

VISUAL EVOKED POTENTIAL RESPONSES IN PREGNANT WOMEN

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Abstract: Sensory functions and their electrophysiological correlates have not been adequately documented during pregnancy. The present study reports visual evoked potential responses to pattern reversal (VEP-P) in ten third trimester pregnant women and changes in latency of NPN complex when compared with these responses in the non pregnant state. Visual evoked potentials were recorded from O1-A1 and O₂-A2 scalp areas, using Ag/AgCl disc electrodes to transient pattern of black and white checkerboard with 32' size and reversal rate 1Hz. Two trials of VEP-P responses to 256 transient pattern stimuli given to each eye, were analysed and averaged by the computer of visual evoked potential recorder (MEB 5200 Nihon Kohden Japan). The latencies of various positive and negative waves, alongwith P1 amplitude, obtained in pregnant women, were compared with those obtained in ten non-pregnant women. The latencies of initial NPN complex (N₁P₁ & N₂) were significantly reduced in pregnant women, indicating that pregnancy facilitates conduction process in the optic pathways.

Key words: visual evoked potential pregnancy transient pattern reversal latency

INTRODUCTION

There are normal variations in systemic physiology during pregnancy. The symptoms of nausea, vomiting and dietary cravings and aversions during normal pregnancy have been attributed to CNS changes (1). Reports regarding sensory changes are lacking. Recently the authors had reported increased threshold of hearing and delayed conduction in brainstem auditory pathways during normal pregnancy (2). Some studies have also suggested changes in the hearing and visual sensitivities during menstrual cycle, with the threshold being reduced during menstruation (3-4). There is no correlation of hormonal cycle changes with headaches occurring before or during menstruation (5-6). However, some studies have shown postponement of headache by artificially maintaining plasma estradiol levels (7). These studies indicate involvement of sex steroids in sensory perceptions, and sex steroids are known to interact with neurotransmitters in sensory pathways (8). As pregnancy provides an altered hormonal environment, the present study

was conducted to observe electrophysiological correlates of excitation and conduction processes in optic pathways in the pregnant state.

METHODS

Twenty young women with mean age of 22.6±3.7 yrs, formed subjects for this study, divided into two groups of ten each. First group consisted of pregnant women in their third trimester (gestation between 30-40 wks), while the second group consisted of non-pregnant women having regular menstrual cycles. The pregnant women having normal and uneventful pregnancy and without previous history of any abnormality, belonged to the nursing staff of the UCMS & GTB Hospital. All the subjects were given a thorough eye examination and refraction, corrected to 6/6.

Transient pattern visual potentials (VEP-P) were recorded using Neuropack II Plus (Nihon Kohden Japan) Evoked potential recorder with O1-A1 and O2-A2 montages (10-20 system) for left and right eye

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respectively. The subjects were previously briefed about the procedure. They were seated comfortably in an airconditioned and sound proof dark room and instructed to fixate their one eye (other being closed with a patch) on the central spot of the TV monitor, kept at one metre distance. The black and white checks (15×15 mm size) subtending an angle of 32 minutes of an arc, were generated on the monitor through electronic generator of the Evokedpotential recorder. The checks were made to reverse at a rate of 1 Hz. The evoked responses from O1-A1 and O2-A2 areas were recorded and averaged after giving a trial of 256 checker board stimuli. Two such trial for each eye were given and responses superimposed to demonstrate replicability. Other details regarding recording procedures were similar to those reported earlier (9). The VEP-P complexes were analysed in terms of absolute peak latencies and P1 amplitude. In the non-pregnant group, an average of three VEP-P readings were taken during menstrual, premenstrual and mid-cycle periods. The results obtained in both groups were compared using student 't' test.

RESULTS

The absolute peak latencies of various VEP-P waves i.e. N1, P1, N2, P2, N3 and P3, alongwith amplitude of P1, obtained from both the groups are given in Table I. As these values were similar for right and left eye, an average of these was taken for each subject. Similarly, in the non-pregnant group, as the values of peak latencies did not differ significantly during menstrual, premenstrual and mid cycle periods, an average of these three, was calculated. Figure 1 shows the typical VEP-P complex and wave form of a representative case. The two responses of 256 trials each have been superimposed to demonstrate replicability.

