fortune Journals

Research Article

JOURNAL OF OPHTHALMOLOGY AND RESEARCH

ISSN: 2644-0024

Flash Visual Evoked Potential Recording in Patients with Brain Stroke

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Abstract

Aim: Stroke, also known as a brain attack, occurs when blood supply to part of the brain is blocked or when a blood vessel in the brain bursts, resulting in damage or death of brain tissue. The visual system, particularly visual pathway may be affected during this episode. The aims is to investigate the visual pathway of stroke patients using flash visual evoked potential.

Material and Methods: Thirteen patients with a brain attack (6 male and 7 female) in the age range of 55 to 70, who were referred to Basir clinic for visual evoked potential recordings, were included in this study. Flash visual evoked potential were used due to the impaired visual acuity in stroke patients. The results were compared with those of a healthy group consisting of 13 individuals matched in terms of age and sex. Statistical analysis was performed using SPSS version 22.

Results: There were not significant differences between the case and control groups in terms of demographical findings such as age and sex. However, there was a significant difference in the best-corrected visual acuity (BCVA) between the two groups ($p < 0.05$). The mean latency of the visual evoked potential (VEP) P100 wave was significantly different between the patient and the healthy group (116.26 ± 5.45 and 104.3 ± 3.28, respectively). Additionally, the amplitude of the VEP P100 peak differed significantly between the case and control groups (1.8 ± 0.49 and 5.07 ± 1.89, respectively).

Conclusion: Stroke can cause damage to the visual pathway, which can be assessed using VEP parameters, specifically the P100 peak.

Keywords: Stroke; Visual pathway; Visual evoked potential.

Introuduction

Brain Stroke is a catastrophic event that can damage various organs of the body, including the visual system. Electrophysiology of vision is a diagnostic technique used to assess different pathological conditions of the visual system, primarily the visual pathway and retina. Electroretinography (ERG), Electrooculography (EOG), and visual evoked potential (VEP) are commonly employed electrophysiological techniques in this field. Abdolalizadeh et al. (2022) conducted a study to investigate the potential effects of antiseizure medication on patients using ERG. The study included twenty participants, consisting of ten males and ten females, ranging in age from 15 to 30 years. The findings revealed retinal changes in these patients, which were diagnosed by measuring the amplitude of ERG, specifically b-wave peak [1]. The same research group also examined the retinal pigment epithelium (RPE) of patients undergoing treatment with anti-epileptic medication using EOG. They utilized the same group of patients and observed pathological changes

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Citation: Seyedehsaba Ameli, Ali Panahi sharif, Sanaz saleh, seyed Mohammad Masoud Shushtarian, Ahmad Shojaei. Flash Visual Evoked Potential Recording in Patients with Brain Stroke. Journal of Ophthalmology and Research. 6 (2023): 40-44.

Received: June 26, 2023
Accepted: July 03, 2023
Published: July 12, 2023

Ameli S., J Opthalmol Res 2023
DOI:10.26502/fjor.2644-00240082

in the RPE, which were identified by assessing the Arden index (AI) of EOG test [2]. Shushtarian et al. (2017) designed a study to investigate the potential effects of vibration on the visual pathway using VEP. They selected 50 workers from a textile factory segment where machinery creating high levels of vibration. The study concluded that occupational vibration had adverse effects on the visual pathway, leading to increased latency of VEP, specifically the P100 peak [3]. Numerous references have been published on this topic [4-37]. In the present work, we utilized flash type VEP to screen the visual pathway of patients who had suffered a brain stroke. Flash type stimulation was chosen due to the reduced visual acuity in most patient, making it difficult for them to discern the fixation point required for recording pattern-type stimulation. Although VEP is a suitable technique for screening the visual pathway in stroke patients [38-40], there exist conflicting findings that will be discussed in the later sections of this manuscript.

Patients and Methods

In this case control study, thirteen patients with brain attack (6 male and 7 female), regardless of the type of stroke, were referred to Basir Eye Clinic for VEP examination to assess possible visual dysfunction. The age range of the patients was 55 to 70 years. Visual acuity was tested and ranged from 1/10 to 4/10 (BCVA). Visual evoked potential (VEP) with flash stimulation method was performed to evaluate the visual pathway of the patients. The latency (msec) and amplitude (µv) of of the P100 peak in VEP were measured for all patients using the Mangoni machine. To connect the machine to the patients three electrodes were used: one attached to the occipital region as the active electrode, one to the vertex as the reference electrode, and one to the forehead as the ground electrode.The same procedure was repeated for 13 healthy individual, matched in terms of age and sex, serving as the control group for comparison with the patient group. These individuals were selected based on their intact visual system, particularly the visual pathway.The obtained results from the two groups were compared to identify any differences between them.

Results

There was no statistically significant between the two groups regarding age (P value = 0.88*) and sex (0*), whereas a significant difference was observed in BCVA (P < 0.001).

Table 2 presents the measurement for latency and amplitude of VEP P100 peaks in the control and case groups. There was statistically significant difference in the latency and amplitude of VEP P100 peaks between the healthy and patient groups (P100 < 0.0.1 for both groups).

Table1: Demographical findings in case and control groups.

Variable	Number of participants	groups (Mean ± SD)		P value
		Control	Case	
Age	13	68.15 ± 6.87	68.53 ± 6.83	0.888*
Visual Acuity (LogMar)	13	0.062 ± 0.041	0.605 ± 0.22	0*
Sex	Male	6 (38.46%)	6 (38.46%)	1**
	Female	7 (61.53%)	7 (61.53%)	
* Based on Mann-Whitney U Test				
** Based on Chi-Square Tests				

Table 2: Measurement of the mean latency and amplitude of the P100 peak in visual evoked potentials (VEP) was conducted in both case and control groups.

Variable	Number of participants	groups (Mean ± SD)		P value*
		Control	Case	
Latency (msec)	13	104.3 ±3.28	116.26 ±5.45	0
Amplitude (µv)	13	5.07 ±1.89	1.8 ±0.49	0
* Based on Mann-Whitney U Test				

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Discussion

Stroke is a heterogenous syndrome and a leading cause of death and disability worldwide.

The visual system, particularly the visual pathway, may be affected during a stroke episode. VEP is a technique used to assess visual pathway disturbances, and it was employed in this study to investigate potential changes in the visual pathway.The findings demonstrated prolonged latency and reduced amplitude of the VEP P100 peak, providing evidence of visual pathway disturbances in these patients. The following references may supports the findings of the present study: Pojda- Wilczek D et al. (2015) conducted a relevant study where they evaluated VEP using flash-type stimulation in various patient with brain circulatory problems, including those with hemianpsia, quadratanpsia and hemiparesis after a stroke. Their result indicated an increase in latency and a decrease in amplitude of the VEP P100 peak in the patients [41]. Gaffat Al-Nasriwy SZ (2018) investigated the utility of VEP in stroke patients with a focus on sensitivity and specificity. The results demonstrated a sensitivity of 25.9% and a specificity of 100% (P value < 0.01, highly significant). Among all patients, 26% exhibited abnormal VEP P100 peak being the most common abnormality [42]. In addition to the above two references, there is a study suggesting that stroke does not produces changes in VEP test [41]. It is worth noting that the authors of that study employed pattern stimulation, whereas the present study used flash-type stimulation.

Conclusion

Stroke can affect the visual pathway of patients, as evidenced by alterations in the latency and amplitude of the VEP P100 peak during flash VEP testing.

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