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Comparison of NCV of Right and Left Limb in Right handed Male Subjects.

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ABSTRACT

Background: Nerve Conduction Velocity is affected by various factors like age gender & temperature. Various studies have been done regarding development of brain and dominance of right or left side, some studies have found differences between left and right hand for nerve conduction. Our aim is to compare NCV of dominant limb to non-dominant limb in right hand dominant subjects and to find out if different normal values should be considered in right and left hand. **Methods:** The Median and Common Peroneal Nerve (CPN) of dominant as well as Non- dominant limb were used for measuring Motor & Sensory Nerve Conduction Velocity (MNCV & SNCV) in age groups of 31-35 and 36-40 years using Medicaid system. **Results:** We found p value was insignificant using unpaired t-test for MNCV & SNCV of Median and Common Peroneal Nerve of left and right side. Similarly, the MNCV & SNCV of dominant and non-dominant limb for median and CPN were insignificant. **Conclusion:** Consideration of right or left side dominance is not necessary while measuring NCV in asymptomatic subjects and different set of normal values are not required for right and left hand.

Keywords: Common peroneal nerve, dominant side, Median Nerve, Nerve Conduction Velocity, non-dominant side, Sural nerve.

INTRODUCTION

Nerve conduction study is an important test used to test the functioning of nerves, specially the ability of conduction of electrical stimulus in the peripheral motor or sensory nerves. It is an objective test, which involves electrical stimulation of a nerve and recording of the evoked potential either from the muscle or from the nerve itself. Slowing of conduction may be caused by various pathological processes, which hamper fast conduction like damage or loss of myelin, focal compression (carpal tunnel syndrome) or generalized peripheral neuropathy. [1]

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Peroneal neuropathy at fibular head is the most common entrapment neuropathy in lower limbs because peroneal nerve is most superficial and vulnerable to injury at this site. Acute peroneal neuropathy often results from trauma or immobilization for prolonged periods. Habitual leg crossing, repetitive stretching from squatting position has been associated with peroneal neuropathy.[2,3]

On most manual tasks usually the preferred hand is used more than the non-preferred hand.[4]

Various studies have been done regarding development of brain and dominance of right or left side but studies on effect of dominance of right and left hand on neuromuscular systems are scanty.[5-7] Specially the effect of dominance of right or left side on NCV. So we planned to study the subjects of Aligarh for effect of right dominance on NCV.

MATERIALS AND METHODS

This study was done in the Department of Physiology, Jawaharlal Nehru Medical College and Hospital, A.M.U, Aligarh. After obtaining an institutional ethical clearance from the ethical committee, 90 right-handed male subjects employed in various professions were included for this study. Subjects were interviewed for any history of Diabetes Mellitus, Thyroid Disorder, Alcohol Intake, Smoking, Drug Intake and their valid consent was taken after explaining the procedure of test. Subjects having any sign and symptom of neuropathy were excluded from the study. Most of these subjects were people living

and in and around Aligarh. We compared 46 subjects in 31-35 years age group and 44 subjects in 36-40 years age group using unpaired t-test.

Technique of Experiment:
Nerve Conduction Study involves the application of depolarizing square wave electrical pulses to the skin over a peripheral nerve.
Pre-requisite for the examination:

- Warm room
- Relaxed and cooperative subject
- Proper posture
- High quality gold plated surface electrodes
- Impedance of electrodes is kept minimum
- EEG jelly or paste
- Pre-amplifier
- Spirit and cotton
- Adhesive tape

Motor Nerve Conduction Velocity (MNCV)

- The motor or mixed nerve was stimulated at two points along its course. The stimulation intensity was adjusted to record a Compound Muscle Action Potential (CMAP).
- Stimulation intensity was increased gradually and the point at which the amplitude did not increase any further was determined as the supra-maximal intensity. This was the intensity at which the response was recorded. The duration of stimuli was 0.1 ms.
- The cathode of the stimulator was kept close to the active electrode. The surface recording electrodes were used and placed in belly tendon montage; keeping the active electrode close to the motor point and the reference to the tendon.
- Ground electrode was placed between the stimulating and the recording electrodes.
- A biphasic action potential with initial negativity was thus recorded.
- Filter setting was 2 Hz - 5 KHz with sweep speed of 5 ms / division.

Calculation of MNCV

- The onset latency is the time in milliseconds from the stimulus artefact to the first negative deflection of CMAP.
- MNCV was calculated by measuring the distance in mm between 2 points of stimulation, which was divided by latency difference between the proximal and the distal latencies (ms).The nerve conduction velocity is expressed as m/s.

$$\text{MNCV} = \frac{D}{(PL-DL)}(m/s)$$

Where
PL is the Proximal Latency (ms).
DL is the Distal Latency (ms)
D is the distance between proximal and distal stimulation sites (mm).

