

Original Article

Electroretinographic Changes in Multiple Sclerosis Patients with Abnormal Visual Evoked Potentials

Seyed Mohammad Masoud Shushtarian¹, PhD; Farhad Adhami-Moghadam^{*1}, MD; Maryam Naser¹, MD

1. Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran.

*Corresponding Author: Farhad Adhami-Moghadam

E-mail: farhad.adhami@gmail.com

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Abstract

Purpose: Multiple Sclerosis (MS) is a disease of nervous system which is accompanied by degeneration of visual pathway in certain cases. Magnetic Resonance Imaging (MRI) and Visual Evoked Potentials (VEP) are among the diagnostic techniques in detecting this disease. The aim of the present study was to evaluate the possible electroretinography (ERG) changes among these patients.

Patients and Methods: Thirty eyes of patients with definite diagnosis of multiple sclerosis and delay in latency of visual evoked potential P100 peak entered the present prospective case control study as the case group. Latency and amplitude of ERG b-wave peak were measured in each eye. The result was compared with thirty normal eyes from age and sex marched individuals to evaluate the possible differences between the two groups.

Results: There was no statistically significant difference regarding the demographic data (age, uncorrected visual acuity) between the case and control groups. The b-wave latency showed a statistically significant difference between patients with MS and normal controls ($P < 0.001$). The ERG b-wave amplitude did not show statistically significant difference between patients with MS and controls.

Conclusion: From the result of the present study it seems that the latency of b-wave in flash ERG might be used as an indicator to evaluate the retinal dysfunction in MS patients with abnormal VEP pattern.

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Introduction

Early diagnosis of multiple sclerosis (MS) is an important task as far as proper medication is concerned. Magnetic resonance imaging (MRI) and visual evoked potential (VEP) are the two diagnostic techniques commonly used for early diagnosis of multiple sclerosis ^{1,2}.

Beside these techniques there are other methods which evaluate other organs dysfunctions among these patients. In this regard the MS patients with hearing loss may be tested with auditory evoked potentials ³ and somatosensory gating response might be checked in MS patients with walking impairments ⁴.

Other than these routine diagnostic techniques, there are some other methods which may be taken into consideration among these patients. These techniques may not be important for early diagnosis of MS but indicate the structural organ changes following this disease. Electroretinography (ERG) which is the study of electrical response of retina is among these techniques.

One of the early studies in this field was the work of Coupland et al., ⁵ in 1982. They evaluated MS patients using flash VEP (FVEP) and ERG and found that 13-14 % of MS patients had prolonged ERG b-wave but FVEP was delayed in all patients ⁵. Later on Persson et al., ⁶ in 1984, tested different types of ERG along with VEP in MS patients and found certain changes in some types of ERG pattern. Pierelli et al., ⁷ studied VEP and ERG recordings in a group of 15 patients. The result was high percentage of VEP alteration in examined eyes (99.3 %) while a lower percentage of abnormal ERG was observed (20 %). A recent work in this area was reported by Rodriguez-Mena et al., ⁸ indicating the usefulness of ERG in detecting retinal structural changes among multiple sclerosis patients.

Related literature regarding the use of ERG in diagnosis of multiple sclerotic patients is relatively scarce, therefore the present study was conducted to evaluate electroretinographic changes in MS patients with abnormal VEP.

Patients and Methods

In the present prospective case control study thirty eyes from thirty patients with definite diagnosis of MS and thirty eyes from age and sex matched normal individuals were evaluated. All patients were referred by neurologists for further eye examinations. Patients had undergone different diagnostic tests like magnetic resonance imaging (MRI) and evoked potentials testing by a neurologist to confirm their MS. The patients were all female and the age range was 18-28 years. The neurologists were asked to refer the MS patients with abnormal VEP, P100 peaks (delayed P100 peak in VEP pattern). This delay was in either one or both eyes, and the present study was conducted on one affected eye from each patient. The authors asked the neurologist to send the patients after proper medication. The visual acuity of the patients was tested and only those patients were selected that their possible fall in visual acuity could be corrected by suitable lenses or glasses, otherwise they were excluded from the present study. The care was taken to exclude the patients with any other retinal problems. Finally flash type of ERG or FERG was performed in affected eyes of the patients in Basir eye clinic, Tehran, Iran. The present study was approved by the ethics committee of Basir Eye Health Research Center and written consent was obtained from all patients prior to entering the study. International Society for Clinical Electrophysiology of Vision (ISCEV) protocol for FERG recording was used to evaluate eyes from MS patients. Same procedure was used for 30 normal eyes. In both groups latency (ms) and amplitude (μ v)

of ERG b-peak were measured. The results obtained from two groups were compared to detect possible differences. The statistical analysis was performed using SPSS software Version 24 (Armonk, NY: IBM Corp) and p values less than 0.05 were considered as statistically significant.

