National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Comparative assessment of median nerve conduction velocity in right and left handed young healthy people

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Received: July 21, 2016; **Accepted:** August 02, 2016

ABSTRACT

Background: In the past few decades, major changes have taken place in the field of peripheral nerve studies, especially in the relation to its ultrastructure, histochemistry, neurophysiology, and axonal transport system. The widespread introduction of various new investigating techniques in disorders of peripheral nervous system which have emerged in recent years. **Aims and Objectives:** Present study was undertaken to assess and compare median nerve conduction velocity (NCV) in right and left handed young healthy people. **Materials and Methods:** 100 healthy individuals were included in the study. Material used to assess median NCV was Computerized NCV Equipment (Neurocare™ 2000 manufactured by Biotech™, Mumbai, India). **Results:** The mean age of the right handed participants was 22.28 ± 1.97 and 22.7 ± 1.66 in left-handed participants involved in the study. The mean median NCV was higher in right hand than left hand in right handed participants. NCV was higher in left hand than right hand in left handed participants. On comparison, the difference in NCV in right median nerve is statistically not significant between right and left handed participants ($P > 0.05$) and NCV in left median nerve is significantly higher in left handed participants than right handed participants ($P < 0.001$). **Conclusion:** Sensory conduction velocity in left median nerve was significantly higher in left handed participants. Sensory conduction velocity in right median nerve was lower in left handed participants as compared with right handed ones.

KEY WORDS: Nerve Conduction Velocity; Peripheral Nerve; Right Handedness; Left Handedness

INTRODUCTION

In everyday life, we use the hands in most of our goal directed object oriented actions. Primary functions of the hand are to reach, grasp, and manipulate objects and to perform haptic exploration. One hallmark of the human hand is its ability to effectively use objects as tools to extend the capacity of the hand; a skill that requires that the tool becomes integrated functionally in our body. Most people show hand preference in many tasks and consider themselves as right or left handed. The phenomenon of handedness has been the focus of several studies.[1-5] Moreover, in many bimanual situations, the two hands tend to have specific roles to complete the task. The dominant hand is often considered taking a leading role and the "sub-dominant" hand a more postural and supporting role.[6]

The conduction velocity of the nerve depends on the fiber diameter, degree of myelination, and the internodal distance. Other physiological variables affecting nerve conduction study include age, temperature, height, gender and dominancy of limbs, etc.[7] In the past few decades, major changes have taken place in the field of peripheral nerve studies especially in the relation to its ultra-structure, histochemistry, neurophysiology, and axonal transport

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2016.6.0821602082016	

system. The widespread interest in disorders of peripheral nervous system, which has emerged in recent years and introduction of various new investigating techniques. Hence, this study was planned with the objectives: (i) To assess median nerve conduction velocity (NCV) in right and left handed young healthy people and (ii) to compare NCV of median nerve in right and left handed young healthy people.

MATERIALS AND METHODS

Study Site

The present study was conducted in the Department of Physiology, Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, Telangana, between August 2014 and August 2015.

Study Design

It was a randomized controlled study to assess and compare the median NCV between right and left handed individuals.

Materials used in the study are as follows (1) pedestal type weighing scale with maximum capacity of 150 kg. (2) Vertical scale stadiometer (Avery, India) for measurement of height (3) computerized NCV equipment (Neurocare™ - 2000 manufactured by Biotech™, Mumbai, India).

Study Participants

100 healthy individuals were included in the study.

Inclusion Criteria

(i) Age between 18 and 24 years; (ii) non-athlete; and (iii) apparently healthy participants after thorough clinical examination.

Exclusion Criteria

(i) Not ready to participate voluntarily; (ii) age below 18 years and above 24 years; (iii) history of metabolic or cardiovascular diseases, alcoholism, smoking, neurological abnormalities such as compression neuropathy, symptoms of abnormal sensation or numbness, peripheral nerve injury, radiculopathy, cervical spondylosis, and unstable body weight (change of >1% within the month before the study).

