fortune Journals

Research Article

JOURNAL OF OPHTHALMOLOGY AND RESEARCH

ISSN: 2644-0024

Retinal Screening of Patients Treated with Antiseizure Medications Using Electroretinography

Sanaz Abdolalizadeh[1*], Mina Ghasemi[2], Parastoo Mohammadzadeh[1], Seyed Mohammad Masoud Shushtarian[3], Ahmad Shojaei[4]

Abstract

Aim: This paper uses electroretinography to identify the probable side effects of antiseizure medications on the retina. A seizure is a severe involuntary shrinkage state of the skeletal muscle and occurs spasmodically. There are certain antiseizure medications, such as carbamazepine and valproic acid. These medications may affect the retinal layers of the visual system.

Methods: Twenty patients (ten males and ten females) in the age range of 15–30 years participated in this study. The patients received treatment with antiseizure medications. Full-field electroretinography was recorded in the population. The electroretinography pattern of the patient group was compared with that of the control group with healthy retina.

Results: There was no statistical difference regarding demographics, i.e., sex and age. This is while the difference in the case of the best corrected visual acuity (BCVA) was significant ($P < 0.001$). There was also a significant decrease in the amplitude of the ERG **b**-wave peak between the case and control groups ($P < 0.001$). However, the difference in terms of the ERG latency of the b-wave peak was not significant.

Conclusions: Antiseizure drugs may affect certain retinal layers. This effect can be diagnosed by the amplitude of ERG, **b**-wave peak.

Keywords: seizure; antiseizure medications; electroretinography.

Introuduction

A seizure is a burst of uncontrolled electrical activity between brain cells that causes temporary abnormalities in muscle tone or behaviors, sensations, or status of awareness. Antiseizure medications are usually used to control seizures in patients. These medications are known to have some side effects, specifically on the visual system.

Electrophysiological tests of the visual system – electrooculogram (EOG), electroretinogram (ERG), and visual evoked potential (VEP) – are valuable tools for studying the different pathological conditions of the visual system. Sanaie S. et al. (2014) adopted the EOG technique to study the effect of toxoplasmosis on the visual system, particularly the retina of toxoplasmosis patients. They reported a significant difference between the Arden Index (AI) of the case and control groups, indicating pathological changes in the retina, especially the retinal pigment epithelium [1].

Sarzaeim F. et al. [2] investigated the effect of hand-arm vibration on the retina of road drilling machinery operators. They found that the hand-arm vibration produced by road drilling machinery could affect the operators' retinas. The range of this effect can be measured by ERG. In another work by the same authors, flash VEP was measured in ten patients with head trauma. Some VEP pathological changes were found, indicating visual pathway

Affiliation:

[1]Department of Ophthalmology, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

[2]Department of Neurology, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

[3]Department of Biophysics and Biochemistry, Faculty of Advance Science and Technology, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran.

[4]Basir Eye Health Research Center, Iran University of Medical Sciences, Tehran, Iran.

Corresponding author:
Seyed Mohammad Masoud Shushtarian , Department of Biophysics and Biochemistry, Faculty of Advance Science and Technology, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran.

Citation: Sanaz Abdolalizadeh, Mina Ghasemi, Parastoo Mohammadzadeh, Seyed Mohammad Masoud Shushtarian, Ahmad Shojaei. Retinal Screening of Patients Treated with Antiseizure Medications Using Electroretinography. Journal of Ophthalmology and Research 5 (2022): 165-167.

Received: November 04, 2022
Accepted: November 11, 2022
Published: December 14, 2022

Abdolalizadeh S et al., J Opthalmol Res 2022
DOI:10.26502/fjor.2644-00240074

disturbances produced by head trauma, which could be diagnosed by VEP [3]. There is sufficient research evidence that proves the usefulness of these techniques [4–12].

Electroophthalmological techniques can also be used to study the side effects of different medications on the visual system. Extensive research on the probable toxic effect of amiodarone on various parts of the visual system i.e., the retina and visual pathway, corroborated the effect of consuming amiodarone. The range of this effect can be diagnosed by ERG & VEP [13, 14]. Allahdady F. et al. (2016) studied the toxic effect of hydroxychloroquine on the retina of arthritis rheumatoid patients using the EOG test. They concluded that EOG is a suitable technique to evaluate retinal damage caused by hydroxychloroquine [15].

