vibration.^{11,12} The study was also done to observe the effect of the cerebral dominance if any on the motor nerve conduction velocity by recording nerve conduction velocity of both right and left sides in upper limb.

MATERIAL AND METHODS

The present study was conducted in the Department of Physiology of Adesh Institute of Medical Sciences and Research Bathinda, after taking informed consent of the subjects. 100 medical students (50 male and 50 female) 18 – 24 years participated in the study on voluntary basis after making a group announcement. Those without any significant present or past systemic illness disorder affecting the central or peripheral nervous system were selected for the study. The subjects were age matched. Students doing repetitive or forceful hand exertion activities were excluded. A self administered questionnaire was filled by the selected students which contained all the information regarding age, height, medical history.

Prior to the stimulation of the median nerve the thenar area and the skin overlying the median nerve at elbow and wrist was cleaned using ethanol. The skin temperature was recorded with the thermometer. Using conducting jelly, the recording (active) electrode was placed close to the motor point of Abductor pollicis brevis and reference electrode 3cm distal to active electrode at 1st metacarpophalangeal joint. The ground electrode was placed between stimulation and recording electrodes. With the help of stimulating electrodes, a supramaximal stimulation was given first at the wrist (3cm proximal to the distal wrist crease) and then at the elbow (near the volar crease of the brachial pulse). The action potential was observed and recorded at each occasion. The distances between the wrist (3cm proximal to its distal crease) and the recording electrode and between the wrist and the stimulating area of the elbow were measured in cm. The room temperature ranged from 30°±4°F.

Motor nerve conduction for Median nerve was done using computerized software Octopus EMG/NCV/EP. Latency, Amplitude, duration and conduction velocity were measured for both the arms. After the whole procedure, data was analyzed to see the difference.

STATISTICAL ANALYSIS

The collected data was analyzed statistically with Unpaired *t* test to compare the difference between Motor Nerve Conduction Velocity and other parameters in left and right upper limbs in equal no of male and female medical students

RESULTS

Median Nerve motor conduction was recorded in both right and left upper limbs in 50 male and 50 female medical students of age group between 18 to 24 years in the Department of Physiology. The data was separately analyzed for males and females students.

Our study showed that the motor nerve conduction velocity

Median nerve Parameters	Mean ± S.D		p value
	Right hand (Males)	Left hand (Males)	
NCV (m/s)	56.87 ± 3.6	56.33 ± 3.53	>.05
Latency (ms)	2.71 ± 0.27	2.78 ± 0.32	>.05
Amplitude (mv)	8.28 ± 0.25	8.29 ± 0.98	>.05

Table-1: Comparison of Nerve Conduction Velocity, Latency and Amplitude of Median Nerve in Right and Left upper limbs of Males

Median nerve Parameters	Mean ± S.D.		p value
	Right hand (females)	Left hand (females)	
NCV (m/s)	57.5 ± 3.35	56.97 ± 3.48	>.05
Latency (ms)	2.65 ± 0.24	2.75 ± 0.32	>.05
Amplitude (mv)	8.02 ± 0.82	8.06 ± 0.64	>.05

Table-2: Comparison of Nerve Conduction Velocity, Latency and Amplitude of Median Nerve in Right and Left upper limbs of Females

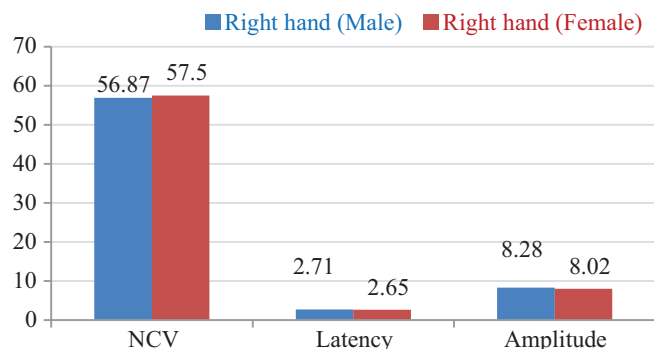


Figure-1: Graphical distribution showing comparison of NCV, Latency and Amplitude in Right Upper Limbs Males and Females

