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ORIGINAL RESEARCH ARTICLE

Comparison Of Effect Of Temperature On Conduction Velocity Of Right Hand Median Motor And Sensory Nerve To Left Hand Median Motor And Sensory Nerve In Healthy Subjects

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Abstract

Nerve conduction study is a part of electro diagnostic procedures that help in establishing the type and extent of the abnormality of the nerves. The use of conduction velocity measurement as a diagnostic procedure in neurology requires a knowledge of arrange of values encountered in healthy individuals. In the present study an attempt was made to compare the effect of different temperature on nerve conduction velocity between right and left hand median motor-sensory nerve in healthy subject. This study was conducted in the Department of Physiology,Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur(M.P.)after obtaining ethical clearance. Both motor and sensory component of median nerve examined in 60 Medical student, having no signs or symptoms of neurological impairment. Nerve conduction study of Median nerve both motor and sensory bilaterally were performed,with help of Computerized machine RMSAleron201EMG&NCV,using surfaceand ring electrodes. Different temperature i.e .hot & cold were maintained with the help of Waterbath and skin temperature measured by using Digital Mercury Thermometer. Our study revealed that on comparing conduction velocity in right and left hand median nerve while increasing temperature from 29°-39°C,$p > 0.05$ showing non-significant difference at different studied temperature. Study concluded that conduction velocity in right and left hand is independent of temperature change.

Keywords: Nerve conduction velocity, median nerve,temperature

Introduction

Nerve conduction studies (NCS) are an objective, quantitative and reproducible measure of peripheral nerve function and are widely used in the diagnosis of neuropathies [1].

They have also been used to monitor neuropathic disease progression [2] and the efficacy of interventions in clinical trials [3, 4] Nerve conduction studies are being increasingly used in diagnosis and prognosis of various neurological diseases.

The conduction velocity of the nerve depends on the fiber diameter, degree of myelination and the inter-nodal distance. Nerve conduction study can be affected by many physiologic and technical variables [5-8]. The most common factors are temperature, age, height, and distance measurements.

The use of conduction velocity measurement as a diagnostic procedure in neurology requires a knowledge of a range of values encountered in healthy individuals. Normal values for maximum conduction velocity in human peripheral nerve had been described way back in 1850 by Helmholtz who measured median conduction velocity of humans using crude mechanical instruments and had found the normal range to be 61.0 ± 5.1 m/s [9].

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The nerve conduction studies provide an objective and qualitative measure of nerve function and also help in predicting the prognosis of neuropathy. With steady improvement in recording apparatuses; nerve conduction studies have become a simple and reliable test of peripheral nerve function (Aminoff1999)[10].

Nerve conduction studies (NCS) are one of the two major components of theelectrodiagnostic (EDX) assessment, the other being the needle electrode examination (NEE). There are three types of NCS-motor, sensory, and mixed. Because of differing technical aspects in their performance, these must be performed sequentially, rather than simultaneously, whenever the same mixed nerve is being assessed (i.e., motor and sensory NCS cannot be done on a nerve trunk at the same time). Similar to the NEE and the various special studies, all three types of NCS assess only large,heavilymyelinated nerve fibers[11, 12, 13].

Temperature variation in the tissue surrounding a nerve is an important factor influencing the velocity of the nerve impulse. The distal extremities are constantly exposed to environmental temperature changes and are subjected to significant tissue temperature variation even in healthy subjects (Halar*et al*., 1981) [14, 15, 16].

Temperature affects biologic and neurophysiologic processes and is, therefore, always well controlled *in vitro* experiments. With so much of importance attached to this electro-diagnostic test, the accuracy of results is of extreme importance. A small error like incorrect recording of skin temperature or disregarding it totally can result in disastrous diagnosis.

The indoor thermal environment will directly influence human physical and psychological health, sense of comfort, as well as human's well-being [17, 19]. This study attempts to determine the comparison of effect of skin temperature onconduction velocityof right and lefthand motorand sensorybranchofmediannerveinnormalsubject.

Material and Method

This studywasconductedintheDepartmentofPhysiology,Netaji SubhashChandraBoseMedicalCollegeandHospital, Jabalpur(M.P)60 Medicalstudentwererecruitedfromthe FirstM.B.B.SbatchfromN.S.C.B.MedicalCollege,Jabalpur(M.P.),having nosignsorsymptomsofneurologicalimpairment.

NerveconductionstudyofMediannervebothmotorandsensorybilaterallywereperformed,withhelpofComputerizedmachine RMSAleron201EMG&NCV,usingsurfaceandringelectrodes. Differenttemperaturei.e.hot&coldweremaintainedwiththehelpofWaterbathandskintemperaturemeasuredby usingDigitalMercuryThermometer.