Methodology

All the individuals were screened for eligibility and informed consent was taken and randomized to attend on particular dates for diagnostic evaluation. Institutional Ethics Committee approval was taken for the study. Demographic and anthropometric parameters were obtained before the diagnostic evaluation. Assessment was done between 10:30 AM and 1:30 PM. The participants were instructed to have light breakfast without tea, coffee, etc. The body weight of the participants was measured using a pedestal type of weighing scale with a maximum capacity of 150 kg. The body weight was considered to the nearest of 0.1 kg. Height without footwear was measured using a vertical scale (Avery, India) with an accuracy 0.5 cm and was rounded to the nearest 0.01 m. Body mass index (BMI) was calculated from height and weight using formula:

$$\text{BMI} = \frac{\text{Weight(kg)}}{\text{Height}(\text{m}^2)}$$

Each participant in supine position was subjected for diagnostic procedure after 5 min in eyes closed relaxed state and explaining the procedure before starting it. Median NCV was measured following all the precautions in right and left handed participants using Neurocare™ - 2000 computerized NCV equipment manufactured by Biotech™, Mumbai, India.

$$\text{Median nerve conduction velocity} = \frac{\text{Distance between proximal and distal stimulation(mm)}}{\text{Proximal latency} - \text{Distal latency}}$$

Statistical Analysis

All data are expressed as mean ± standard deviation. To compare quantitative variables of two different groups, unpaired '*t*' test was used. A two-tailed $P \leq 0.05$ was considered statistically significant.

RESULTS

The mean age of the right handed participants was 22.28 ± 1.97 and in left handed participants, 22.7 ± 1.66 as depicted in Table 1. The anthropometric parameters were slightly higher in left handed participants than right handed participants. The mean latency was higher in left hand than right hand and amplitude, area, and NCV was higher in right hand than left hand in right handed participants as depicted in Table 2. As depicted in Table 3, the mean latency was higher in right hand than left hand and amplitude, area, and NCV was higher in left hand than right hand in left handed participants.

As depicted in Table 4, on comparison of the difference in latency in right median nerve is not significant between right and left handed participants ($P > 0.05$). The difference in amplitude in right median nerve is not significant between right and left handed participants ($P > 0.05$). The difference in area in right median nerve is not statistically significant between right and left handed participants ($P > 0.05$). The difference in NCV in right median nerve is not statistically significant between right and left handed participants ($P > 0.05$). NCV value is slightly higher in right handed participants than left handed participants, even though it is not statistically significant.

As depicted in Table 5, on comparison, the latency in left median nerve is significantly higher in right handed participants than left handed participants ($P < 0.05$). The amplitude in left median nerve is significantly higher in left handed participants than right handed participants ($P = 0.05$). The area in left median nerve is significantly higher in left handed participants than right handed participants ($P < 0.001$). The NCV in left median nerve is significantly higher in left handed participants than right handed participants ($P < 0.001$).

Table 1: Anthropometric characteristics of the participants involved in the study (n=50 in each group)

Characteristic	Left handed participants	Right handed participants
Age (in years)	22.7±1.66	22.28±1.97
Sex (Male/Female) (n)	29/21	26/24
Height (cms)	161.92±13.03	160.2±11.54
Weight (kg)	60.66±15.69	57.76±12.02
BMI	23.36±4.23	22.54±4.32

BMI: Body mass index

Table 2: Median NCV parameters expressed as mean±SD of right handed participants (n=50 in each group)

Parameter	Right handed participants	Left handed participants
Latency	2.59±0.29	2.73±0.43
Amplitude	56.25±17.83	46.99±15.88
Area	34.2±10.02	31.16±7.68
NCV	52.86±5.79	48.77±6.21

NCV: Nerve conduction velocity, SD: Standard deviation

Table 3: Median NCV parameters expressed as mean±SD of left handed participants (n=50 in each group)

Parameter	Right handed participants	Left handed participants
Latency	2.65±0.45	2.45±0.31
Amplitude	55.00±17.27	60.34±20.22
Area	33.17±7.93	39.81±10.66
NCV	51.82±6.23	56.33±5.99

NCV: Nerve conduction velocity, SD: Standard deviation

DISCUSSION

Handedness is primarily because of dominance of specific cerebral hemisphere although peripheral factors may also be involved. Genetic theory is most widely accepted in explaining the onset of lateralization.[8] Corballis proposed the emergence of "dextral" (D) allele with the evolution of *Homo sapiens* in Africa.[9] He proposed that this along with other probable genes might be responsible for laterality.