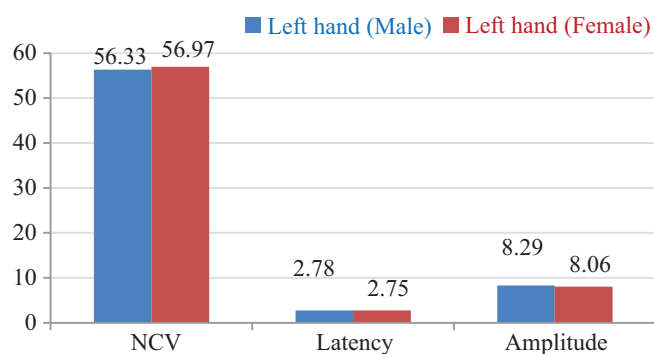


Figure-2: Graphical distribution showing comparison of NCV, Latency and Amplitude in Left Upper Limbs Males and Females

was greater and latency was less in the right limb as compared to the left limb in the median nerve in both males and females, though the difference was statistically insignificant ($p > 0.05$). [Table 1 and 2]. On comparing nerve conduction parameters of latency and amplitude of median nerve were found to be higher in males than females although the difference was statistically insignificant whereas conduction velocity was found to be higher in females than males and again the difference was found to be statistically insignificant ($p > 0.05$) [fig 1 and 2].

DISCUSSION

Motor nerve conduction velocity was measured in both right and left upper limbs of both males and females. It was observed to be greater in right limb as compared to left limb in both male and in females medical students but the results were not statistically significant. Our study was similar to other studies which also fail to find statistically significant variations in conduction in right and left hands.¹³

A study showed statistically significant increase as compared to present study and found that the conduction velocity was faster on the right side in right handed persons as compared to that in the left side in right handed persons.¹⁴ Limb dominance has been found to be important factor influencing conduction velocity. A study done on the dominant and non dominant limbs of the same individuals was found that the nerve conduction velocity in the right handed subjects was more as compared to that in their counterparts.¹⁵ The disparity in the size of motor neurons of the limbs of both sides can be the cause for the difference. It has been also observed that motor neurons of spinal cord supplying right upper limb were larger as compared with motor neurons supplying the upper limb which may account for the difference on two sides.¹⁶

Gender plays important role on amplitude, duration and latency of motor and sensory nerve conduction studies.¹⁷ Earlier influence of gender on conduction velocity, sensory amplitudes and the distal and F minimum latencies of the motor nerve have been observed.¹⁸ The study was therefore done to find any effect of gender find difference in conduction in both limbs of male and female medical students. Motor nerve conduction velocity was found to be more in right limb and left limb of female students as compared to right and left limb of male students respectively. The difference in conduction velocity between male and female may be because of anthropometric variations.³ Hence further research may be needed by selecting subjects with similar height to find if there is actual true variation between male and female subjects.

In the present study shorter latency in females as compared to males though not statistically significant was observed in both limbs. The reason may be probably greater height and limb length in male students. The results were similar in urban population of eastern India where they observed both proximal and distal Median latencies more in males as compared to females which they explained may be due to the poor volume of conduction, large muscle fibre length and/or the large motor units in males⁵

We therefore conclude that the motor nerve conduction velocity did not show a significant difference when compared to that in the right and left upper limbs of both male and female medical students. Also, limb dominance did not have any significant effect on the motor nerve conduction velocity of the upper limbs. Variation in Nerve Conduction Study Parameters has been seen in males and females medical students. This variation is explained due to difference in anthropometric parameters. Hence, influence of gender

must be taken into consideration during Nerve Conduction Study for establishing normative data for reference value for different populations. This will serve as better and accurate reference data for patients of same age and gender to see prognosis of nerve growth in fracture patients and early detection of carpal tunnel syndrome patients as it excludes subjects doing repetitive movements and more prone to carpal tunnel syndrome.

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