CONDUCTION VELOCITY IN THE FASTEST MOTOR FIBRES OF ULNAR NERVE

S.K. LAL* AND V. ANANTHARAMAN

Department of Physiology, J.I.P.M.E.R., Pondicherry-6

Summary: Conduction velocity of ulnar nerve of 115 males and 73 females was studied and the results grouped according to different age groups. The results suggest that the conductoin rate decreased significantly after 40 years with further decrease after 50 years of age, in the case of male; in the case of female the decrease in the conduction velocity was significant only after the age of 50 years.

Key words: conduction velocity ulnar nerve effect of age.

Age has been reported to influence motor nerve conduction (2, 3 and 5); accordingly we investigated the effect of age on the fastest motor fibres in the human ulnar nerve to provide data to serve as age-matched controls for studies on possible alterations in conduction rates in diabetes mellitus, leprosy, etc.

MATERIALS AND METHODS

Apparently healthy subjects, attending the out-patient department of J.I.P.M.E.R. Hospital for minor surgical ailments, having no neurological signs and symptoms or metabolic disorders, and, medical students constituted the sample which included 115 males and 73 females. They were grouped into age groups 15-20, 21-30, 31-40, 41-50, 51-60 years.

The ulnar nerve was stimulated percutaneously along its course at two distances from the hypothenar muscle. Bipolar low—resistance metal electrodes with a sponge-cover moistened with saline were used as stimulating electrodes placed near the elbow and near the wrist. Supramaximal stimuli, 0.1 to 0.2 m.sec. duration and having a mean voltage of 80 V were delivered by a Grass model S4 stimulator through a stimulus isolation unit with an output impedence of less than 1000 ohms.

Muscle action potentials were recorded between a pair of 6 mm diameter silver disc electrodes placed with 2 cm. centre to centre separation on the skin over the hypothenar muscle; after suitable amplification displayed on the upper beam of a dual—beam Oscilloscope, while the time marks generated by Tektronix Time mark Generator were displayed on the lower beam of the oscilloscope. Latencies were measured from the stimulus artifact to the first inflexion which is due to the fastest conducting fibres. (Stimulus artifact could be shifted by the delay control in order to eliminate artifact).

The measurements were performed in a quiet room with the patient relaxed. The ambient laboratory temperature was maintained at 27°C, the laboratory being air-conditioned.

*Present address: Department of Physiology, Lady Hardinge Medical College, New Delhi-110001.

RESULTS

The results are summarized in Table I for males and Table II for females.

TABLE I: (Males: 115 numbers)

Sl. No.	*Age group (years)*	*No. of cases*	*Conduction velocity m/sec.*	*Standard deviation*	*Standard error*
1	15—20	19	59.3	4.24	0.97
2	21—30	30	58.5	6.63	1.21
3	31—40	24	57.5	5.28	1.08
4	41—50	17	53.7	6.91	1.67
5	51—60	25	50.3	4.61	0.925

TABLE II: (Females: 73 numbers)

Sl No.	*Age group (years)*	*No. of cases*	*Conduction velocity m/sec.*	*Standard deviation*	*Standard error*
1	15—20	18	56.8	4.81	1.135
2	21—30	16	55.2	1.88	0.472
3	31—40	14	54.7	1.57	0.409
4	41—50	15	53.5	1.00	0.514
5	51—60	10	49.8	2.31	0.731

TABLE III. Males

Sl. No.	*Age group (years)*	*Conduction vel. mps.*	*Comparison between S.Nos.*	*t*	*P less than*
1	15—20	59.3	1&2	0.46	0.6
			1&3	1.18	0.2
2	21—30	58.5	2&4	5.77	0.001
			2&5	5.12	0.001
3	31—40	57.5	3&2	0.59	0.5
			3&4	1.99	0.05
4	41—50	53.7	4&1	2.88	0.01
			4&5	1.87	0.1
5	51—60	50.5	5&1	6.50	0.001
			5&3	4.98	0.001