Antiseizure medications, such as carbamazepine, and valproic acid, can also affect the visual system. Sarzaeim F. et al. (2022) investigated the toxic effect of antiseizure medication on the visual pathway in 20 patients. They concluded that the patients under antiseizure treatment may experience visual pathway disturbances which can be diagnosed by the VEP test [16]. Based on the above findings, a research work was planned to look for probable effect of Antiseizure drugs on retina.

Patients and Methods

Here, 20 patients (40 eyes) suffering from seizures were assigned to the case group. The patients were between 15 and 30 years of age. The case group received either monotherapy or polypharmacy for a period of more than one year to control the disease. The patients were evaluated for visual acuity and brain magnetic resonance imaging (MRI). The case group had visual acuity (BCVA) ranging from 7 / 10 to 10 / 10 and normal MRI. In the patient group, Ganzfeld electroretinography was studied. The amplitude (µv) and latency (msec) of the ERG b-wave were measured in the patient group using a Mangoni device. A total of three electrodes were used to connect the device to the patients. The active, reference, and ground electrodes were placed on the sclera, ear pinna, and forehead of patients. The same procedure was repeated for 20 subjects of the same age and sex and healthy (retina) in the control group. The results obtained in the two groups were compared to extract probable differences between them.

Results

Table 1 shows the demographic results in the case and control groups. There is no statistically significant difference between the two groups in age (P = 0.84) and sex, whereas the difference in BCVA is significant (P < 0001).

Table 2 shows the measurements of the mean amplitude and latency of the ERG **b**-wave in the case and control groups. The difference in amplitude of ERG and the **b**-wave peak is significant between the case and control groups (P<0.001), whereas the difference in latency is insignificant.

Table 1: The demographic findings in the case and control groups

Variable		Groups (Mean ± SD)		P value*
		Control	Case	
Age		20.40 ± 4.78	19.9 ± 4.38	0.84*
Sex	Male	10 (50%)	10 (50%)	1**
	Female	10 (50%)	10 (50%)	
Visual Acuity (LogMar)		0 ± 0	0.031 ± 0.036	0.000*
* Based on Mann-Whitney U Test				
* Based on Chi-squared				

Table 2: The measurement of mean amplitude and latency of ERG, b wave peak.

Variable	Groups (Mean ± SD)		P value*
	Control	Case	
Latency (msec)	43.75 ±1.51	43.9 ±1.49	0.65
Amplitude (µv)	111.82 ±8.83	98.75 ±10.38	0
* Based on Mann-Whitney U Test			

Discussion

Full-field electroretinography was tested in patients taking antiseizure medications for epilepsy treatment. It was found that ERG **b**-wave amplitude was reduced in the patient group compared with the healthy group.

The ERG **b**-wave amplitude originates from bipolar and muller cells of the retina [17]. Therefore, these two layers of the retina are affected in seizure patients consuming antiseizure medications. Our results are consistent with the findings of the following sources:

Shushtarian SM et al. [18] worked on the probable toxic effect of sodium valproate (SV) on the human retina using ERG. For this purpose, 25 patients who had consuming SV for more than three years were selected. The flash ERG was measured in patients. They reported decreased amplitude of the ERG **b**-wave, indicating pathological changes in the human retina due to SV treatment.

Moreno MC et al 2005 studied visual alterations in a group of Argentine patients treated with the antiepileptic drug vigabatrin. They used a scotopic electroretinogram and observed that **a**-wave and **b**-wave amplitudes of the scotopic electroretinogram were significantly reduced in most of the patients receiving vigabatrin [19].

Barret D and his research team reported a case under the antiepileptic drug treatment vigabatrin. They commented on ERG **b**-wave changes in the patient before imaging and visual field deterioration [20].

Conclusions

Antiseizure medications affect the retinal layers. They

Citation: Sanaz Abdolalizadeh, Mina Ghasemi, Parastoo Mohammadzadeh, Seyed Mohammad Masoud Shushtarian, Ahmad Shojaei. Retinal Screening of Patients Treated with Antiseizure Medications Using Electroretinography. Journal of Ophthalmology and Research 5 (2022): 165-167.

Abdolalizadeh S et al., J Opthalmol Res 2022
DOI:10.26502/fjor.2644-00240074

mainly affect the bipolar and muller cells which can be detected by reducing the **b**-wave amplitude of the ERG.

