



A STUDY ON UTILIZATION OF VISUALLY EVOKED POTENTIAL IN IDIOPATHIC INTRACRANIAL HYPERTENSION

Neurology

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ABSTRACT

Introduction: Idiopathic Intracranial Hypertension (IIH) can be defined as raised intracranial pressure with a normal cerebrospinal fluid. VEP is one of the electrophysiological test which helps in evaluating the visual system and useful in patients with IIH. **Aim:** To demonstrate the utilization of Visually Evoked Potential (VEP) in patients with Idiopathic Intracranial Hypertension (IIH). **Materials and Methods:** This is a prospective cross sectional study done from January 2021 to June 2022. This study included 19 patients detected recently with IIH and 19 healthy volunteers. The demographic data clinical presentation data collected and ophthalmological evaluation done in both groups. Comparison of the VEP values of IIH patient done with VEP values of controls and their association with demographic data and clinical findings done. **Results:** The mean age of the patients is 28.15 ± 4.7 years. Of the 19 patients, 2 were males (10.52%) and 17 (89.73%) were females. There was statistically significant association between patients with normal and pathological VEP in terms of obesity ($p = 0.0449$ (<0.05)) and visual field abnormalities ($p = 0.0379$ (<0.05)). The P100 latency showed a statistically significant difference between IIH patients and controls in terms of right eye ($p < 0.001$) and left eye ($p < 0.001$). **Conclusion:** The values of P 100 latencies are prolonged in IIH patients as compared to the control group also there was a statistically significant association between the visual field abnormalities and obesity in IIH patients. VEP can be used as a screening tool in patients with IIH.

KEYWORDS

Idiopathic Intracranial Hypertension, Visually Evoked Potential, P 100 latency.

INTRODUCTION

Idiopathic Intracranial Hypertension (IIH) is a syndrome characterized by raised intracranial pressure with no clinical, laboratory or radiological evidence of an intracranial space occupying lesion.^{1,2} The incidence of IIH is 2.4 per 1 lakh general population and increased to 22 per lakhs in obese woman.^{3,4} Female gender and high Body Mass Index (BMI) were considered risk factors.^{3,6} The clinical features may be variable. Visual field is affected commonly and can be used to monitor the further disease course, but not very sensitive and specific.⁷ Papilledema with long standing disease increases the pressure on optic nerve and can lead to irreversible optic neuropathy with defects in visual field, color vision loss and visual acuity which is the most dreaded complication.^{8,9} Fundoscopic examination is the first line investigation followed by perimetry for visual field evaluation.¹⁰ Visually Evoked Potential (VEP) is a non-invasive and sensitive electrophysiological test which helps in evaluating the visual system from retina to occipital cortex. It is most sensitive for diagnosing diseases of anterior visual pathway.¹¹ Patterned VEP gives the response of cortical cells against patterned stimuli. It is far more important to identify the optic nerve damage and visual loss. This study aimed at demonstrating the utilization of VEP in patients with Idiopathic Intracranial Hypertension.

METHODS

This is a prospective cross sectional study done from January 2021 to June 2022 held in the Department of Neuromedicine in Government Thoothukudi Medical College, Thoothukudi. Written informed consent has been obtained by all the participants who were included in the study.

Inclusion Criteria

Patients diagnosed with IIH were included in this study. IIH was diagnosed according to Dandy criteria.

Exclusion Criteria

Patient's age <18 years of age, patients with other ocular disease like uveitis and glaucoma, pregnant women and breast feeding mothers.

