A Study of Nerve Conduction Properties in Labourers

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Abstract

Thirty healthy male volunteers who are labourer by occupation were included in the study after their informed written consent to participate. All the participants were examined to exclude any history of orthopedic, systemic or neuromuscular disorder by relevant history taking with psychological, musculoskeletal and neurological examination. Subjects were excluded if any one of them is not fit to the inclusion criteria. A NEUROPERFECT 2000 mechine was used to check nerve conduction properties of the subjects. The study was conducted to know the nerve conduction properties of median nerve in healthy male labourer for dominant and non dominant hand. The nerve conduction properties studied for motor and sensory nerve were latency, amplitude and nerve conduction velocity of median nerve for dominant and non dominant hand of the subjects. The site of stimulation for motor median was the wrist; elbow and axial and recording site were motor point of Abductor Pollicis Brevis. The results indicate that there is no statistical significant difference in median motor nerve conduction properties as well as in median sensory nerve conduction properties of dominant and nondominant hand of labourer sample. Furthermore the MNCV and SDL of median nerve for dominant hand are lower than the reffered healthy subjects reported in earlier studies it may be due to the working requirement of handloom industry (i.e. repetitive movement) and SNAP amplitude is lower only than that reported by Shehab as he measured it from negative peak to subsequent positive peak which was different than our procedure.

Key words: Labourers, Median Nerve, Motor, Sensory, Amplitude, Latency

Introduction

An activity that serves as one's regular source of livelihood or the principal activity in life that one does to earn money is known as occupation. There are various occupations in which people are involved to earn money. Labourer is a person engaged in physical work, especially of an unskilled kind.

Nerve conductions study (NCS) is a standard procedure for the evaluation of peripheral neuropathy. In the peripheral nervous system, the nerve fibres of various diameters and functions (motor and sensory) are bundled together by the connective tissue to form nerves. NCS help in delineating the extent and the distribution of neural lesions and they distinguish two major categories of peripheral nerve diseases: demyelination and axonal degeneration *(Kimura, 1984)*. The Increased use of NCS in clinical trials and research, and attention to quality in health care has heightened interest in the reliability of results. The results may be used as a basis for diagnosis and in pre-placement examinations for work restrictions, such as those related to carpal tunnel syndrome (CTS). A variety of tests

may be performed to detect sensory abnormalities, which are typical findings in early stages of disease. The nerve conduction velocity is the speed at which an electrical stimulus passes through the nerves. The motor nerve conduction velocity (MNCV) is performed by the electrical stimulation of a peripheral nerve and by using the recording from a muscle which is supplied by this nerve. The time it takes for the electrical impulse to travel from the stimulation site to the recording site is measured. This value is called the latency and it is measured in milliseconds (ms). The size of the response called the amplitude is also measured. The motor amplitudes are measured in millivolts (mv). Nerve conduction studies are influenced by number of physiological and technical variables *(Gassel, 1964, Simpson, 1964)* such as standardized measurements, temperature, height, the gender and the age of normal healthy individuals and parameters like the nerve diameter and myelination. *Stetson et al (1992)* showed that in randomly selected adults without an occupational exposure to high forces or repetitive hand exertions, the age, height, and the index finger circumference were found to be important predictors of the median, ulnar, and the sural nerve conduction measures *(Stetson et al, 1992)*. Although methods for evaluating nerve function have evolved since the 1940s, but the reliability has rarely been assessed and particularly among workers. Many studies have been published from the Western countries regarding normative data for the nerves of the upper and lower limbs *(Kimura, 1986, Perez et al, 1986, Falco et al, 1992, Hennessey et al, 1994)*. To the best of our knowledge no study has been performed on factory setup labourers in India, The primary purpose of this study is to provide electrophysiological data for commonly tested Median nerve in normal healthy labourers using standard distance, procedure and controlled temperature.

Material and Methods

Thirty healthy male volunteers who are labourer by occupation were included in the study after their informed written consent to participate. All participants were examined to exclude any history of orthopedic, systemic or neuromuscular disorder by relevant history taking with psychological, musculoskeletal and neurological examination. Subjects were excluded if any one of them is not fit to the inclusion criteria. A Neuroperfect 2000 mechine was used to check nerve conduction properties of the subjects. Nerve conduction studies were performed using standard techniques of supramaximal percutaneus stimulation with a constant current stimulator and surface electrode recording on both extremities of each subject. The nerve conduction properties studied for motor and sensory nerve were latency, amplitude and nerve conduction velocity of median nerve for dominant and non dominant hand of the subjects. The site of stimulation for motor median was the wrist; elbow and axial and recording site were motor point of Abductor Pollicis Brevis. The reference electrode was placed 4 cm distally over the 1st metacarpo-phalangeal joint for median nerve. For sensory nerves, antidromic study was done using ring electrode. Electrodes were placed on index for median nerve. Sensory nerve action potential (SNAP) amplitude was taken from peak to base. Ground electrode was

placed between stimulation and recording electrode.

Results

30 healthy male labourer volunteers included in the study were aged 20-45 years with mean age of 31±7.2 years. The height of the volunteers ranged from 150-175 cm with mean height of 160.9 ±8.20 cm.

Table 1 Morphological Characteristic of male labourers

	AGE, YRS	HEIGHT, CMS	WEIGHT, KG	BMI
Mean±SD	31 ±7.2	160.9 ±8.20	57.93 ±9.27	22.18 ±2.42

The weight of the volunteers ranged between 48 to 88 kg with mean weight of 57.93±9.27kg. The BMI of selected volunteers was 22.18. On an average all the subjects were found to possess normal height, weight and normal BMI.