References

1. Sanaie S, Nematian J, & Shoushtarian SMM. Study of electrooculogram (EOG) abnormalities in patient with ocular toxoplasmosis. Medical Science Journal of Islamic Azad Univesity-Tehran Medical Branch 24(1) (2014): 33-36.
2. Sarzaeim F, Ojani F, Hojati TS, et al. Effect of Hand-Arm Vibration on Retina of Road Drilling Machine Laborers Measured by Electroretinography. Journal of Ophthalmology and Research 5(2) (2022): 81-85.
3. Sarzaeim F, Hashemzehi M, Shushtarian SMM, et al. Flash Visual Evoked Potential as a Suitable Technique to Evaluate the Extent of Injury to Visual Pathway Following Head Trauma. Journal of Ophthalmology and Research 5(2022): 20-3.
4. Shushtarian SM, Kalantari AS, Tajik F, et al. Effect of occupational vibration on visual pathway measured by visual evoked potentials. Journal of Ophthalmic and Optometric Sciences 1(5) (2017): 7-11.
5. Keramti S, Ojani F, Shushtarian SMM, et al. Early Diagnosis of Pathological Changes in Visual System of Prolactinoma Patients Using Visual Evoked Potential. Journal of Ophthalmology and Research 4(3)(2021): 289-93.
6. Ojani F, Shushtarian SMM, Shojaei A, et al. Visual Evoked Potential Findings of Bardet-Biedl Syndrome. Journal of Ophthalmology and Research 4(3)(2021): 254-257.
7. Sarzaeim F, Hashemzehi M, Shushtarian SMM , et al. (2022)Visual Evoked Potential Findings in Road Drilling Machine laborers. Journal of Ophthalmology and Research 5(1)(2022): 43-47.
8. Shushtarian SM, Mirdehghan MS, & Valiollahi P. Retinal damages in turner workers of a factory exposed to intraocular foreign bodies. Indian Journal of Occupational and Environmental Medicine 12(3)(2008): 136.
9. Shushtarian SMM, Mohammad-Rabei H, & Raki STB. Effect of Occupational Vibration on Human Retina Measured by Electroretinography. Journal of Ophthalmic and Optometric Sciences 2(3) (2018): 14-7.
10. Keramti S, Javanshir S, Tajik F, et al. Retinal Screening of Prolactinoma Patients using Flash Electroretinography. Journal of Ophthalmology and Research 4(4)(2021): 321-326.
11. Shushtarian SMM, Tajik F, & Abdolhoseinpour H. Measurement of Visual Evoked Potentials in Patients with Spastic Cerebral Palsy. J. Ophthalmic Optom. Sci 2(2018): 10-13.
12. Hajibeygi R, Shushtarian SMM, & Abolghasemi S. Visual Evoked Potential Findings of Sjogren's Syndrome. Journal of Ophthalmic and Optometric Sciences 4(1) (2022): 13-17.
13. Naser M, Shushtarian SMM, Shojaei A, et al. Visual Disturbance in a Patient with Amiodarone Treatment Following Refractive Surgery. Journal of Ophthalmic and Optometric Sciences 1(3)(2017).
14. Tajik F, & Shushtarian SMM. Electrooculographic and Electroretinographic Changes among Patients Undergoing Treatment with Amiodarone. Journal of Ophthalmic and Optometric Sciences 2(4) (2018): 7-11.
15. Allahdady F, Aghazadeh Amiri M, Shushtarian M, et al. Comparison of visual evoked potential and electro-oculogram tests in early detection of hydroxychloroquine retinal toxicity. Journal of Ophthalmic and Optometric Sciences 1(1)(2016).
16. Sarzaeim F, Abdolalizadeh S, Shushtarian SMM, et al. Visual Evoked Potential Findings in Patients using Anti-Seizure Medicine. Journal of Ophthalmology and Research 5(3)(2022): 123-126.
17. Naser M, & Shushtarian SMM. Amplitude and Latency of Electroretinographical Peaks as a tool to predict the Extent of Retinal Degeneration in Retinitis Pigmentosa Patients. Journal of Ophthalmology and Research 3(3) (2020): 71-74.
18. Shushtarian SMM, & Hayti Z. Probable Toxic Effect of Sodium Valproate on Retine Using Electroretinogram. Journal of Ophthalmic and Optometric Sciences 3(4) (2019): 24-28.
19. Moreno MC, Giagante B, Saidon P, et al. Visual defects associated with vigabatrin: a study of epileptic argentine patients. Canadian journal of neurological sciences 32(4) (2005): 459-464.
20. Barrett D, Yang J, Sujirakul T, et al. Vigabatrin retinal toxicity first detected with electroretinographic changes: a case report. Journal of clinical & experimental ophthalmology 5(5) (2014).