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Effect of Phases of Menstrual Cycle on Visual Evoked Potential

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Abstract: ***Objective- Latency and amplitude of P100 of VEP recording is affected by various variables like age, refractive errors, eye dominance, sex hormones etc. so we tried to evaluate the effect of follicular and luteal phase of menstrual cycle on VEP by using LED goggle as stimulation source. Method- We studied 40 healthy female volunteers of age between 17-21yrs with regular menstrual cycle of 28±2 days in both phases. They were called on 10th day after commencement of menstruation for follicular phase recording and 2-3 days prior to expected date of next menstruation. Result- Normative value for latency of P100 for LED goggle recording is 87.3ms. latency of P100 for right eye was 82.515±13.483 ms & 89.260±13.414 ms in follicular and luteal phase respectively and p-Value was 0.0221. Latency of P100 for left eye was 85.553±14.423 ms & 93.675±18.377ms in follicular and luteal phase respectively and statistically significant p-Value of 0.0170. Conclusion- our results suggested that there were significant changes in VEP in during different phases of menstrual cycle thus while recording of VEP in females the phase of menstrual cycle should be kept in mind at the time of interpretation of the result.***

Keywords: VEP, Latency of P100, Amplitude (N75-P100), Follicular & Luteal phase

1. Introduction

Visual evoked potentials (VEPs) provides information regarding the central nervous system (CNS) including the visual excitability and are often used in clinical neurophysiology. Variability in VEP amplitude and latencies are criteria of pathology. The mood or psychometric performance changes in normal females has been reported during menstruation which can affect values of VEP recordings[1]. Ovarian steroids have wide spread effects throughout the central nervous system including sensory information processing in the brain[2]. Hormonal changes that occur in women during menstrual cycle affect the catecholamine metabolism in CNS. It has been proven in studies that estrogen causes a decrease in the visual transmission time by increasing the sensitivity of receptors in the optic pathways to dopamine. Sex steroid estrogen has excitatory effects on both cerebral and the visual cortex[3].EEG gender differences using a visual object recognition task was significant. The differentiation found with VEP components also with variation across the menstrual cycle as well as between genders[4]. It has been reported that technical and physiological factors such as pupil diameter, refractive errors, type of stimulus, age & sex, electrode position and anatomical variations may affect VEP. VEPO is an evoked electrophysiological potential which can be extracted using signal averaging from electroencephalographic activity recorded at the scalp. Increased latency on VEP waves is the hallmark of many visual pathway diseases. Prolongation of VEP latency during the menstrual cycle in the luteal phase probably reflects the effect of progesterone[5]. The VEP is standardized and reproducible test of optic nerve function. The VEP is an important test that is very good at detecting problems with the optic nerve and lesion in anterior part of visual pathway. Normal menstrual cycle lasts for 28±2 days and divided in 4 phases: follicular, ovulatory, luteal and menstrual. The menstrual cycle influences various clinical & neurological conditions such as atopic dermatitis, diabetes, astma, rheumatoid arthritis, pulmonary edema, myasthenia gravis, multiple sclerosis, epilepsy & meningioma etc. and it may be worse during pre menstrual phase which is supposed to be change in sex hormones[6]. During the menstrual cycle changes in neuronal activity and in auditory, olfactory and taste thresholds were found[7].

Aim of present study is evaluate the difference in VEP during follicular and luteal phase of menstrual cycle by using LED goggle.

2. Material and Method

This study was carried out in Department of Physiology (Neurophysiology laboratory) in L.N.Medical College and Research Center, Bhopal. 40healthy females of age 17-22yrs with regular menstrual cycle (28±2 days) were enrolled for the study after approval from Institutional Ethical committee.

Exclusion criteria for selection of the candidates were
Candidates with bilateral dominance.
Irregular menstrual cycle
H/O eye surgery
Color-blindness.
H/O seizures.
Candidates on anti-depressants.
Device used for recording of VEP was EMG Octopus by Clarity Medical Private Limited ISO9001 & ISO13485.

Candidates were called for recording between 10AM to 1PM according to the day of phases like 1st on 10th day from Day 1 of menstruation(follicular Phase) then 2nd time same candidate has been called just 2-3 days prior to expected date of menstruation (luteal Phase).

All subjects were instructed for –

- Washing of hairs to make hairs oil free and not to apply oil or any type of lotion before test.
- To take good sleep and normal meal.
- To remove contact lenses during procedure.

Technical setting for recording of VEP used was-
Channels –

- Active – Mid-Occiput - Oz.
- Reference – Mid Frontal - Fz.
- Ground – On hair line of fore-head - Cz.

Band Pass –

- Low filter = 2Hz.
- High Filter = 200 Hz.

Number of epochs given = 200.
Rate of stimulation was 2Hz.

After fulfilling exclusion criteria and history along with written consent candidate was asked to sit on a comfortable chair facing in opposite direction from the recording monitor. Candidate was well informed about the procedure. Electrodes were placed with the gel over the positions mentioned above as per 10-20 system after cleaning the area before hand.LED goggle has been worn to the candidate and impedance check was done which was maintained below 5KΩ. Stimulation was given to eyes one after another at above mentioned rate and epochs. Recording done and collection of data was done according to the group.