There is no statistical significant difference in median motor nerve conduction properties as well as in median sensory nerve conduction properties of dominant and nondominant hand of labourer sample.

Table 2: Comparison of nerve properties of the dominant & non dominant hands in the subjects.

DOMINANT HAND				NON DOMINANT HAND			
Sr.No.	Nerve	Properties		Sr.No	Nerve	Properties	
1	Median Motor	Latency (msec)	3.09±0.50	1	Median Motar	Latency (msec)	2.96±0.46
		Amplitude(mV)	13.28±5.39			Amplitude(mV)	13.05±5.33
		N.C.V (m/s)	51.30±4.51			N.C.V (m/s)	52.54±7.03
2	Median Sensory	Latency (msec)	2.29 ±1.01	2	Median Sensory	Latency (msec)	2.44 ±1.17
		Amplitude (μV)	38.33 ±25.36			Amplitude (μV)	39.35 ±31.2
		N.C.V (m/s)	53.54 ±16.30			N.C.V (m/s)	51.00 ±15.86

Discussion:

This study examined the nerve conduction parameters of the most commonly tested nerve i.e Median nerve in the upper limb of a healthy adult population of labourer working in handloom industry of Panipat, Haryana. A comparison was made between this study and other studies published in the literature for healthy individuals that used dominant hand, standardized techniques and recorded limb temperature of the subjects *(Kimura, 1986, Robinson et al, 1993, Hennessey et al, 1994, Shehab, 1998, Mishra, & Kalita, 2006)* were chosen. The results of this study for the motor nerve conduction parameters of the median nerve were in accordance with those of other studies, has been seen in table no. 3

Table 3: Comparison of Nerve conduction parameters-

	Present Study (N = 30)	*Mishra & Kalita, 2006.* (N = 26)	*Shehab, 1998.* (N = 50)	*Hennessey et al, 1994.* (N = 44)	*Robinson et al, 1993.* (N = 44)	*Kimura, 1986.* (N = 61)
Motor Median						
Latency(msec)	3.09±0.50	3.77 ± 0.4	3.1 ± 0.3	3.2 ± 0.4	3.6 ± 0.4	3.49 ± 0.34
Amplitude(mV)	13.28±5.39	8.10 ± 2.62	11.1 ± 2.8	12.1 ± 3.8	9.5 ± 2.9	7.0 ± 3.0
N.C.V (m/s)	51.30±4.51	58.52 ± 3.76	56.5 ± 3.5	59.5 ± 4.4	54.4 ± 3.8	57.7 ± 4.9
Sensory Median						
Latency(msec)	2.29 ±1.01	3.06 ± 0.41	2.3± 0.3	2.5 ± 0.2	3.7 ± 0.3	2.84 ± 0.34
Amplitude(μV)	38.33 ± 25.36	8.91 ± 4.48	63.3± 18.9	31.4 ± 8.2	35.6± 11.8	38.5 ± 15.6
N.C.V (m/s)	53.54 ±16.30	45.45 ± 9.4	56.6± 7.6	61.2 ± 4.3	54.6± 3.7	56.2 ± 5.8

The result for Latancy of the present study is in accordance with previous studies done by *Shehab (1998)*. Amplitude of the present study is higher than the compared studies but values significantly differ from study done by *Mishra & Kalita (2006)* and *Kimura (1986)*. Conduction velocity of the sample is in accordance with *Robinson et al (1993)* but lower than reported for other studies *(Hennessey et al, 1994, Kimura, 1986, Shehab, 1998 and Mishra, & Kalita, 2006)* it may be due to repetitive movement of wrist as per their job requirement.

Sensory Latancy of the study is lesser than all but significantly differ from the results of *Hennessey et al (1994)*. SNAP amplitude that we recorded was measured from peak of negative potential to base line in accordance with other studies *(Hennessey et al, 1994, Kimura, 1986, and Robinson et al, 1993)*. However, Shehab (9) measured it from negative peak to subsequent positive peak. This might be the reason why we got lesser SNAP amplitude. The result for conduction velocity for the present study is in accordance with all the referred researchers.

Thus, the values for the nerve which was tested, agreed with those of most of the other researches, while a few nerve parameters showed considerable differences. This difference between the results of the present study and the data which has been published in the literature could be attributed to a variety of causes. Firstly, the difference in the distance between the stimulating and the recording electrodes and the muscles which were tested, inflicted well on the lower values. Secondly; the age of the subjects who were studied. Thirdly, the diversity of the methods and techniques (the studies differed in the setting and the recording of the electrical responses, and the equipment which was used). Finally, the type of electrode which was used could also be a source of this variation. Besides, different studies were done on different ethnic groups. Some studies were done on Caucasian subjects and others were done on Asians.

At present it is difficult to attribute the differences to a single factor. On the other hand, the diversity could have resulted for variables that were not yet considered by researchers such as body built and climatic dwelling conditions.

Conclusion: The study was conducted to know the nerve conduction properties of median nerve in healthy male labourer for dominant and non dominant hand. The study concluded that there is no significant difference in the values of nerve conduction properties of dominant and non dominant hand of the healthy sample ; furthermore the MNCV and SDL of median nerve for dominant hand is lesser than the reffered healthy subjects studies it may be due to the working requirement of handloom industry(i.e. repetitive movement). and SNAP amplitude is lesser only than Shehab as he measured it from negative peak to subsequent positive peak which was different than our procedure.

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