IJCEP 2019; 6(1): 15-17
www.ijcep.org

Original Article

Comparative Study of Sensory Nerve-conduction Velocity in Right and Left Handed Human Subjects: A Cross Sectional Study

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ABSTRACT

Background and Aim: Nerve conduction study is a part of electro-diagnostic procedures that help in establishing the type and extent of the abnormality of the nerves. The nerve conduction velocity depends upon age, weight, height, sex, temperature and parameters like nerve diameter and myelination. The aim of this study is to compare the sensory nerve conduction velocity between left-handed and right-handed subjects using median nerve and ulnar nerve to find out whether there is any difference in sensory nerve conduction velocity with handedness. **Methods:** The study was conducted on 25 right-handed and 25 left-handed healthy medical students of age 17 to 20 year with permission from Institutional Human Ethics committee. Sensory nerve conduction velocity of the median and the ulnar nerves in the left and right upper limbs were be compared between rights handed subjects and left-handed subjects. Unpaired *t*- test was used to comparison of two groups. *P* value less than 0.05 will be considered as significant. **Results:** Sensory nerve conduction of right median, left median and left ulnar nerve were insignificantly higher in left-handed subjects compared to right-handed subjects. Sensory nerve conduction of right ulnar nerve was significantly higher in left-handed subjects compared to right-handed subjects. **Conclusion:** The study concludes that the sensory nerve conduction velocities are higher in left handers, which could be because of genetic reasons contributing to functional differences during growth in early childhood.

Key words: Handedness, Sensory nerve conduction velocity, Median nerve, Ulnar nerve, Right handed, Left handed.

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History

- Submission Date: 26-12-2018
- Review completed: 08-01-2019;
- Accepted Date: 02-02-2019.

DOI : 10.5530/ijcep.2019.6.1.5

INTRODUCTION

In the peripheral nervous system, the nerve fibres of various diameters and functions (motor and sensory) are bundled together by the connective tissue to form nerves.[1] The Nerve Conduction Study (NCS) is a test which is commonly used to evaluate the function, especially the ability of the electrical conduction of the motor and sensory nerves of the human body. The nerve conduction velocity is the speed at which an electrical stimulus passes through the nerves. Nerve conduction study is a part of electro-diagnostic procedures that help in establishing the type and extent of the abnormality of the nerves. It is a diagnostic tool for various neuropathies. The nerve conduction velocity depends upon age, weight, height, sex, temperature and parameters like nerve diameter and myelination.[2]

Researchers who study human hand preference agree that the side of the preferred hand (right versus left) is produced by biological and, most likely, genetic causes. Approximately 85 percent of people are right-hand. These theories also try to explain the persistent and continuing presence of a left-handed minority (about 15 percent of humans).[3] Lateralilization of various cerebral functions is well known which include speech and language, visuospatial relations, analysis of face, recognition of musical themes and use of hand for fine motor movements. Disproportionately large numbers of artists, musicians and mathematicians are left handers. Lateraization of nerve conduction velocity is also expected. Reference data on the normal range of conduction velocity is necessary for comparison purposes in left handers. Currently the same reference data is used for both right handers and left handers.

The aim of this study is to compare the sensory nerve conduction velocity between left-handed and right handed subjects using median nerve and ulnar nerve to find out whether there is any difference in sensory nerve conduction velocity with handedness.

MATERIALS AND METHODS

Nerve conduction velocity was performed on RMS-Aleron-portable electromyograph machine Figure 1 manufactured by Recorders and Medicare systems Chandigarh, India in the Physiology Department of GMERS Medical College Gotri Vadodara. The study was conducted on 25 right-handed and 25 left-handed medical students with permission from

Cite this article: Parmar DJ, Ghugare BW, Dinkar M, Chauhan H, Campvala S. Comparative Study of Sensory Nerve-conduction Velocity in Right and Left Handed Human Subjects: A Cross Sectional Study. Int J Clin Exp Physion. 2019;6(1):15-7.