25 patients admitted in our neurology ward with provisional diagnosis of IIH were evaluated and final diagnosis of IIH was made in 19 patients. All 19 included patients were taken detailed medical history which includes age, gender, weight, height, BMI, intake of contraceptive pills and hypothyroidism. Neurological history and thorough examination done. All patients undergone ophthalmological evaluation- visual acuity using Snellen's chart and Humphrey's visual field test by automated perimetry. Brain Imaging- MRI and MR venogram was done in all patients. Lumbar puncture was done to measure CSF opening pressure. According to BMI, patients were divided into 2 groups. BMI values more than 30 were considered obese and less than 30 were considered non obese. VEP recording done after preparing the patient, active electrode was placed on occipital bone 2

cm above the external occipital protuberance and the reference electrode was placed in front of the frontal hairline and the earth electrode on the ear lobe. The parameters evaluated in Pattern VEP were the P100 latency (ms) and P100 amplitude (μV). At 5 minutes interval, at least 100 stimulations were given to each eye twice and recorded at a rate of 2 Hz. The pattern size was made as 0.3° and contrast was 99% of the Michelson constant. The patient was continuously monitored for fixation, pupil diameter, age, refractive errors and movements that might affect the result and also if the rate of blink of peripheral artifacts reached a level above 5%, recording were repeated. The results are interpreted as if P100 latencies >116 ms or with distorted VEP waveforms, inter peak latency differences of more than 6 ms, amplitude less than $4 \mu V$ and amplitude difference more than 50% between the two eyes. The VEP latencies and amplitudes of patients were compared with healthy controls. The categorical variables were mentioned in numbers and percentages and data was analyzed to signify their effects on VEP. The statistical analyses were performed by SPSS version 23.

RESULTS

Demographic and clinical presentation of patients are presented in Table-1. The mean age of the patients is 28.15 ± 4.7 years. There were 2 males (10.52%) and 17 (89.73%) females in patient group and 4 (21.05%) males and 15 (78.9%) females in healthy volunteer group. Obesity was observed in 12 patients (63.15%) and 6 (31.57%) persons in control group. Decrease in visual acuity confirmed by Snellen's chart was noted in 13 patients (68.42%) and 2 (10.52%) of control group. Visual field defects are detected in 14 patients (73.68%) and 4 (21.05%) in control group. The mean CSF opening pressure was found to be 28.71 ± 4.38 .

Table 1- shows the demographic and clinical features of patients with IIH

Age	
Male	30.5 $\pm$ 2.5
Female	27.82 $\pm$ 4.85
Sex	
Male	2 (10.52%)
Female	17 (89.73%)
Obesity	
Yes	12 (63.15%)
No	7(36.84%)
Visual acuity	
Normal	13 (68.42%)
Abnormal	6 (31.57%)
Visual field	
Normal	5 (26.31%)
Pathological	14 (73.68%)

Papilledema	
Yes	16 (84.21%)
No	3 (15.78%)
CSF opening pressure cm H ₂ O	28.71±4.38
Presenting Symptom	
Headache	19 (100%)
Temporary Blurring of vision	12(63.15)
Diplopia	6 (31.57%)
Painful eye	4 (21.05%)
Vertigo	3 (15.78%)
Tinnitus	2 (10.52%)
Time duration from symptoms onset and diagnosis (months)	5.07±3.93

Headache was presenting complaint of all the patients presented. Followed by others symptoms like transient visual loss, diplopia and painful eyes. Mean time duration from symptoms onset and diagnosis is 5.07±3.93 months. The mean age of control group was 35.21±5.46 years. Of the healthy controls, 4 (42%) were males and 15 (57%) were females. Between the patients and control group, age and gender was not statistically significant. The VEP values evaluated showed normal values in 7 (36.8%) patients and abnormal values in 12 (63.15%) patients. Table 2- shows the comparison between VEP values of patients and healthy controls.

Comparison of P100 latencies result in IIH patients and healthy controls in both eyes showed statistically significant results and on the other hand amplitude results were not significant.

Table 2- shows the comparison between VEP values of patients and healthy controls

Variables	VEP results of IIH patients (n=19)	VEP results of healthy controls (n=19)	P value
P 100 latency- Right (ms)	116.42±7.0	98.05±3.4	P<0.001
P 100 latency- Left (ms)	116.32±7.5	97.10±3.7	P<0.001
Amplitude- Right (μV)	10.18±4.24	10.03±4.62	P=0.863
Amplitude- Left (μV)	9.81±4.03	9.75±3.476	P=0.769

Table 3. shows the association between abnormal VEP with gender, obesity, visual acuity and visual field results in patients. The gender results noted in patients with normal and pathological VEP was not statistically significant. The visual acuity findings in patients with normal and abnormal VEP were also not statistically significant. The comparison of obesity in patients with normal and pathological VEP was statistically significant (P 0.0449 (<0.05)). The visual field abnormality between patient with normal and pathological VEP is statistically significant (P value-0.0379 (<0.05)).

