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Original Research Article

Nerve Conduction Velocity and Effect of Different Phases of Menstrual Cycle on it

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Abstract

Objective: The study was done to find out the effect of different phases of menstrual cycle on the Nerve conduction velocity in females.

Methods: 50 normal menstruating women with age between 18 to 24 years, with regular menstrual cycle were randomly selected from the nearest nursing college hostel and were included in the study. Evoked electromyogram (EMG) was used to measure the nerve conduction velocity of median nerve in all the three phases of menstrual cycle i.e. proliferative, secretory and menstrual phase. Their mean values were calculated and compared in all the three phases.

Results: When the mean of nerve conduction velocities in different phases of menstrual cycle were compared, a decrease in the NCV was observed in the secretory phase as compared to the menstrual and proliferative phase but the p value was not significant.

Conclusion: Nerve conduction velocity of the peripheral nerves does not vary significantly during the different phases of the menstrual cycle. However these parameters should be kept in mind while conducting studies on nerve conduction velocities.

Keywords: Menstrual cycle, Nerve conduction velocity, Median nerve.

Introduction

Menstrual cycle is a physiological phenomenon during reproductive life of women. Its phases are influenced by alteration in the concentration of hormones such as estrogen and progesterone. During reproductive life of women, menstrual cycle is a physiological phenomenon. Alteration in the concentration of hormones such as estrogen and progesterone influences its phases. Across normal menstrual cycle, fluctuating levels of sex steroids affect sensory- motor association of an individual.

Nerve conduction velocity (NCV) can be easily measured on peripheral nerves. Sufficient stimuli from an electrical stimulator can trigger nerve impulses. Once the action potential threshold of a nerve fiber is reached, its electrical impulses will propagate at a rate of hundred meters per second. The velocity is directly dependent on the diameter of fiber, myelination and temperature. [1-3]

The validity of the calculated nerve conduction velocity depends primarily on the accuracy in determining the latencies and the conduction distances. Several factors may contribute to determination of

accurate nerve conduction velocity like age, temperature, and height etc. Several studies show that height and Body Mass Index (BMI) has an inverserelation with the nerve conduction velocity. Because of these uncontrolled variables, the calculated values only approximate the true nerve conduction values. Of these, age and temperature have a major influence on nerve conduction studies. [4]

Not much work has been done on nerve conduction velocity related to the different phases of the menstrual cycle. So this study was done to find the relation of different phases of menstrual cycle with nerve conduction velocity. [5]

Materials and Methods

It was a cross sectional study conducted in the Department of Physiology, LNMC, Bhopal from November 2019 to January 2020. 50 normal menstruating females of age group 18 to 24 years, with regular menstrual cycle were randomly selected from a nearby nursing college hostel Bhopal and were included in the study. Those with irregular menstrual cycle were excluded. Any women with previous history of Diabetes Mellitus, hypertension, renal disease, thyroid disorder or any systemic disorder were excluded from study. Informed consent was taken from all the subjects. Different parameters like Height, Pulse, Blood pressure and weight of the individuals were measured. Body Mass Index (BMI) was calculated by using the formula weight in kg/ ht. in m^2.

Evoked electromyogram (EMG) was used to measure the nerve conduction velocity by EMG Machine (OCTOPUS by CLARITY). The EMG electrodes were placed on the abductor policis Brevis muscle and recording was done by stimulating Median Nerve at elbow and at wrist with the help of EMG electrodes. Distance between the stimulation point at wrist and elbow was measured and the latent period was noted from recording.

Nerve conduction velocity was calculated by formula- Velocity = Distance between stimulation sites in mm /Time. It was then expressed in meter per second

Observation Chart

Table 1: Nerve conduction velocity in different phases ofmenstrual cycle

Parameter	Menstrual phase [Mean± SD]	Proliferative phase [Mean± SD]	Secretory phase [Mean± SD]
NCV (m/s)	56.86±3.04	56.27±3.56	56.08±3.92

Table 2: Comparison of NCV between different phases menstrual cycle

Parameter	Menstrual phase [Mean± SD]	Proliferative phase [Mean± SD]	t Value	p value
NCV (m/s)	56.86±3.04	56.27±3.56	0.89	0.37
Parameter	Menstrual phase [Mean± SD]	Secretory phase [Mean± SD]		
NCV (m/s)	56.86±3.04	56.08±3.92	1.11	0.26
Parameter	Proliferative phase [Mean± SD]	Secretory phase [Mean± SD]		
NCV (m/s)	56.27±3.56	56.08±3.92	0.25	.080

Results

In the present study the females considered were of mean age 20.5±2.05 years and their mean BMI was 20.09±2.87 kg/m^2. The mean of nerve conduction velocity during menstrual phase was 56.86± 3.04 m/s, during the proliferative phase was 56.27±3.56 m/s and during the secretory phase was 56.08±3.92 m/s. Distribution of

the mean nerve conduction velocities according to the different phases of menstrual cycle is shown in Table no.1.

