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RESEARCH ARTICLE

Normative data of upper limb nerve conduction studies in healthy adult population of Haryana

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ABSTRACT

Background: The nerve condition velocity depends on the diameter, the degree of myelination, and internodal distance. It is also affected by physiological variables such as age, temperature, height, gender, and limb and also affected by ethnicity and food habits. Every neurophysiology laboratory needs to have its own normative data for its population required in clinical practice to identify the abnormalities. **Aims and Objective:** The objective of this study was to get normative data of upper limb nerve conduction in Haryana population and to compare our values with worldwide published data. **Materials and Methods:** This study was conducted in randomized selected 120 healthy subjects of both sexes of the general population who were between the ages of 18 and 70 years using PC based Neurostem-2 machine with silver electrode. Nerve conduction properties were evaluated for median and ulnar nerve on both sides using standard techniques of supramaximal percutaneous stimulation with a constant current stimulator and surface recording electrode for both nerves of each subject. Parameters included are distal motor latency (DML), amplitude, and conduction velocity (CV). **Results:** In the right median nerve, DML was 2.9 ± 0.58, the amplitude was 11.72 ± 5.22, and the CV was 52.58 ± 6.62. In the left median nerve, DML was 2.88 ± 0.61, the amplitude was 12.32 ± 5.44, and the CV was 52.48 ± 5.92. In the right ulnar nerve, DML was 2.07 ± 0.44, the amplitude was 10.02 ± 3.22, and the CV was 53.28 ± 6.62. In the left ulnar nerve, DML was 2.11 ± 0.52, the amplitude was 9.8 ± 2.88, and the CV was 52.18 ± 5.32. **Conclusions:** Normative conduction parameter of the median and ulnar nerve in the upper limb was established for neurophysiology laboratory of SGT Medical College, Hospital and Research Institute, Gurgaon.

KEY WORDS: Upper Limb; Nerve Conduction Study; Median Nerve; Ulnar Nerve; Haryana Population; Conduction Velocity; Normative Data

INTRODUCTION

Nerves are the channels of impulse transmission. Many neuronal and muscular diseases lead to nerve conduction impairment. Nerve conduction studies are the physiological expansion of the neurological assessment.[1] Nerve conduction studies are non-invasive investigation procedure to find nerve conduction impairment. There are many anatomical and physiological aspect to nerve conduction velocity (CV). These studies can diagnostically aid in patients with any disorder of the peripheral nervous system, compressing disorders of nerve roots, peripheral nerves, muscles, and neuromuscular junctions.[2] Motor conduction studies aid in distinguishing two groups of peripheral diseases: Demyelination and axonal degeneration.[3] The nerve condition velocity depends on the diameter, the degree of myelination, and intermodal distance.

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A myelinated neuron can conduct up to 50 times faster than the unmyelinated fiber owing to salutatory conduction.[4] Demyelination of motor neuron leads to decrease in CV with relative sparing in the amplitude of the compound muscle action potential (CMAP) with stimulus distal to the site of lesion. While axonal degeneration leads to the reduced amplitude of CMAP distally, although surviving axons conduct normally.[5] It is also affected by physiological variables such as age, temperature, height, gender, and limb.[5-10] These factors vary in different geographical regions having different ethnicity and food habits. Every neurophysiology laboratory needs to have its own normative data for its population required in clinical practice to identify the abnormalities.

Aims and Objectives

The purpose of this study was to establish normative electrophysiological data for commonly tested upper limb nerves in carefully screened normal healthy adults of Haryana and to compare our values with Worldwide published data.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Physiology, SGT Medical College, Hospital and Research Institute, Gurgaon, after getting permission from the Institutional Ethical Committee. This study lasted for 1 year. A total of 120 healthy subjects, 60 male (mean age 44.82 ± 12.8) and 60 female (mean age 40.24 ± 8.8), of age group 18–60 years were included in this study. Exclusion criteria included any metabolic diseases, nerve compression, neuropathy, fracture, radiculopathy, intake of drugs, and any addictions.

Motor nerve conduction studies were performed for median and ulnar nerve on both sides using standard techniques of supramaximal percutaneous stimulation with a constant current stimulator and surface recording electrode for both nerves of each subject.

The study was carried out at an ambient room temperature of 25°C. This study was conducted using PC based Neurostem-2 machine with silver electrode. The method used was that of Johnson and Oslen.[11]

For the motor study, sensitivity 2–5 Hz, low-frequency filter 2–5 Hz, high-frequency filter 10 kHz, sweep speed 2-5ms/mm, and duration 100 μs were used.

