Ind. J. Physiol. Pharmac., 1990; 34(1): 51-53

LIMB DOMINANCE AND MOTOR CONDUCTION VELOCITY OF MEDIAN AND ULNAR NERVES

ANURADHA SATHIAMOORTHY*
AND S. S. SATHIAMOORTHY

Department of Physiology,
Kasturba Medical College,
Manipal - 576 119

(Received on August 18, 1989)

Abstract : The influence of one-sided limb dominance on the muscles, bones and motor conduction velocity of median nerve has been investigated and reported. We have undertaken a more detailed study of the conduction velocity of the efferent fibres of median and ulnar nerves of both sides in 25 right-handed and an equal number of left-handed subjects of both sexes in the age group of 18-30 years. A significant correlation between "handedness" and motor nerve conduction especially in median nerve, is shown by the results in both right handers and left handers.

Key words : limb dominance motor conduction velocity median nerve ulnar nerve

INTRODUCTION

Several studies have been conducted on various factors influencing conduction velocity in peripheral nerves (1, 2, 3) but the influence of limb dominance or handedness on nerve conduction has not been clearly established (4). Handedness, perception of language and speech are functional areas of behaviour that are, in most individuals, controlled by the dominant cerebral hemisphere. More than 90 percent of the adult population are right-handed and are therefore left hemisphere dominant (5). The criteria for the selection of left-handed subjects is an important factor in the design of any investigation on left-handers. According to Cromwell and Rife (6), a right-handed person is one who uses the right hand preferentially in all acts calling for dexterity or strength. In our study, only those who use their left hand either for dexterity or strength or both have been labelled as left-handers. The motor conduction velocity of median and ulnar nerves of the two sides in right-handed and left-handed subjects were measured to determine the relationship, between limb dominance and motor nerve conduction.

METHODS

The study was carried out on apparently healthy human volunteers, drawn from medical students and faculty members. The subjects were divided into two age and sex-matched groups. Each group had 25 right-handers and an equal number of left-handers. The male/female ratio was 4:1 in both groups and the age ranged from 18 to 30 years. The motor conduction velocity of median and ulnar nerves were estimated for all subjects, bilaterally, in an air-conditioned room with a temperature of 26° ± 1°C. The mean oral temperature of the subjects was 37° ± 0.5°C. The procedures for stimulating the motor nerves and recording the evoked muscle action potentials (EMAP) (2,7). The recording electrodes were made up of a pair of 6 mm diameter silver discs, placed 2 cm part (centre to centre) on the skin over the hypothenar muscle for the ulnar nerve, and over the thenar muscle for the median nerve. The stimulating electrodes were made up of bipolar low-resistance metal electrodes with a sponge cover moistened with saline. The nerves were individually stimulated at the elbow and the wrist with supra-maximal stimuli of 0.1 to 0.2 msec duration. The stimulus was delivered from a standard stimulator (EC MS 871). EMAP was recorded after suitable amplification (EC MA 876) on one of the beams of a dual beam Cathode Ray Oscilloscope (EC MM 883). Latencies were measured from the stimulus artefact to the first inflexion of EMAP with the help of a time-marker in the Oscilloscope. The conduction velocities in metres/second (m/sec)

*Corresponding Author

of the respective nerves were calculated from the length of the nerve measured from the point of stimulation at the elbow to the wrist, and the difference between the latencies obtained at the elbow and wrist. The values were compared by students 't' test.

RESULTS

The motor conduction velocities of median and ulnar nerves in metres/second (Mean ± SEM) in right-handers and left-handers are shown in Table I. The statistical significance obtained on comparing the individual nerves of the two sides, both within and between the two groups, are presented in the same table. The right median nerve of right handers is shown to conduct significantly faster than the left median nerve of the same group ($P < 0.05$), and also significantly faster than the right median nerve of left-handers ($P < 0.001$). In the left-handers, the left median nerve has a significantly faster conduction velocity than the right median ($P < 0.05$). In case of ulnar nerve, right-handers demonstrated a significantly faster conduction on the right side compared to either side of left-handers ($P < 0.001$). The left ulnar nerve conducts faster in the right-handers compared to its counterpart in the left-handers ($P < 0.05$).

nerve conduction. However, the male/female ratio was kept equal in both groups in our study to eliminate the effect of sex, if any, on our results. Of the 25 left-handers studied only five were amphidextrous. Analysing the results after excluding them did not alter the conclusions presented in the table.