TABLE IV: Females

Sl. No.	Age group (years)	Conduction vel. mps	Comparison between S.Nos.	t	P less than
1	15—20	56.8	1&2	1.21	0.2
			1&3	1.52	0.1
2	21—30	55.2	2&3	2.38	0.02
			2&5	6.33	0.001
3	31—40	54.7	3&2	0.78	0.4
			3&4	1.74	0.1
4	41—50	53.5	4&1	2.55	0.02
			4&5	4.09	0.01
5	51—60	49.8	5&1	4.18	0.01
			5&3	5.99	0.001

Graphs 1 & 2 show the effect of age on conduction velocity for males and females respectively.

DISCUSSION

Conduction velocities for the fastest conducting motor fibres of ulnar nerve in healthy South Indians compare with those of Europeans, Americans and Japanese. Kato (1) reported a higher value than that found out by Thies *et al.* (7) and it was explained as due to the elevated room temperature utilized by (1). Thies *et al.* (7) (loc cit) did not find any effect of age upon conduction velocity, nor should it be expected as their sample ranges from 19—26 years. Lower than normal values have been reported for age group below 4 or 5 years (8) and above age of 50 years (6). Kyral, (3) observed a decrease of conduction velocity in ulnar nerve (elbow to wrist) after the age of 50 years and a significant fall after 60 years. Lucci *et al.* (5) reported a 6.7% decrease in the motor nerve conduction in ulnar nerve of subjects after age of 50 years.

Tables III and IV give the statistical significance of the conduction velocities of males and females respectively when the values of one age group are compared with those of the other age group of the same sex. The conduction rate of age group 21—30 is about the average of the conduction velocities for the first three age groups, viz., 15—20, 21—30 and 31—40. The difference is significant ($P < .001$), when this conduction rate is compared with that of the age group 41—50 and 51—60 in the case of males. But in females the significance is best seen between the conduction velocity of the age group 21—30 and 51—60.

The results here reported show that there is a decrease in the conduction velocity of fastest

motor fibres in the ulnar nerve in males after the age of 40 years, and in the case of females we observed a significant decrease of conduction velocity only after the age of 50 years.

ACKNOWLEDGEMENTS

We are grateful to Dr. M. Balasubrahmanya, M.D., Principal, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, for facilities to undertake the study; and Dr. S. Chandrasekaran and Dr. A.K. Gupta for making available volunteers from their O.P.D. for this work.

REFERENCES

1. Kato M. Conduction velocity of the Ulnar nerve and the spinal reflex time measured by means of the H wave in average adults and athletes. *J. Expt. Med.*, **73** : 74-85, 1960.
2. Kemble F. Conduction in the normal Adult Median Nerve: the different effect of aging in Men and Women. *Electromyography*, **7** : 275-288, 1967.
3. Kyral, V. Changes of conduction velocity in the fastest motor fibres of n. ulnaris caused by aging. *Electroenceph. clin. Neurophysiol.*, **22** : 289, 1967.
4. Lal, S. K., S. S. Moorthy, C. V. J. Verghese, D. Jeyamitra and V. Anantharaman. Motor nerve conduction velocity in Diabetic Neuropathy. *Neurol. Ind.*, **18** : 189-191, 1970.
5. Lucci, R. M., U.S.A.F. Clark and A. F. B. Clark. The effect of age on Motor nerve conduction velocity. *J. Amer. Phys. Ther. Ass.*, **49/9** : 973-976, 1969
6. Mayer, R. F. Nerve conduction studies in man. *Neurol.*, **13** : 1021-1030, 1963.
7. Thies, R. E., J. R. Billinghurst and H. D. Richardson. Motor Nerve Conduction velocities in healthy young East Africans. *J. Appl. Physiol.*, **23/3**: 321-323, 1967.
8. Thomas, P. K. Motor nerve conduction in the carpal tunnel syndrome. *Nemology*, **10**: 1045, 1960.