

## Study of Effect of Temperature on Motor Nerve Conduction Velocity in Normal Healthy Young Adults

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### Abstract

Nerve conduction studies are increasingly used in diagnosis and prognosis of various neurological diseases. Temperature changes influence the nerve conduction study. It is an important factor influencing the velocity of nerve impulse. To what extent and whether the effect is same along the temperature scale is still disputed. The aim of the study was to evaluate the influence of temperature changes on normal human motor nerve conduction and to compare it with results obtained in previous studies. The study was conducted over 50 young healthy adult medics of NMCH, Patna aged between 18-25 years of age of average height and weight. Median motor nerve was selected for study. The forearm skin temperatures were varied from 27°C to 37°C using hot and cold packs. Mean and Standard deviation of MNCV at various temperatures were calculated and one way ANOVA was done. The result showed significant change in MNCV with rise in temperature of 0.92-1.32m/sec/°C for median motor nerve. The rise obtained was almost linear and different from the previous studies.

**Keywords** – MNCV, temperature, young, healthy, adults

**Abbreviations** – MNCV- Motor nerve conduction velocity, ANOVA- Analysis of variance

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### I. Introduction

Nerve conduction studies have become an important tool in diagnosis and prognosis of various neurological diseases. Temperature variations in tissues surrounding a nerve affect the nerve conduction velocity. Several studies suggest an increase of nerve conduction velocity by ~5%/°C rise of temperature from 27°C to 37°C. To what extent and whether the effect is same along the temperature scale is still disputed. Various previous studies have shown different results. As nerve conduction velocity has become an important tool for investigation of neurological disorders, the accuracy of results is extremely important. As the temperature change of tissues around a nerve affects its conduction velocity one must know the normal variations in MNCV with temperature. The study will help to provide data for normal variations and relationship of MNCV with temperature changes and will help clinicians to establish the diagnosis and prognosis of any neurological disease. This study will also help to compare the results with earlier studies and help in future and ongoing research.

### II. Aims & Objective

The aim of this study was to evaluate the influence of temperature changes on normal healthy adult human motor nerve conduction and to compare the results obtained in previous studies.

### III. Materials And Method

Median MNCV was recorded in 50 healthy subjects. 25 males and 25 females aged 18-25 years of average height and weight were selected from among first year medics of NMCH, Patna. The study was approved by the ethical committee of the institute. The forearm skin temperatures were varied from 27°C to 37°C using hot packs and cold packs. Mean and standard deviation of MNCV for every 2°C rise was calculated. One way ANOVA was done for statistical purpose. MNCV was performed by Neurostimulator using surface electrodes. Skin temperature was measured using a digital mercury thermometer.

### Exclusion criteria

1. Subjects below 18 years and above 25 years were excluded.
2. Subjects with any previously diagnosed neurological disease or with any neurological sign or symptoms were excluded.

**Limitation**

Only a single motor nerve (median nerve) was selected for study.

**IV. Observation And Result**

Significant change in MNCV was found with rise in temperature, ranging 0.92 -1.32m/sec/°C for median motor nerve.

Temperature (°C)	Mean MNCV (m/sec)	±SD
27°C	53.32	6.53
29°C	55.97	6.55
31°C	58.49	6.62
33°C	60.98	6.57
35°C	63.20	6.66
37°C	65.04	6.81

**Table 1:-** Mean and Standard deviation of MNCV of median motor nerve recorded at various temperatures.

F Value = 22.391
p Value = 0.001

**Table 2:-** One way ANOVA of median motor nerve conduction velocity recorded at various temperatures. Our study indicates linear increase in MNCV with rise in temperature.

**V. Discussion**

Study indicates linear increase in MNCV with rise of temperature. This rise was different from some of the previous studies which have shown a non linear increase in MNCV. This could be due to the different methods and machine used for various studies and also due to some confounding factors. The increase in MNCV with increase in temperature is probably due to the fact that warming causes hyperpolarization by acceleration of the electrogenic sodium pump.

The MNCV is less at lower temperatures because of slowing of sodium channel opening and delay in its inactivation which slows the nerve conduction and increase the amplitude. Also there is reduction in the sodium permeability of nerve axons during excitation resulting in a lower sodium influx and increased latency. As the temperature is gradually increased the resistance to impulse conduction decreases which decreases the latency and increases the conduction velocity.

**VI. Conclusion**

The study indicates linear increase in MNCV with rise of temperature which was different from some of the previous studies which showed a non linear increase.

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