The study shows a definite relationship between limb dominance and median nerve conduction, although the results are not so clear in case of ulnar nerve. The reason may be purely anatomical in that the median nerve has greater dermato-myotomal distribution than the ulnar nerve. There is even a suggestion, based on dissection of brains of human fetuses and neonates, that the anterior horn cells on the dominant side of the spinal cord have a greater corticospinal innervation than those on the other side (5). But there is no significant variation between the median nerves of the dominant limbs of the two groups, although ulnar nerves demonstrate a highly significant difference ($P < 0.001$). This is probably an indication that motor nerves conduct, in general, faster in right-handers than left-handers. Further studies are required to validate this hypothesis. An earlier study by Singh et al (4) demonstrated that mean conduction velocity of median nerve was greater

TABLE I : Motor Conduction Velocities of median and ulnar nerves. (Mean ± SEM metres/second)

NERVE	RIGHT - HANDERS		LEFT - HANDERS		'P' Values					
	RIGHT (A)	LEFT (B)	RIGHT (C)	LEFT (D)	A-B	A-C	A-D	B-C	B-D	C-D
MEDIAN	58.7±0.78	56.6±0.59	54.0±0.78	56.6±0.89	<0.05*	<0.001**	N.S	<0.01*	N.S	<0.05*
ULNAR	54.7±0.68	53.2±0.78	51.0±0.94	51.3±0.56	N.S	<0.001**	<0:001**	N.S	<0.05*	N.S

n = 25, * Significant, **Highly significant, NS Not significant

DISCUSSION

The subjects selected for our study belonged to the age group of 18-30 years and none of them was an active sports person. Besides, Lal et al (2) reported that there is no significant variation in ulnar nerve conduction among healthy South Indians of age group 15-30 years. As the study was carried out in a laboratory at a constant temperature, the results cannot be attributed to variations in temperature. Krishnamurthy et al (7) demonstrated that there is no influence of sex on median on the right side than the left in right-handers ($P < 0.02$), but they did not find a similar pattern for left-handers.

ACKNOWLEDGEMENTS

The authors are grateful to the Principal and Head, Department of Physiology, Kasturba Medical College, Manipal for providing the facilities for this project. We wish to thank our colleagues and students who willingly participated in the study.

REFERENCES

1. Kemble F. Conduction in normal adult median nerve : the different effects of ageing in men and women. *Electromyography* 1967; 7: 275-88.
2. Lal SK, Ananthasaman V. Conduction velocity in the fastest motor fibres of ulnar nerve. *Ind J Physiol Pharmac* 1974; 18: 35-8.
3. Norris AH, Shock NW, Wagmen IH. Age changes in the maximum conduction velocity of motor fibres of human ulnar nerves. *J Applied Physiol* 1953; 5: 589-93.
4. Singh PI, Maini BK, Singh I. Bilateral asymmetry in conduction velocity in the efferent fibres of the median nerve and its relationship to handedness. *Ind J Physiol Pharmac* 1977; 21: 364-8.
5. Snell RS. The structure and functional localization of the cerebral cortex. In : Clinical Neuroanatomy for Medical students Little, Brown and Company, Boston, 2nd edition , 1987; 296.
6. Cromwell H, Rife HC. Dermatoglyphics in relation to functional handedness. *Human Biology* 1942; 14: 515-26.
7. Krishnamurthy N, Susheela Veliath, Shyam Kishan, Viswamithra S, Bharathi S, Chakrabarty AS. The standardized distal motor latency and the peak to peak amplitudes of evoked potentials in the extremities of humans. *Ind J Physiol Pharmac* 1988; 32:51-5.