STUDY OF H-REFLEX IN PREOVULATORY AND POSTOVULATORY PHASE OF MENSTRUAL CYCLE IN ADULT FEMALE VOLUNTEERS

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Abstracts: **Background**: H-Reflex is one of the late responses seen in nerve conduction study. H-Reflex is electrophysiologic equivalent of monosynaptic stretch reflex. Temperature has major influence on nerve conduction and it has been also proved that temperature variation found in different phase of menstrual cycle. H-reflex is likely to be influenced by small change in body temperature during menstrual cycle. **Objective**: The aim was to study the results of carried out H-reflex in normal adult female in pre ovulatory and post ovulatory phase of menstrual cycle. Objective is to determine the reliability of contraction induced upper extremity H-reflexes during menstrual cycle in normal healthy adult female. **Materials and Methods:** The study was carried out on 25 healthy adult female volunteers between age group of 20-35 years. H-reflex recording was done using digital nerve conduction/EMG/EP machine (Recorders Medicare System, India).During pre ovulatory and post ovulatory phase of participant, H-reflex recordings were done between 9:00a.m. to 11:00a.m. , in the electrophysiology laboratory, temperature maintained at 22+3˚C. H-reflex was obtained during stimulation of median nerve while abducting the thumb of dominant hand. **Result**: Latency and Amplitude of APB H-reflex obtained during two phases of menstrual cycle were compared. The median value(22ms) of latency of APB H-reflex in post ovulatory phase was significantally (p value < 0.0001) shorter as compared to preovulatory phase (25.5ms). The median value of amplitude (0.73mv) of APB H-reflex in postovulatory phase was significantally (p value <0.000001) higher as compared to preovulatory phase (0.36mv).This was possible due to significant (<0.004) higher body temperature in the post ovulatory phase.

Conclusion : Shorter latency and Higher amplitude of APB H-reflex in postovulatory phase was observed in our study may be explained by increased nerve conduction velocity in median nerve which would have occurred either due to increase in body temperature or due to thermogenic effect of progesterone during postovulatory phase of menstrual cycle. From this study we conclude that H reflex affects menstrual cycle. Hence it is suggested that phases of menstrual cycle should be considered while performing and interpreting the H-reflex in female patients in the age group of 20-35 years having normal regular menstrual cycle.

Key Words: Latency, Amplitude, Body Temperature

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Introduction:

The Hoffman or H-reflex is one of the late responses seen in nerve conduction study. Traditionally ,this response has been considered the electrophysiological equivalent of the monosynaptic stretch reflex. The H-reflex is a reflectory reaction of muscles after electrical stimulation of type Ia sensory fibers (Primary Afferent Fibers which constantly monitor how fast a muscle stretch changes) in their innervating nerves. The group Ia sensory fibers and alpha motor neurons form the afferent and efferent arcs of the H-reflex[1] . H-reflex does not include muscle spindle activation but rest of the arc is similar to tendon reflex produced by muscle stretch. H reflexes are sensitive test for polyneuropathies and may be abnormal even in mild neuropathies. H reflex is absent in proximal nerve lesions. So H reflex testing useful in detection of plexopathies, Guillain Barre syndrome and radiculopathies.

Nerve conduction is known to be affected by various factors like age ,myelination, diameter of neuron and body temperature. An increase nerve conduction velocity by 5 % per degree centigrade increase in body temperature is well established [2] .

During menstrual cycle variation in body temperature could be due to cyclical changes in the secretion of female sex hormones in the various phases of menstrual cycle. It is known that the plasma level of estrogen is higher during pre ovulatory phase and that of progesterone is higher during postovulatory phase. During nerve conduction studies in females, changes in conduction velocity during the phases of the menstrual cycle might not be noticed as the velocity measured in shorter segments of the

peripheral nerve[1] . However, the change in conduction velocity might be apparent in studies using longer segments of the nerve as in H-reflex [1] .

Our study attempts to determine the effect of the menstrual cycle on the latency and amplitude of the H-reflex. Conclusion of this study will be helpful while interpreting the results of the carried out H-reflex in female patients in different phases of the menstrual cycle .

Material and Methods:

After taking the permission from ethical committee review board from BJ Medical College, Ahmedabad, study was carried out. Study was done on 30 normal adult female aged between 20 to 35 years using RMS EMG EP Mark- II Electrophysiology machine in physiology department, BJ Medical college. Informed written consent was taken from each participating subject .

During pre- ovulatory phase of menstrual cycle , the subject was asked to lie down comfortably in the supine position. The skin over the palm and dorsum of the forearm was thoroughly cleaned with spirit to decrease the impedance. The subject's dominant hand was placed in an extended position with support. The subject was asked to contract the abductor pollicis brevis and maintain 10% maximal isometric contraction of APB. In normal adults, the APB H-reflex cannot be recorded under resting condition due to inhibition of APB H-reflex by higher center [5] .Collision mechanism due to antidromic impulses in the motor axons simultaneously created by the electrical stimulus while recording H-reflex may also be responsible for the absence of H-reflex at rest [1] . However, during isometric contraction, the inhibition from higher center is abolished. Thus, during voluntary contraction , H-reflex from APB was elicited by electrical stimulation of the median nerve. Stimulus intensity was 10-20mA and duration of 1ms delivered from a constant current stimulator through bipolar stimulating electrodes. Stimulation repetition rate was once in every 2 seconds. H-reflex latency was measured from the stimulus artefact to the first deflection from the baseline and the peak to peak amplitude of the evoked H responses were measured digitally. Similar procedure was repeated for the same subject in post –ovulatory phase .