In the present study comparison of the mean of nerve conduction velocities in different phases of menstrual cycle was done by applying paired t-test, i.e. between menstrual phase and proliferative phase the t value observed was 0.89 and p value was 0.37 (not significant). Between menstrual phase and proliferative phase the t value observed was 1.11 and p value was 0.26 (not significant) and between proliferative phase and secretory phase the t value observed was 0.25 and p value was 0.08 (not significant). Comparison of the mean of nerve conduction velocities between the different phases of menstrual cycle is shown in Table no. 2

Statistical Analysis:

Data was entered in Microsoft office excels 2007 and analyzed by using the same. Paired t test was used to calculate the difference of mean between two groups.

Discussion

Menstrual cycle is a physiological phenomenon during reproductive life of women. Its phases are influenced by alteration in the concentration of hormones such as estrogen and progesterone. [6] During reproductive life of women, menstrual cycle is a physiological phenomenon. Alteration in the concentration of hormones such as estrogen and progesterone influences its phases. Across normal menstrual cycle, fluctuating levels of sex steroids affect sensory- motor association of an individual. [7-10]

In our study, the mean of nerve conduction velocity during menstrual phase was 56.86± 3.04 m/s, during the proliferative phase was 56.27±3.56 m/s and during the secretory phase was 56.08±3.92 m/s. We observed a decrease in the mean NCV during the secretory phase of the menstrual cycle. Similar findings were observed in a study conducted by Vashisht S et al in 2017, where they explained the reason for this slowing of the NCV may be due to female sex hormones, causing salt and water retention, which in turn influence the process of axonal conduction and availability of neurotransmitters at the synapse [11].

In our study, when we compare the means of the nerve conduction velocities in different phases of menstrual cycle, though we saw a decrease in the NCV in secretory phase than the menstrual and proliferative phase, the p value observed was not significant. Similar findings were observed in a study conducted by Bennal AS, Chavan V in 2017 in Karnataka [12], the reason explained was, that because fluctuation of female hormones during different phases of menstrual cycle, causes salt and water retention during the secretory phase, which in turn influence the process of axonal conduction and availability of neurotransmitters at the synapse. Similar types of reasons were also explained by the different authors who conducted studies on nerve conduction velocities. [13]

Mentese B, Kutlu N et al studied menstrual cycle phases, sex hormones and hand preference modulate nerve conduction velocity in healthy subjects.The aim of the study was to investigate the relationship between hand preference and electrophysiological parameters in women menstrual cycle phases and men. The study was conducted on 25 healthy, naturally cycling females and 30 healthy males. The female participants completed three test sessions (early follicular phase, the late follicular phase, and the luteal phase. The median nerve conduction velocities of the dominant hands of both the males and females were higher than those of the non-dominant hands. When the nerve conduction velocities of the participants were evaluated,authors observed the effects of sexual dimorphism and lateralization. The findings suggested that nerve conduction velocity was found to be affected during the phases of

the menstrual cycle in healthy female volunteers. [14]

Contreras CM et al studied relations between anxiety, psychophysiological variables and menstrual cycle in healthy women. The present study was designed to explore whether changes occur in psychophysiological variables in healthy women not suffering from premenstrual tension. Variations in electroencephalogram frequencies, reaction time, somatosensory evoked potentials, and nerve conduction velocity were examined in a sample of 30 women. Anxiety scores as well as reaction time increased during the premenstrual period only for the low anxiety group. The authors concluded that for some women premenstrual anxiety may be related to previous and continuous high levels of anxiety, which associated with some subtle neurological differences as compared with women who rated in low scores for anxiety. Bennal AS, Chavan V et al studied nerve Conduction Velocity across the phases of menstrual cycle. NCV slightly decreases during secretory phase, may be due to the hormones estrogen and progesterone causing retention of salt and water, may be considered as physiological. [15]

Similar study by Vashisht S, Chawla A et al on nerve conduction studies during various phases of menstrual cycle but had contrasting result. They did a cross-sectional study on 35 healthy female volunteers aged 18-35 years. Nerve conduction studies consisting of sensory and motor conduction velocity, distal latencies, compound muscle action potential amplitude, sensory nerve action potential amplitude, and the F wave latencies were carried out on ulnar, common peroneal, and the sural nerve during four phases of the menstrual cycle. Nerve conduction parameters did not vary significantly with various phases of the menstrual cycle. Although synaptic conduction and release of neurotransmitters is modulated by estrogen and progesterone but these appear to have no significant role on the normal axonal conduction. Hence, no significant changes were observed in peripheral nerve conduction across various phases of the menstrual cycle. [16]

Study by Ustaömer K et al aims to investigate the effects of estrogen and progesterone on nerve conduction studies (NCSs) in three different hormonal phases of the ovarian cycle.The participants were regularly menstruating for at least one year, without any hormonal disease and without taking any medication that could lead to hormonal dysregulation. Motor and sensory conduction velocities, amplitudes, and distal latencies were analyzed at the dominant extremities within the early follicular phase (EFP), late follicular phase (LFP), and the midluteal phase (MLP).Study results showed that only median nerve MCV was affected in the menstrual cycle.