Peripheral nerve conduction parameters have been studied by various workers. In this study, we report a significantly higher sensory conduction velocity in left handers in left median nerve. Asymmetry of sensory conduction velocity was also detected by Bromberg and Jaros,[10] although no sensory laterality was demonstrated by Tan.[11]

Higher sensory conduction velocity in left handers may be because of genetic reasons and this may somehow contribute to functional differences during growth in early childhood. Further, this difference should be taken into account before making any neurological diagnosis in left handers. Further work is required to find out the physiological basis of higher sensory conduction velocity in left handers.

Our study is in accordance with the study of Singh et al. (1977), who compared the conduction velocity in the efferent

Table 4: Comparison of NCV in right median nerve between right handed and left handed participants (n=50 in each group)

Parameter	Right handed participants	Left handed participants	95% CI of difference	*t*-value	*P*-value
Latency	2.59±0.29	2.65±0.45	−0.087-0.214	0.836	0.405*
Amplitude	56.25±17.83	55.00±17.27	−8.216-5.716	0.356	0.722*
Area	34.2±10.02	33.17±7.93	−4.613-2.561	0.567	0.572*
NCV	52.86±5.79	51.82±6.23	−3.434-1.341	0.869	0.387*

P>0.05 - Non-significant*. NCV: Nerve conduction velocity, CI: Confidence interval

Table 5: Comparison of NCV in left median nerve between right handed and left handed participants (n=50 in each group)

Parameter	Right handed participants	Left handed Participants	95% CI of difference	*t*-value	*P*-value
Latency	2.73±0.43	2.45±0.31	−0.426-−0.127	3.678	0.0004*
Amplitude	46.99±15.88	60.34±20.22	6.136-20.568	3.672	0.0004*
Area	31.16±7.68	39.81±10.66	4.955-12.329	4.651	0.0001**
NCV	48.77±6.21	56.33±5.99	5.136-9.976	6.196	0.0001**

P<0.05 - Significant*, P<0.001 - Highly significant**. NCV: Nerve conduction velocity, CI: Confidence interval

fibers of the right and left forelimbs of 38 human participants. They found the conduction velocity to be faster on the right side in the majority of right handed participants and on the left side in left handed participants.[12]

Another study done by Sathiamoorthy and Sathiamoorthy in 1990 showed a definite relationship between limb dominance and median nerve conduction although the results are not so clear in case of other nerves. The reason may be purely anatomical in that the median nerve has greater dermato-myotomal distribution than the other upper limb peripheral nerve.[13]

Contrary to the above studies is the study of Tan, who found no statistically significant difference in the NCV on the left and right sides of these participants. It was suggested that the mechanisms of handedness do not contribute to the differences in nerve conduction velocities.[11]

Limitations

Though our current study did not show a statistically significant difference in conduction velocity between the dominant and non-dominant limbs of the same individual, probably a larger sample size would be of great value in predicting this relationship. Hence, it is essential to do further studies related to the effect of handedness on nerve conduction.

Also studies related to motor nerve conduction should be undertaken, to properly ascertain the effect of limb dominance on NCV.

CONCLUSION

Sensory conduction velocity in left median nerve was significantly higher in left handed participants. Sensory conduction velocity in right median nerve was lower in left handed participants compared with right handed ones.

ACKNOWLEDGMENT

Authors are thankful to the volunteers involved in the study.

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How to cite this article: Rayan SK, Narhare PM. Comparative assessment of median nerve conduction velocity in right and left handed young healthy people. Natl J Physiol Pharm Pharmacol 2016;6(6):612-615.

Source of Support: Nil, **Conflict of Interest:** None declared.