Effect of limb dominance on the nerve conduction studies in healthy subjects

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Abstract

Nerve conduction studies are affected by the various physiological parameters like age, gender, height and temperature are well known. However very least attention in research is towards the limb dominance. The present study was planned to assess the effect of limb dominance on motor as well as sensory nerve conduction velocities. In the present study , 20 right handed and 20 left handed healthy medical students in the age group ranging from 18 years to 25 years, with no history of any radiculopathy, fracture, nerve compression ,any form of neurological disorders , any history of medication as well as any form of addiction like smoking , tobacco chewing , alcohol etc. were selected. The median nerve conduction velocity was measured by using Clarity Medicare's OCTOPUS- 2-Channel EMG Machine. Data was analyzed by using appropriate statistical methods. In our present study there was found no any statistically significant difference in the velocity between the dominant hands and nondominent hands. However some variations were noted in relation with sensory nerve conduction velocities. The sensory nerve conduction velocity in the left handed subjects was found more than the right handed subjects.

Keywords: *Limb dominance, Median nerve conduction velocity.*

Introduction

In the recent years electrodiagnostic studies play a key role in evaluation of patients with various neuromuscular disorders. The nerve conduction studies are most often used to diagnose disorders of the peripheral nervous system.[1] Conduction velocity of the nerves depends on the fiber diameter, degree of demyelination and intermodal distance. Other physiological factors like age, height, temperature, gender, weight are variables affecting the conduction studies.[2] In our present study we compared the conduction velocities of right handed with left handed subjects. We measured both motor as well as sensory nerve conduction velocities in both type of subjects.

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Aim and Objectives

Our aim was to find correlation between the hand dominance and variables in nerve conduction velocities. Our objective was to assess the relative correlation of handedness and nerve conduction velocities.

Study Design

In the present study, 40 male medical students in the age group from 18 to 25 years comprising of 20 rights handed and 20 left handed were selected. The complete history with all details was taken. The exclusion criteria included any radiculopathy, fracture, nerve compression, any form of neurological disorders, history of any medication as well any form of addiction like smoking, tobacco chewing, alcohol etc. After explaining the procedure and purpose of the study, written consent was obtained.

Subjects were called in the morning at 9.00 a.m. after light breakfast. In the present study motor and sensory nerve conduction velocity of the median nerve was measured by using Clarity Medicare's OCTOPUS- 2 Channel EMG Machine available in our Department (Fig 1).

Fig 1: Clarity Medicare's Octopus two- Channel EMG Machine

For motor nerve conduction velocity median nerve was stimulated supramaximally at two points along it's course respectively at the wrist and antecubital fossa (elbow). Recoding and reference electrodes were placed over the abductor pollicis brevis along the thenar muscle border. Ground electrode was placed over the forearm.

For sensory nerve conduction velocity ring electrodes were placed at the index finger. The cathode was placed at the first interphalengeal joint and anode 3 cm distal to it. Ground electrode was placed over the palm. With the help of stimulating electrode a sub-maximal stimulation was given at wrist and measured conduction velocity.

Motor nerve conduction study setting:

Sensitivity: 2-5 mv/mm, Low frequency filter: 2-5 Hz, High frequency filter: 10 KHz,
Sweep speed: 2-7 ms/cm. Supramaximal stimulation range: 30-45 mv.

Sensory nerve conduction study setting:

Sensitivity: 2-5 mv/mm, Low frequency filter: 2-5 Hz, High frequency filter: 10 KHz, Sweep speed: 2-7 ms/cm . Submaximal stimulation range: 10-15 mv.

The conduction velocity was determined using the following formula.

Conduction velocity = distance (mm) / L_1-L_2 ms.

Where, L_1 = Proximal latency , L_2 = Distal latency.

Distance in millimeter is the distance between two stimulating sites respectively the wrist and antecubital fossa

Observations

Table 1: The record of motor and sensory nerve conduction velocities (median nerve)

Group	Extremity	Motor nerve conduction velocity (mt/sec) (Mean ± S.D.)	Sensory nerve conduction velocity (mt/sec) (Mean ± S.D.)
1.Right handed subjects (n=20)	Right hand	54.62±2.72	59.35 ± 3.41
	Left hand	55.72±3.66	60.29 ± 4.80
2. Left handed subjects (n =20)	Right hand	54.21±7.38	62.93 ± 3.12
	Left hand	54.98±1.22	63.33 ± 0.67

(S.D. = Standard Deviation.) (mt/sec = meter per seconds)

Statistical analysis

The results were expressed as mean+ S.D. The standard error of difference between two means was taken. Afterwards we applied Z test. By using the said test, P Value was found < 0.05 (non significant)

Results

In our present study, there was found no any statistically significant difference in the velocity between dominant hands and nondominent hands. However some variations were noted in relation with the sensory nerve

conduction velocities. Sensory nerve conduction velocity in the left handed subjects was found more than the right handed subjects, though it was found statistically nonsignificant.

Discussion

The human motor system adapts to the functional requirements with considerable plasticity. Repetitive low-intensity exercise during endurance training results in enhanced aerobic capacity, fatigue resistance, and contractile slowing of the muscle. High-resistance training induces muscle fiber hypertrophy and concomitantly increased maximal force output. Thus, depending on the use of a particular muscle, its physiological characteristics and mechanical response changes. Long-term preferential use of selected muscles can be viewed as a moderate form of exercise. In the past decade, several researchers reported differences in physiology between the dominant and the nondominant upper limb.[3]

Study done by Sathiamoorthy A. (1990) found a significant correlation between the handedness and motor nerve conduction velocities especially in median nerve.[4] In our present study such variations were not found in relation with motor nerve conduction velocity. Bhorania et. al (2009) also found, there was no significant difference in velocity between the dominant and non dominant limbs of same individuals in relation to motor nerve conduction velocity, but nerve conduction velocity in the right handed subjects was more as compared to their counterparts for both dominant and non dominant limbs.[5]

Harinder J. Singh et.al (2011) found limb dominance did not have any significant effect on the motor nerve conduction velocity of the upper limbs.[6] Similarly work done by Gupta N. et al (2008), found the sensory nerve conduction velocities in both right and left hands were significantly higher in left handers as compared with right handers whereas no such changes were seen in relation with motor nerve.[7] Our findings also suggest almost the similar conclusion as him.

From our current study, there is found no any significant differences between the right and left handed individuals in relation with the motor as well as sensory nerves. However there are seen variations in relation with the sensory conduction velocities. In future there seem to be need of a large scale data collection and analysis in predicting this relationship.

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Abbreviations

NCV: Nerve conduction velocity
mv: milivolts
mt/sec : meter per second
ms : milliseconds
S.D. : Standard deviation
cm: centimeter
EMG: Electromyography
mm: millimeter

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