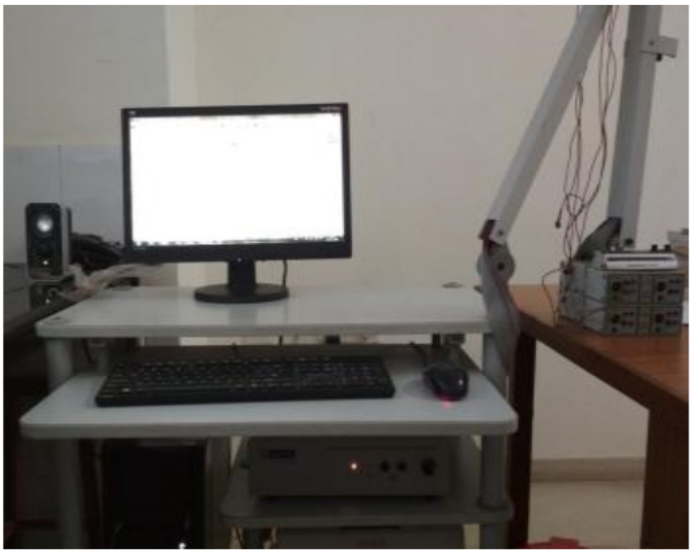

Figure 1: The electromyograph machine used for testing.

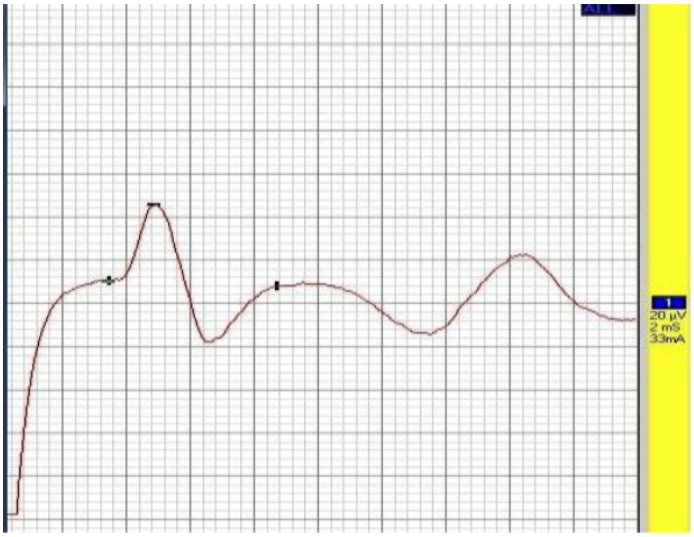

Figure 2: View of a sensory SNAP from left median nerve.

Institutional Human Ethics committee. All our subjects were 17 to 20 years' age groups and they are non -smokers, normotensives with moderate built and moderately active lifestyle Written consent was taken from each subject. Ambidextrous as well as those subjects who had abnormal numbness, a tingling sensation or neuropathy or any peripheral nerve injuries were be excluded from the study.

Tool for Testing and Procedure

Subjects were acclimatized to standard room temperature for 10 min. After that procedure was performed under following settings, for sensory nerve conduction Gain/ sensitivity: 1-5µV/mm, Sweep speed: 1-2 ms/mm Filter: 5-10 Hz (low frequency), 2-3 KHz (High frequency). Distances were measured by a standard measure tap. In this study, sensory nerve conduction velocity of the median and the ulnar nerves in the left and right upper limbs were be compared between rights handed subjects and left-handed subjects. Latency of response measured from time interval between stimulus artifact and onset of electrical response. Then nerve conduction velocity was calculated by dividing the distance between two stimuli with their latency difference. Figure 2

Statistical Analysis

Unpaired *t*- test was used to comparison of two groups. *P* value less than 0.05 will be considered as significant.

