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Effect of Different Phases of Menstrual Cycle on Nerve Conduction Velocity: A Study from Central India

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

1. 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[1].

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[2,3]. The velocity is directly dependent on the diameter of fiber, myelination and temperature[4].

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 inverse relation with the nerve conduction velocity[5-9]. 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[10].

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.

2. Material and Methods

It was a cross sectional study conducted in the Department of Physiology, LNMC, Bhopal from November 2016 to January 2017.

3. Procedure

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 wt 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

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.

4. 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.**

Table 1: Nerve conduction velocity in different phases of menstrual 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**

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.**

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**

5. Discussion

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[13-15].

6. 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 the peripheral 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.

7. Ethical Clearance

Ethical clearance was taken by institute's ethical committee.

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