TABLE I : Showing values of peak latencies of VEP-P (Mean±SD in msec) and amplitude of P1 in pregnant women.

Group	Age	N1	P1	N2	P2	N3	P3	P1 Amp (µv)
Pregnant	24.2±2.9	68.5±5.0	95.7±6.4	127.2±8.8	165.0±19.5	219.2±27.1	253.8±27.8	3.7±1.6
Non pregnant	21.3±4.5	**73.2±6.2	104.5±*2.10	143.5±*21.0	180.8±27.3	224.6±30.7	264.3±26.6	4.1±2.2

*P < 05 **P < .01

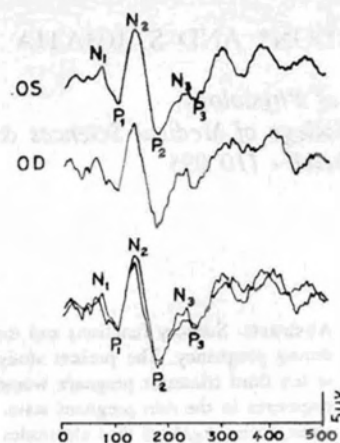


Fig. 1 : Showing representative traces of VEP-P responses for left (OS) and right (OD) eye upper and middle traces respectively. A typical record shows initial NPN complex i.e. N1-P1-N2 waves, latencies of which are clinically important, followed by later P2, N3, P3 waves, about which very little is known.

Lower panel shows replication of responses on presentation of two trials of 256 checker board pattern reversal stimuli in an eye.

DISCUSSION

The present study is well controlled with regard to various physiological variables influencing VEP-P. The values of latencies of various waves including P1 amplitude in the two groups are comparable with those reported by other workers in similar age groups of female subjects (10-12). In pregnant group of present study, peak latencies of wave N1, P1 and N2 (Initial NPN Complex) were significantly lower as compared with these parameters in the control group. However, the latencies of later waves (P2, N3, P3) and P1 amplitude in both the groups are similar. This implies

that neural excitation and conduction processes are better in optic nerve and pathways during pregnancy. It is not known whether the changed neuro-humoral or hormonal milieu of pregnancy influences sensory mechanisms. Even the subject of variations in sensory threshold of various stimuli, during different periods of menstrual cycle is controversial (3-5, 13). The present study did not show any significant changes in the latencies of VEP-P waves during the different phases of the menstrual cycle suggesting that VEP-P does not change during menstrual cycle. The authors have previously reported significant increase in inter-peak latency (I-V) in brainstem auditory evoked potentials (BAEPs) during normal pregnancy (2), supporting the view that the raised level of sex steroids and other pregnancy hormones, had a slowing effect on auditory conduction. In the present study, the effect of pregnancy on latency of NPN complex is just the reverse i.e. there is significant reduction in latency values. These observations indicate that hormonal milieu of pregnancy sensitises the process of neural conduction in visual pathways. The exact mechanism of this differential effect of pregnancy on VEP-P and BAEPs is not known. The optic nerve and pathways are outgrowths of the brain (prolongation of

brain substance) whereas auditory nerve and pathways are extra-cerebral in origin. There is also difference in their mode of growth and myelination (14). Further, there may be differences in the neurotransmitters or neuromodulators concerned with the functional integrity of visual and auditory pathways. The neurotransmitter involved in auditory pathway is acetylcholine (16), synthesis of which is affected by raised levels of sex steroids (8). This could explain changes in BAEPs during pregnancy. Besides cholinergic, dopaminergic and serotonergic neurotransmission, there is a whole gamut of synaptic mediators i.e. various peptides including endorphins in the retina and visual pathways. It is difficult to say how sensitivities of these change during pregnancy. Present observations only suggest that the 'Generators' for NPN complex of VEP in pregnancy are somehow facilitated so that latency of waves N1, P1, N2 are on the lower side of normal. The present study, demonstrating that normal pregnancy, causing improvement in sensitivity of neural mechanisms generating N1-P1-N2, is one of the physiological factors, like age, sex, body temperature (17) influencing normal variations in latencies of visual evoked potential responses.

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