Indian J Physiol Pharmacol 2008; 52 (2) : 189–192

SENSORY NERVE CONDUCTION VELOCITY IS GREATER IN LEFT HANDED PERSONS

NAVIN GUPTA, SHARMILA SANYAL AND RASHMI BABBAR*

Department of Physiology,
Maulana Azad Medical College,
New Delhi – 110 002

(Received on March 29, 2007)

Abstract : Dependence of nerve conduction velocity on factors like age, sex and temperature is well known. Effect of handedness on nerve conduction velocity has not been studied adequately. In this study correlation between handedness and motor as well as sensory conduction velocity of right as well as left median nerve was studied in 84 medical students in the age group between 17–21 years out of which 72 were right handed and 12 were left handed. In addition auditory and visual reaction times were also studied. Sensory conduction velocity in both right and left median nerve was significantly higher in left handers as compared with right handers whereas, the motor conduction velocity in right handers and left handers was not different. The auditory and visual reaction times were also not different in these groups. Because of greater sensory conduction velocity in left handers there is a requirement of different set of normal reference values for left handers in clinical diagnosis.

Key words : handedness, nerve conduction velocity, reaction time, median nerve

INTRODUCTION

Nerve conduction study has emerged as a tool for diagnosing various neurological diseases. Dependence of nerve conduction parameters on intrinsic factors like age and sex as well as on extrinsic factors like temperature is well known. Lateralization 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. Lateralization of nerve conduction velocity is also expected. Similarly left handed subjects may have different auditory and visual reaction times as compared with right handed ones.

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. Therefore, in this study we have compared motor as well as sensory conduction velocity in both right and left median nerve in left handed healthy medical students with their

*Corresponding Author : E-mail : drnavingupta@gmail.com; Tel. Ph. No.: 091-11-23239271; Mobile No. : 9810879644

right handed counterparts. Moreover we have also compared auditory and visual reaction times in left handed subjects with right handed ones to see if any observed difference in nerve conduction velocity translates into difference in reaction time, which will have real life implications.

METHODS

Recruitment : Study was performed in 84 medical students of Maulana Azad Medical College of the age between 17–21 years. Study was performed in accordance with ethical standards of the institute. 72 subjects were right handed (54 males and 18 females) and 12 were left-handed (9 males and 3 females). Those who used their left hand either for dexterity or strength or both were labeled as left handers (1). Male : female ratio was kept at 3:1 in both the groups. Exclusion criteria included any metabolic disease, compression neuropathy, symptoms of abnormal sensation or numbness, peripheral nerve injury, radiculopathy, cervical spondylosis and any auditory or visual impairment.

Testing equipment and procedure: Nerve conduction studies were performed on EB Neuro (Italy) system using MYTO CE0051 software. Subjects were allowed to acclimatize in air-conditioned room (25°C) for 15 minutes before the procedure. Recordings were obtained at following instrument settings: For motor studies: sensitivity: 2–5 mv/mm, low frequency filter: 2–5 Hz, high frequency filter: 10 KHz, sweep speed: 2–5 ms/mm. For sensory studies: sensitivity: 10–20 μv/mm, low frequency filter: 5–10 Hz, high frequency filter: 2–3 KHz, sweep speed: 1–2 ms/mm. Stimulation was done using standard supra-maximal technique using a square wave of 0.1 ms duration. Distances were measured using a metal tape. Simple auditory and visual reaction times were measured using a smoked drum and a signal marker as recording apparatus. For simple auditory reaction time electrical circuit was made which included two tap keys and a signal marker in series. Tapping sound of the tap key was used as the auditory stimulus. Subjects responded by lifting the right index finger from the second tap key. Subjects were habituated with the tapping sound several times before the procedure. For visual reaction time a similar circuit was made which included a bulb as a light source. After becoming habituated to it, subjects responded by lifting the index finger from the second tap key.

Parameters studied : Motor as well as sensory conduction velocity of both right and left median nerves was measured. Latency was measured as time interval between stimultis artifact and onset of electrical response. Nerve conduction velocity was calculated by dividing the latent period by nerve length. Reaction times were measured in milliseconds.

Analysis : Results were expressed as mean±S.D. Comparisons were made between groups by unpaired ‘t’ test. P-value, less than 0.05, was considered as significant.