The mean values of latency and amplitude of H-reflex obtained in pre ovulatory phase and post ovulatory phase were compared.

Result:

APB H- reflex was studied in 30 adult female volunteers. Contraction induced APB H-reflex in the dominant hand was recorded in all subjects in pre-ovulatory and post-ovulatory phases of menstrual cycle.

Student's t-test is used for statistical analysis.

H-Latency

The mean value of APB H-reflex latency was shorter(23.08) during postovulatory phase compared to pre ovulatory phase (24.85).

APB H-reflex latency was significantly shorter in postovulatory phase compared to pre ovulatory phase with p value less than 0.0001.

Variable		Mean	SD	P value
Latency	Pre ovulatory phase	24.85	1.82	<0.0001
	Post ovulatory phase	23.08	1.57	

Table 1 : shows mean latency and standard deviation values in both pre-ovulatory phase and post-ovulatory phase

H Amplitude

The mean value of APB H-reflex was greater (0.51)during postovulatory phase compared to pre ovulatory phase(0.29).

The difference in H amplitude during both phases of menstrual cycle was statistically significant(p value <0.05).

Variable		Mean	SD	P value
Amplitude (mv)	Pre ovulatory phase	0.29	0.12	<0.000001
	Post ovulatory phase	0.51	0.18	

Table -2: shows mean amplitude and standard deviation values in both pre ovulatory phase and postovulatory phase

Body Temperature during Menstrual Cycle:

The mean value of body temperature during (98.64 ˚F)postovulatory phase was higher compared to preovulatory phase(98.42˚F).

Variable		Mean	SD	P value
Body temperature (˚ F)	Pre ovulatory phase	98.42	0.28	<0.004
	Postovulatory phase	98.64	0.29	

Table 3: shows mean and standard deviation values of body temperature in both pre ovulatory phase and post ovulatory phase.

Discussion:

The result of our study showed that the mean latency of APB H-reflex was significantly shorter (23.08)during postovulatory phase as compared to pre ovulatory phase (24.85).APB H-reflex amplitude was higher (0.51) during postovulatory phase as compared to pre ovulatory phase (0.29).

The body temperature also significantly higher during postovulatory phase compared to preovulatory phase(p value <0.05).

The variation in body temperature could be due to cyclical changes in secretion of female sex hormones in the various phases of menstrual cycle. Increase in temperature during postovulatory phase was probably due to thermogenic effect of progesterone as proved by the following studies:

D. Rekha and N. Krishnamurthy found that H-latency was higher during early follicular phase and H-amplitude was higher during mid luteal phase [1].

Animal study was done by Marrone Bl.et.al, to know the effect of gonadal hormones and body temperature in rats during estrous cycle. He foundthat rise in body temperature was directly related progesterone and inversely proportional to estrogen [7]. Strott JR et.al. did a study in 18-35 years old females and found an increase in body temperature during postovulatory phase [8]. Lee et.al. and Kattapong et.al found a positive correlation between plasma level of progesterone and body temperature during postovulatory phase [9,10].

Temperature is known to have a major influence on nerve conduction velocity. This is because temperature variation in tissues surrounding the nerve alters the opening time of voltage gated calcium channel and also alters the resistance of skin surface thereby affecting NCV and latency.

Lowering of the temperature prolongs the open time of the voltage gated sodium channel, thereby generting a larger and longer action potential with reduction in nerve conduction velocity and increasing the latency [11].

Study done by Tiwari S et.al concluded that the latency ,amplitude and conduction velocity of median motor nerve is not affected by temperature variation in different phase of menstrual cycle of female [12]. This may be due to short segment nerve studied and minimal change in body temperature like 0.5˚ C. But in H-reflex study longer nerve segment is involved and thus H-reflex is likely to be influenced by small change in body temperature during menstrual cycle.

Study done by Dewhurst et.al concluded that cooling increased and warming decreased the

H-latency. This is because cold temperature will decrease the facilitation in reflex output along with a delayed reflex response [13]. Chen et.al measured soleus H-reflex in rat and found out H-reflex amplitude was largest during late morning and smallest around midnight [14].

Conclusion:

In our study, the median value of APB H-reflex latency of dominant hand during postovulatory phase was significantly shorter as compared to preovulatory phase. The APB H-reflex amplitude of dominant hand during the postovulatory phase was significantly greater than obtained during the pre ovulatory phase.

The shorter latency and higher amplitude of APB H-reflex in postovulatory phase observed in our study may be explained by increased nerve conduction velocity in median nerve which would have occurred either due to increase in body temperature or due to thermogenic effect of progesterone during postovulatory phase of menstrual cycle [1].

From this study we conclude that menstrual cycle affects H-reflex. Hence it is suggested that phases of menstrual cycle should be considered while performing and interpreting the H-reflex in female patients in the age group of 20-35 years having normal regular menstrual cycle.

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