Median Motor Nerve Conduction Study

Active electrode was placed over the abductor pollicis brevis, and the reference electrode was placed over the proximal phalanx of the thumb. The ground electrode was placed over the dorsum of the hand. The site of stimulation was at the wrist between the palmaris longus and flexor carpi radialis tendon at the second crease and at the elbow crease, medial to the biceps tendon, and the brachial artery.

Ulnar Motor Nerve Conduction Study

Active electrode was placed over the midportion of the abductor digiti minimi, and the reference electrode was placed over the proximal phalanx of the little finger. The ground electrode was placed on the dorsum of the hand. The site of stimulation was at palmer aspect of the wrist just medial or lateral to the flexor carpi ulnaris tendon and slightly above the ulnar groove at the elbow.

RESULTS

The study was conducted on 120 subjects. Normative data of upper limb motor conduction in Haryana population were derived [Table 1].

The normative data derived in this study were compared with standard values derived in different population published in different studies [Table 2].

DISCUSSION

For nerve conduction studies, reference values should be established from the local population because previous studies have shown differences in nerve conduction study function related to ethnicity and demographic factors.[12] In this study, normative data of motor conduction parameter were derived in Haryana population. These values can be used as reference data to find abnormalities in the given population. Electrodiagnostic studies allow to find the site of damage. It has been investigated that NCV, distal motor latency (DML), and amplitude of motor action potential have useful diagnostic values.[13]

The present work is mainly concerned with the study of various electrodiagnostic parameters, i.e., DML, motor nerve

Table 1: Normative data of upper limb motor conduction in Haryana population

	Mean±SD		
Nerves	**Distal latency (ms)**	**Amplitude (mv)**	**Velocity (m/s)**
Median nerve			
Right side	2.9±0.58	11.72±5.22	52.58±6.62
Left side	2.88±0.61	12.32±5.44	52.48±5.92
Ulnar nerve			
Right side	2.07±0.44	10.02±3.22	53.28±6.62
Left side	2.11±0.52	9.8±2.88	52.18±5.32

SD: Standard deviation

Table 2: Comparison of this study with other published studies

Nerve	Parameters	Kimura 1984[5]	Falco *et al.* 1992[10]	Robinson *et al.* 1993[9]	Hennessey *et al.* 1994[14]	Shehab *et al.* 1998[15]	Present study	
							Right side	Left side
Moto rmedian	DML (ms)	3.49±0.34	3.5±0.5	3.6±0.4	3.2±0.4	3.1±0.3	2.9±0.58	2.88±0.61
	Amp (mv)	7.0±3.0	9.2±3.1	9.5±2.9	12.1±3.8	11.1±2.8	11.72±5.22	12.32±5.44
	CV (m/s)	57.7±4.9	54.4±5.4	54.4±3.8	59.5±4.4	56.5±3.5	52.58±6.62	52.48±5.92
Motor ulnar	DML (ms)	2.59±0.39	2.7±0.3	2.9±0.4	2.6±0.3	2.4±0.3	2.07±0.44	2.11±0.52
	Amp (mv)	5.7±2.0	9.9±1.8	8.4±2.1	12.6±2.3	9.2±2.2	10.02±3.22	9.8±2.88
	CV (m/s)	58.7±5.1	61.6±4.1	56.3±6.2	63±4.8	60.4±5.2	53.28±6.62	52.18±5.32

DML: Distal motor latency, CMAP: Compound muscle action potential, CMAPA: Compound motor action potential amplitude, MNCV: Motor nerve conduction velocity, CV: Conduction velocity

conduction velocity, and compound motor action potential amplitude in normal healthy adult population of Haryana. The results of this study were compared with the results of previous studies. DML and amplitude of median and ulnar nerve found in this study are in close proximity with the findings of Shehab, Hennessey *et al* and Falco *et al*.[10,14,15] Motor CV of the median nerve is in close proximity to results obtained from Shehab, Falco *et al*., and Robinson *et al*.[9,10,15] Motor nerve CV of the ulnar nerve is also in close proximity to results obtained by Robinson *et al*.[9]

CONCLUSION

This study provides normative baseline data of most commonly tested peripheral nerves of upper limb, i.e. median nerve and ulnar nerve in Haryana population. This data will be helpful in diagnosing the patients with peripheral neuropathy.

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