Table-3- The association between abnormal VEP with gender, obesity, visual acuity and visual field in patients.

Variables	Abnormal VEP	Normal VEP	P-value
Sex			0.128
Male	0	2	
Female	12	5	
Obesity			0.0449 (P< 0.05)
Yes	10	2	
No	2	5	
Visual acuity			0.3331
Normal	7	6	
Decreased	5	1	
Visual field			0.0379 (P< 0.05)
Normal	1	4	
Abnormal	11	3	

DISCUSSION

The pathogenesis of elevated intracranial pressure in IIH patients include several mechanisms like increased resistance to flow of CSF across arachnoid villi or impaired CSF absorption resulting in increased cerebral blood volume or elevated cerebral venous pressure.¹² Visual system is involved most commonly and transient visual obscurations are the earliest symptom and prolonged elevated pressures can lead to significant visual loss. The mean age of patients included in our study was 28.15 +/- 4.79 years. It correlates with

literature which showed mean age of onset in range from 25-37 years.¹³ Male: Female ratio in our study is 2:17. In other studies, it reported as variable and ranges from 1-10:1.^{5,13} The findings noted in our study are compatible with data in the available literature. World wide data suggests that there is a strong relationship between IIH and obesity and prevalence ranges from 70.5-94%.¹⁴ In our study, the occurrence of obesity is 63.15%. In obese patients, the adipose tissue present in excess amount will release hormones like ghrelin and leptin which in turn produces more estrogen. The increased estrogen can be a contributing factor for development of IIH. Central obesity causes increased intra-abdominal pressure which in turn produces elevated intracardiac and intrapleural pressure and in turn result in increased intracranial pressure.¹⁵ Headache is found to be the most common symptom and reported in 98% of IIH patients in other studies. 55-70% of patients have temporary visual loss.¹³ It is followed by other symptoms like double vision, painful eye, photops, vertigo and tinnitus. In our study group patients had headache, blurring of vision, painful eye, diplopia, vertigo and tinnitus and it is consistent with literature. Papilledema was present in 84.21%. The frequency of abnormal visual acuity in Snellen's chart testing in IIH patient range from 29-35%.¹⁵ Visual acuity is abnormal in 31.57% of patients in our patient group. Pathological visual fields were reported in 80% of patients.¹⁵ In our study group pathological visual fields noted in 73.68% of patients. Takkar et al¹⁶ showed no statistical significance between VEP latencies and visual acuity and visual field findings. In our study, significance noted between visual field and pathological VEP in patients. This shows the importance of visual field testing in patients with IIH and can be used as a marker of severity, clinical course and for the prognosis of the disease. Verplank et al¹⁸ study conducted with less number of patients showed P 100 latency prolongation in only 17% of patients. Sorensen et al¹⁹ reported abnormal VEP findings in 28-31% of patients. Kesler et al¹⁵ showed abnormal measures in 55% of patient with chronic IIH. Hamamci-Tombul et al²⁰ study showed P100 latency values were abnormal in 56% patients and normal in 44% patients. In our study the result showed pathological VEP in 63% patients and normal VEP in 36% patients, which is consistent with results in literature. The difference in the VEP abnormalities can be attributed to the disease duration and techniques of VEP. In our study, VEP P100 latency was not correlated with age, sex, symptoms and visual acuity but significantly correlated with obesity and abnormal visual fields. This signifies the importance of VEP in patients with IIH.

CONCLUSION

In concluding, the values of P 100 latencies are prolonged in IIH patients as compared to the control group also there was a statistically significant association between the visual field abnormalities and obesity in IIH patients. VEP can be used as a screening tool in IIH patients.

Limitations:

The limitation of this study- Small sample size, cross sectional study

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