Thenervewerestimulatedsupramaximallywiththe wavepulses of0.2msdurationforeveryrecordingof sensory mediannerveconductionvelocityandmotormediannerveconductionvelocity. Theactiverecordingelectrodeisplacedoverthebellyofthe AbductorPollicis Brevisin ordertorecordmuscleactivityatthemomentofdepolarisationafterthenerveimpulsehasarrivedattheendplate.There referenceelectrodeshouldbeplacedinsuchaway thatnorecordingsaretakenfromthemuscleunderstudy.Referenceelectrodeisplacedoverthetendonof Abductor Pollicis Brevis.

Surfacestimulationisperformedasperstepsfollows

S_1: Firststimulus placedatthewristbetweenthePalmarisLongus&FlexorCarpiRadialistendonatthesecondcrease. (Approximately1cmproximaltothemostdistalcrease).

S_2: Secondstimulusplacedattheelbowcrease,medialtotheBicepstendonandbrachialartery.

Afterobtainingthefirstmotor andsensoryrecordat a roomtemperaturetheforearmincludingtheelbowwascooledin athermostatedwaterbathat32°Cfor10minutes.Theupperextremity wasthenliftedfromthebathanddried,theelectrodewereappliedoverthemarkedpointsandrecordingwasperformedagain.Thenthearmwasimmersedinthewateragainandcooledthe forearm includingtheelbow at29°Cfor10minutes.Similarly recording was done at 39°C.Hence, the temperature was changed stepwise to 32°C, 29°C& 39°C[18].

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Thearmwasinwaterbathfor10minutesbeforethenerveconductionexamination,theskintemperaturewasmeasuredjustbeforethestimulationatsiteoftherecordingandstimulatingelectrodeatthewristwiththedigitalmercurythermometer.

Conduction Velocity (CV)s are obtained by stimulating the nerve at two points along its course, subtracting the distal latency from the proximal latency, and then dividing the difference from the distance (as determined by surface measurements) between the two stimulating points. Thus, with CVs, the rate of conduction is expressed as the distance travelled per unit of time, in meter/second.

Result

Table 1: Comparison of mean values & standard deviation of motor nerve conduction velocity between right & left hand median nerve

Temperature	Right(n=60)	Left(n= 60)	Significance	
29	53.66 (±6.53)	53.51 (±6.52)	t=0.13	p > 0.05
32	55.89 (±6.55)	55.72 (±6.55)	t=0.14	p > 0.05
37	58.77 (±6.84)	58.60 (±6.83)	t=0.13	p > 0.05
39	63.17 (±6.81)	63.10 ±6.81	t=0.06	p > 0.05

It is apparent from table-1 that the right hand median motor nerve conduction velocity showed the mean values are 53.66(±6.53) at 29ºC,55.89(±6.55)at 32ºC,58.77(± 6.84)at 37ºC, 63.17(±6.81) at 39ºC. The left hand median motor nerve conduction velocity showed the mean values are 53.51(±6.52) at 29ºC,55.72(±6.55) at 32ºC, 58.60(±6.83)at 37ºC,63.10(±6.81) at 39ºC.On comparing, p > 0.05 showing non-significant difference at different studied temperature.

Table 2: Comparison of mean values & standard deviation of sensory nerve conduction velocity between right & left hand median nerve

Temperature	Right(n=60)	Left(n=60)	Significance	
29	54.56 (±5.69)	54.39 (±5.71)	t=0.17	p > 0.05
32	57.63 (±5.75)	56.50 (±5.77)	t=1.08	p > 0.05
37	60.38 (±5.44)	59.26 (±5.44)	t=1.12	p > 0.05
39	63.64(±5.35)	61.99 (±5.39)	t=1.69	p > 0.05

It is apparent from table 2 that the right hand median sensory nerve conduction velocity the mean values are 54.56 (±5.69) at 29ºC, 57.63(±5.75) at 32ºC, 60.38(± 5.44)at 37ºC, 63.64(±5.35) at 39ºC. The left hand median sensory nerve conduction velocity showed the mean values are 54.39(±5.71) at 29ºC,56.50(±5.77) at 32ºC, 59.26(±5.44) at 37ºC, 61.99(±5.39) at 39ºC.On comparing, p > 0.05 showing non-significant difference at different studied temperature.

Discussion and Conclusion

On comparing effect of temperature (29ºC-39ºC) on conduction velocity of right median motor and sensory nerve with left median motor and sensory nerve forthe result of our study reveals that there is no statistically significant difference between right and left median motor and sensory nerve(table 1,2). Similar results were obtained by TAN U(1985) and Sunil Chouhan (2005)[20]while studying nerve conduction velocity in youngadult.

This indicates that there was same effect of temperature onconduction velocity of right and left hand nerve.

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