Sensory Nerve Conduction Velocity (SNCV)

- The sensory conduction velocity can be measured orthodromically or antidromically.
- In orthodromic conduction study, a distal portion of the nerve, e.g. digital nerve is stimulated and Sensory Nerve Action Potential (SNAP) is recorded at a proximal point along the nerve.
- In antidromic conduction study, the nerve is stimulated at a proximal point and SNAP is recorded distally. Antidromic recording was done in the present study.

Nerve	Antidromic /Orthodromic	Stimulation Site	SNAP Recorded From
Median	Antidromic	Wrist	Index finger
Sural	Antidromic	At the junction of middle and lower 1/3rd of the leg	Ankle

- The filter setting was 20 Hz – 3 KHz & sweep speed was 2 ms/division.
- The signal enhancement for averaging is generally required for sensory conduction study. The signal enhancement with averaging is proportional to the sq. root of the no. of trials.

Change in amplitude= $\sqrt{n}$

Where' n' is the no. of trials

- The latency of the potential was measured from the stimulus artefact to the initial positive or subsequent negative peak.
- SNCV unlike MNCV is measured by stimulating at a single stimulation site, because the residual latency which comprises neuromuscular transmission time and muscle propagation time is not applicable in sensory nerve conduction. Thus, the SNCV was calculated by dividing the distance (mm) between the stimulating and recording sites by the latency (ms).

$$SNCV = \frac{Distance}{Latency}(m/s)$$

RESULTS

Ninety subjects were included in the study. All the subjects were right handed male, resident of Aligarh.

Table 1: They were grouped in to following two age groups

Group	Age Group	Number of subjects	Mean Age± SD	p Value
Group 1	31-35 years	46	32.67±1.38	> 0 .05
Group 2	36-40 years	44	37.57±1.48	> 0 .05

* p value <0.05: Statistically Significant

Table 2: MNCV of subjects in the age group 31-35 years

No of Subjects = 46	MNCV Dominant Side	MNCV Non-Dominant Side	p Value
Median nerve	54.38 ± 5.17	54.43 ± 4.07	> 0 .05
Common peroneal nerve	49.54 ± 4.05	48.99 ± 5.48	> 0 .05

* p value <0.05: Statistically Significant

Table 3: SNCV of subjects in the age group 31-35 years

No of Subjects = 46	SNCV Dominant Side	SNCV Non-Dominant Side	p Value
Median nerve	52.43 ± 3.84	53.14 ± 5.23	> 0 .05
Sural nerve	47.56 ± 3.91	47.59 ± 3.26	> 0 .05

* p value <0.05: Statistically Significant

Table 4: MNCV of subjects in the age group 36-40 years

No of Subjects = 44	MNCV Dominant Side	MNCV Non-Dominant Side	p Value
Median nerve	54.41 ± 3.88	53.23 ± 4.74	> 0 .05
Common peroneal nerve	49.56 ± 4.94	50.78 ± 4.62	> 0 .05

* p value <0.05: Statistically Significant

Table 5: SNCV of subjects in the age group 36-40 years

No of Subjects = 44	SNCV Dominant Side	SNCV Non-Dominant Side	p Value
Median nerve	52.54 ± 3.92	52.88 ± 5.73	> 0 .05
Sural nerve	48.73 ± 4.89	48.10 ± 3.66	> 0 .05

* p value <0.05: Statistically Significant

DISCUSSION

In nerve conduction study speed of nerve transmission is reflected in the velocity and latency, which is the time between stimulation of the nerve and recording of the waveform.[8,9] Velocity is calculated by dividing the difference in the latencies, by the distance between the two stimulation sites.

Tan U & Gupta in their study on right handed subjects found SNCV to be higher on left side and MNCV faster on right side.[10,11] Bhorania et al in 2009 in their study on 50 medical students found no difference of MNCV in right hand to left hand of same individual.[12]

Due to different trend in various reports and scanty data on effect of dominance of right side on MNCV and SNCV of dominant vs non dominant side we compared the MNCV and SNCV of right and left side in right handed subjects.[10-12]

On comparing MNCV & SNCV of Median Nerve of right(Dominant) hand to left hand we found no significant difference between them in group 1 (31-35 years) and group 2(36-40 years). Our findings were supported by similar reports by Tayade & Latti of 40 students on Median Nerve as they also found no effect of limb domination on nerve conduction studies .[13] To find out if separate normative data is required for right and left side we also compared MNCV of right and left Common peroneal nerve and SNCV of right and left sural nerve . We found that there was no significant difference between, Median Nerve and also between right & left CPN in group 1 (31-35 years) and group 2(36-40 years). Similarly, jaggad et al in their study on 30 healthy volunteers found no effect of limb dominance on handedness. [14] Jagga et al in 2006 in their study on Indian labourers found no significant difference in the NCV of median nerve of dominant hand as compared to non-dominant hand.[15]

CONCLUSION

We concluded that there was no effect of right side dominance on motor and sensory nerve conduction velocities and the nerve conduction velocities of right and left side were comparable for their respective Nerves.

We also suggest that a study should be designed with more number of subjects and with wider age groups. A study with female subjects should also to done to assess if there is any difference in the results from this study.

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