3. Results

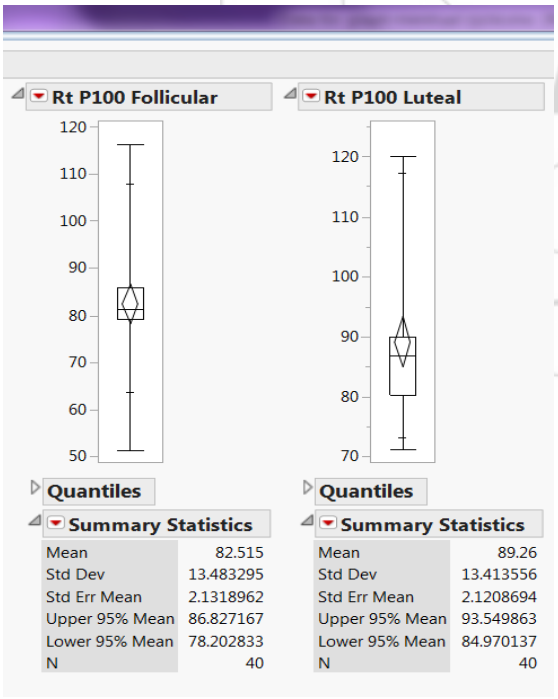
Normative value for P100 for this device is 87.3ms (as given in manual of device).

Table 1: Results of right eye

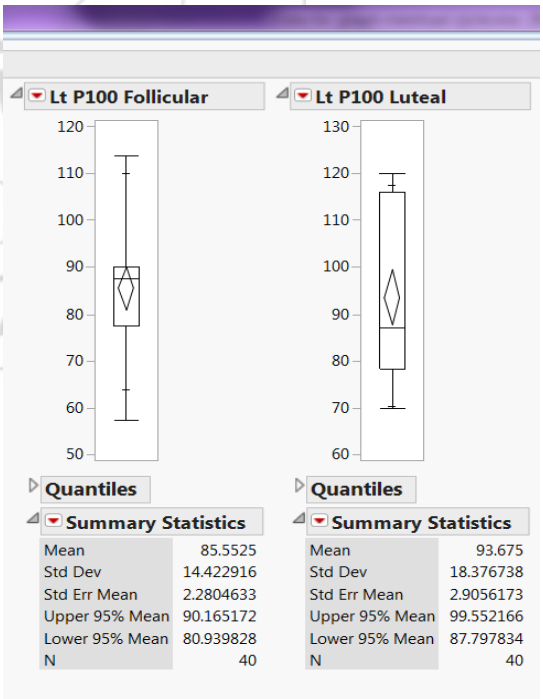
	Follicular phase				Luteal Phase				
	Mean	SD	SEM	N	Mean	SD	SEM	N	p-value
N75 (ms)	62.420	10.326	1.633	40	61.385	10.602	1.676	40	0.6608
P100 (ms)	82.515	13.483	2.132	40	89.260	13.414	2.121	40	0.0221
N75-P100 (µV)	0.875	0.647	0.102	40	0.675	0.430	0.068	40	0.0735

Table 2: Results of left eye

	Follicular phase				Luteal Phase				
	Mean	SD	SEM	N	Mean	SD	SEM	N	p-value
N75 (ms)	60.940	13.197	2.087	40	65.385	13.071	2.067	40	0.1739
P100 (ms)	85.553	14.423	2.280	40	93.675	18.377	2.906	40	0.0170
N75-P100 (µV)	0.540	0.450	0.071	40	0.575	0.315	0.50	40	0.5253



Graph 1



Graph 2

4. Discussion

In present study no statistical significant difference was found in latency of N75 in both eyes in both phases as well

as same for amplitude of N75-P100. But there was significant difference in latencies of P100 waves compared in both eyes in both phases. There was prolongation of latency during luteal phase and showing p-Value of 0.0221 for right eye and 0.0170 for left eye which are statistically significant. Prolongation in latency of P100 is also seen in studies done before by Kaned Y as well as Mohsen Azarmina MD and few more[1,2,3,4,5,6]. Study by few physiologists had shown different results[7,8]. Increased latency of P100 is supporting the view that there is effect of progesterone on neuronal conductivity. Increase in conduction due to effect of estrogen is due to directly and / or indirectly through L-type voltage dependent Ca^{++} channels, acetylcholine and monoamines and to be inhibited due to progesterone through Y-aminobutyric acid or glutamate[9,10] . Further study can be done by taking female of different age groups as there is changes in sex hormones according to the age especially peri-menopausal age.

5. Conclusion

With the result of present study and comparing with previous study it is been concluded that phases of menstrual cycle can affect the result of VEP thus at the time of recording menstrual history should be taken properly and patient is in which phase is to be confirmed. Along with this a normative values, for the device used in the institution should be generated with normal healthy subjects of all age groups so possibilities of false reporting can be cut short.

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