Singh A, Asif N et al did motor nerve conduction velocity in postmenopausal women with peripheral neuropathy. The post-menopausal phase is characterized by a decline in the serum oestrogen and progesterone levels. This phase is also associated with higher incidence of peripheral neuropathy. Subjects were compared for MNCV in median, ulnar and common peroneal nerves and serum levels of oestrogen and progesterone estimated through enzyme immunoassays. The findings of the present study suggest that while the post-menopausal age group is at a greater risk of peripheral neuropathy, it is the decline in the serum estrogen levels which is critical in the development of peripheral neuropathy.

Conclusion

A decrease in the NCV was observed in secretory phase as compared to the menstrual and proliferative phase, but the difference in their mean was found to be insignificant. So it was concluded that the nerve conduction velocity of theperipheral nerves does not vary significantly during

different phases of the menstrual cycle. However these parameters should be kept in mind while carrying on studies on nerve conduction velocities.

Declarations:

Funding: None **Availability of data and material**: Department of Physiology LNMC and RC Bhopal **Code availability**: Not applicable **Consent to participate**: Consent taken **Ethical Consideration**: There are no ethical conflicts related to this study. **Consent for publication**: Consent taken

What this Study Add to Existing Knowledge Menstrual cycle is associated with hormonal fluctuations during various phases. Changes in estrogen levels are associated with swings in mood and cognitive functions. Against this background, this study was undertaken to observe differences in various parameters of nerve conduction during various phases of menstrual cycle. During reproductive life of women, menstrual cycle is a physiological phenomenon. Alteration in the concentration of hormones such as estrogen and progesterone influences its phases. Across normal menstrual cycle, fluctuating levels of sex steroids affect sensory- motor association of an individual.

References

1. Buschbacher RM. Body mass index effect on common nerve conduction study measurements. Muscle Nerve. 1988;002021(11):1398–404.
2. Buschbacher RM. Mixed Nerve Conduction Studies of Median and Ulnar Nerves. Am J Phys Med Rehabil. 1999; 78(6): 69–74.
3. Flack B, Stälberg E. Motor Nerve Conduction Studies: Measurement principles and interpretation of findings. Journal of Clinical Neurophysiology. 1995; 12: 254–79.
4. Amruta S. Bennal, Sudha Biradar Kerure. Glucose handling during menstrual cycle. Int J Reprod Contracept Obstet Gynecol. 2013 Sep; 2(3):284-287 DOI: 10.5455/2320-1770 .0020ijrcog20130905.
5. Rivner,M.H., SwiftT.R. & Malik,K. (2001). Influence of age and height on nerve conduction. Muscle Nerve 24, 1134–1141.
6. Awang MS, Abdullah JM et al. Nerve conduction study among healthy Malays: the influence of age, height and body mass index on median, ulnar, common peroneal and sural nerve. Malaysian journal of medical sciences, vol. 13, no. 2, July 2006 (19-23).
7. Amruta S, R.H Taklikar, Pattar M. Effect of Height and BMI on Nerve Conduction Velocity. Indian Journal of Clinical Anatomy and Physiology 2015;00202(4):231-234. 231.
8. Dhavalikar M, Narkeesh A, Gupta N. Effect of Skin Temperature on Nerve Conduction Velocity and Reliability of Temperature Correction Formula in Indian Females. Journal of Exercise Science and Physiotherapy, 2009; 5: 24–29.
9. Trojaborg WT, Moon A, Andersen BB, Trojaborg N. Sural nerve conduction parameters in normal subjects related to age, gender, temperature, and height: a reappraisal. Muscle Nerve. 1992 Jun; 15(6): 666-71
10. Amruta S. Bennal, Varsha Chavan, R.H Taklikar, Ananth Takalikar. Muscular Performance during different phases of menstrual cycle. Indian Journal of Clinical Anatomy and Physiology. 2016; 3(1); 1-3.
11. Mentese B, Kutlu N. Menstrual cycle phases, sex hormones and hand preference modulate nerve conduction velocity in healthy subjects. Physiology & Behavior. 2023 Jan 1;25 8:114003.
12. Contreras CM, Marván ML, Alcalá-Herrera VE, Yeyha AM. Relations between anxiety, psychophysiological variables and menstrual cycle in healthy women. Boletín de estudios médicos y biológicos. 1989 Jan 1;37(1-2):50-6.
13. Bennal AS, Chavan V. Nerve Conduction Velocity across the phases

of menstrual cycle. Indian Journal of Clinical Anatomy and Physiology. 2017 Jan;4(1):1-3.
14. Vashisht S, Chawla A, Joshi RK. Nerve conduction studies during various phases of menstrual cycle. National Journal of Physiology, Pharmacy and Pharmacology. 2017; 7 (4) :386.
15. Ustaömer K, Sözay S, Sarıfakıoğlu B. Effect of estrogen and progesterone on nerve conduction studies during ovarian cycle. Turkish journal of physical medicine and rehabilitation. 2021 Dec;67(4):502.
16. Singh A, Asif N, Singh PN, Hossain MM. Motor nerve conduction velocity in postmenopausal women with peripheral neuropathy. Journal of clinical and diagnostic research: JCDR. 2016 Dec;10(12):CC13.