RESULTS

The study was conducted on 25 right-handed and 25 left-handed medical students with permission from Institutional Human Ethics committee. All our subjects were 17 to 20 years' age groups and they are non-smokers, normotensives with moderate built and moderately active lifestyle Written consent was taken from each subject. Ambidextrous as well as those subjects who had abnormal numbness, a tingling sensation or neuropathy or any peripheral nerve injuries were be excluded from the study.

Table 1 showed the mean and standard deviation of age, weight and height of right -handed and left-handed subjects. Sensory nerve conduction of right median left median and left ulnar nerve were insignificantly higher in left-handed subjects compared to right-handed subjects. Sensory nerve conduction of right ulnar nerve was significantly higher in left-handed subjects compared to right-handed subjects. Table 2

DISCUSSION

Sensory nerve conduction of right median left median and left ulnar nerve were insignificantly higher in left handed subjects compared to right handed subjects. Sensory nerve conduction of right ulnar nerve was significantly higher in left-handed subjects compared to right-handed subjects. (Table 2) Gupta N *et al.*[2] observed that sensory nerve conduction velocity in right and left median nerve were significantly higher in left handed subjects than right handed subjects. Soumya BA *et al.*[4] reported that sensory conduction velocity in left median nerve was also significantly higher in left handed subjects compared with right handed ones. Anup Patel *et al.*[5] studied that sensory nerve conduction velocity was significantly higher in left handed subjects. Sensory nerve conduction velocities of median and ulnar nerves of both the sides in left-handed individuals were higher compared to their right handed counterparts. But this difference was significant only in the ulnar nerve ($p = 0.012$) Tan u[6] and Bromberg MB[7] noted asymmetry of nerve conduction velocity in their studies.

Table 1: showing mean and standard deviation of age, weight and height of subjects.

Parameter	Right-handed	Left-handed
Age	18.37±0.56	18.47±0.57
weight	57.83±22.05	58.27±8.47
height	161.97±20.30	165.5±9.08

Table 2: showing sensory nerve conduction velocity of ulnar and median nerve in right and left-handed subjects

Sensory nerve conduction velocity	Right-handed subjects	Left-handed subjects	P-value
Right median nerve	60.83±4.50	61.56±5.08	>0.05
Left median nerve	61.14±4.65	61.76±6.19	>0.05
Right ulnar nerve	58.40±4.51	61.53±6.47	< 0.05
Left ulnar nerve	59.82±4.19	60.44±6.85	>0.05

Handedness is primarily found to difference in presentation of cerebral hemisphere. Genetic and heredity theory is quite successful in explaining the defense.[8] lateralization of hemispheres is proposed as main factor for defense in nerve conduction in 2007, researchers discovered that specific alleles of at least one of three single polynucleotide polymorphism upstream of the already known LRRTM gene were linked to left handedness. This gene may be responsible for difference in the nerve conduction.[9] Researchers who study human hand preference agree that the side of the preferred hand (right versus left) is produced by biological and, most likely, genetic causes. The two most widely published genetic theories of human hand preference argue that evolutionary natural selection produced a majority of individuals with speech and language control in the left hemisphere of the brain. Because the left hemisphere also controls the movements of the right hand-and notably the movements needed to produce written language--millennia of evolutionary development resulted in a population of humans that is biased genetically toward individuals with left hemisphere speech/language and right-hand preference. Approximately 85 percent of people are right-handed. These theories also try to explain the persistent and continuing presence of a left-handed minority (about 15 percent of humans).

Limitation of the Study

Small sample size and there may be ethnic and demographic variable remain major limitations of the study.

CONCLUSION

The study concludes that the sensory nerve conduction velocities are higher in left-handed which could be because of genetic reasons contributing to functional differences during growth in early childhood. Further, this difference should be taken into account before making any neurological diagnosis in left hander

ACKNOWLEDGEMENT

We sincerely thankful to medical students who voluntarily participated in the study.

CONFLICT OF INTEREST

None.

ABBREVIATIONS

SNAP: Sensory nerve action potential.

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