RESULTS AND DISCUSSION

Sensory conduction velocity in right median nerve was significantly higher in left handed subjects (P=0.024; Table I). Sensory conduction velocity in left median nerve was also significantly higher in left handed

subjects compared with right handed ones (P=0.0023). Contrary to this motor conduction velocity of right median nerve was not significantly different in left handed subjects as compared with right handed subjects (P=0.77; Table I). Similarly difference of motor conduction velocity in left median nerve was also not significant in left handed subjects as compared with right handed ones (P=0.19). Simple auditory reaction time as well as simple visual reaction time were also similar in left handed group as compared with right handed group (P=0.35 for auditory reaction time and P= 0.69 for visual reaction time; Table I).

TABLE I: Nerve conduction velocities and reaction times in right and left handed subjects.

Parameter	*Left handed (n=12)*	*Right handed (n=72)*
Sensory conduction velocity (m/s)		
Right median nerve	67.92±4.84*	61.33±3.84
Left median nerve	68.52±5.37*	60.49±3.14
Motor conduction velocity (m/s)		
Right median nerve	60.41±3.79	59.83±3.27
Left median nerve	64.35±5.18	60.84±4.06
Auditory reaction time (ms)	186.67±16.66	167.22±23.24
Visual reaction time (ms)	328.33±19.43	342.78±25.01

Values are expressed as mean±S.D. *P<0.05 compared with right handed subjects.

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 lateralisation (2). Corballis proposed the emergence of ‘dextral’ (D) allele with evolution *of Homo sapiens* in Africa (3). 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 both in right and left median nerve. Asymmetry of sensory conduction velocity was also detected by Bromberg et. al. (4) although no sensory laterality was demonstrated by Tan (5). 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 also demonstrates that there is no significant difference in motor conduction velocity of right as well as left median nerve in left handed subjects as compared with right handed ones. Contrary to this, Sathiamoorthy et al demonstrated a significantly lower motor conduction velocity of right median nerve in left handers as compared with right handers (6). Nevertheless, similar finding in left median nerve was absent. In another study motor conduction velocity in right and left median nerve was found to be same (5). Symmetry of motor conduction velocity was also confirmed by Bromberg et al (4) although motoneurones of spinal cord supplying right upper limb was found to be larger as compared with motoneurones supplying left upper limb (7).

Association between handedness and reaction time has not been studied in detail.

Our study does not show any correlation between handedness and either auditory or visual reaction time. Our results are similar to the results of the study carried out by Annett and co-workers although they detected some stimulus laterality (8). Left handers are significantly slower in making the first move in Tower of Hanoi task although completion time is same in both right handers and left handers (9). We therefore propose that although left handers may have more cautious cognitive style but simple reaction tasks are performed by left handers after same latent period as compared with right handers.

REFERENCES

1. Cromwell H, Rife HC. Dermatographics in relation to functional handedness. *Human Biology* 1942; 14: 515–526.
2. Milenkovic S, Belojevic G, Kocijancic R. Aetiological factors in left-handedness. *Srp Arh Celok Lek* 2005; 133: 532–534.
3. Corballis MC. The genetics and evolution oh handedness. *Psychol Rev* 1997; 104: 714–727.
4. Bromberg MB, Jaros L. Symmetry of normal motor and sensory nerve conduction measurements. *Muscle Nerve* 1998; 21: 498–503.
5. Tan U. Velocities of motor and sensory nerve conduction are the same for right and left arms in right and left handed normal subjects. *Percept Mot Skills* 1985; 60: 625–626.
6. Sathiamoorthy A, Sathiamoorthy SS. Limb dominance and motor conduction velocity of median and ulnar nerves. *Indian J Physiol Pharmacol* 1990; 34: 51–53.
7. Melsbach G, Wohlschlager A, Spiess M, Gunturkun O. Morphological asymmetries of motoneurones innervating upper extremities: Clues to the anatomical foundation of handedness ? *Int J Neurosci* 1996; 86: 217–224.
8. Annett M, Annett J. Individual differences in right and left reaction time. *Br J Psychol* 1979; 70: 393–404.
9. Wright L, Hardie SM, Rodway P. Pause before you respond: handedness influences response style on the tower of Hanoi task. *Laterality* 2004; 9: 133–147.