Results

Table 1 shows the demographic data of patients entering the study. There was no statistically

The aim of the present study was to evaluate electroretinographic changes in MS patients with abnormal VEP. The results of the present work indicate that the ERG b-wave shows some changes in MS patients with abnormal VEP pattern. In present work the patients with abnormal VEP's were selected. VEP is based on electrical information recorded from the visual cortex in response to stimulation of retina. Thus the integrity of the visual pathway can be test-

Table 1: Demographic data of patients entering the study

Variable	Control	Case	P- Value
Age	22.13 ± 2.77	22.5 ± 3.28	0.42 *
Visual Acuity (UCVA)- Log mar	0.089 ± 0.06	0.09 ± 0.05	0.564 *

Wilcoxon Test*

Table 2: Comparison of ERG b-wave amplitude and latency between the case and control groups

Variable	Control	Case	P- Value
Latency	43.2 ± 1.86	59.2 ± 5.36	< 0.001*
Amplitude	111.23 ± 10.37	112.36 ± 14.94	0.838 *

Wilcoxon Test*

significant difference between the two groups regarding the mean age or mean UCVA. Table 2 shows the measurement of mean latency and amplitude of ERG b-wave peak in case and control groups. According to the table 2, the difference between the two groups regarding the latency of ERG b-wave peak was statistically significant ($P < 0.001$); but the difference between amplitudes of the same peak was not significant between the case and control groups.

Discussion

Multiple sclerosis is a disease which affects different organs of the body. Retina is a part of visual system which might be degenerated and there is limited previous work regarding the ERG changes among these patients.

ed using this method⁹. From this fact one can conclude that VEP has contribution from retina, so abnormal VEP may be due to possible retinal dysfunction.

To check the retinal function ERG test is routinely performed, but in this test the conditions and stimulations should be taken into consideration. Dark and light adaptation while performing ERG can distinguish the status of rod and cones respectively¹⁰. Type of stimulation like flash in ERG recording provides information about the outer retina⁹. In the present study the flash ERG was tested among MS patients with abnormal VEP recordings. The results indicated a delay in implicit time of b-wave. The prolonged ERG b-wave is an indication of retinal dysfunction mainly to the outer retinal part^{5,9}.

We also studied the amplitude of ERG b-wave peak but there was no significant difference regarding this parameter between MS patients and normal controls; however Pierelli et al.,⁷ reported pathologic b-wave voltage increase among MS patients, which does not match our finding. The difference between results may be due to different types of retinal stimulation

since they used red flash stimulus where white flash stimulus was used in the present study.

Conclusion

From the result of the present study it seems that the latency of b-wave in flash ERG might be used as an indicator to evaluate the retinal dysfunction in MS patients with abnormal VEP pattern.

References

1. Mitsikostas DD. Methodology of clinical trials in multiple sclerosis. *Neurol Sci.* 2006;27 Suppl 5:S362-4.
2. Shushtarian SM, Yahyavi SH. Study of visual evoked potentials during normal monthly cycle in normal female subjects. *Biomed Sci Instrum.* 1999;35:165-7.
3. Bergamaschi R, Romani A, Zappoli F, Versino M, Cosi V. MRI and brainstem auditory evoked potential evidence of eighth cranial nerve involvement in multiple sclerosis. *Neurology.* 1997;48(1):270-2.
4. Arpin DJ, Gehringer JE, Wilson TW, Kurz MJ. A reduced somatosensory gating response in individuals with multiple sclerosis is related to walking impairment. *J Neurophysiol.* 2017;118(4):2025-8.
5. Coupland SG, Kirkham TH. Flash electroretinogram abnormalities in patients with clinically definite multiple sclerosis. *Can J Neurol Sci.* 1982;9(3):325-30.
6. Persson HE, Wanger P. Pattern-reversal electroretinograms and visual evoked cortical potentials in multiple sclerosis. *Br J Ophthalmol.* 1984;68(10):760-4.
7. Pierelli F, Pozzessere G, Stefano E, Martelli M, Rizzo PA, Morocutti C. Pattern visual evoked potentials and flash electroretinogram in clinically definite multiple sclerosis. *Eur Neurol.* 1985;24(5):324-9.
8. Rodriguez-Mena D, Almarcegui C, Dolz I, Herrero R, Bambo MP, Fernandez J, et al. Electropysiological evaluation of the visual pathway in patients with multiple sclerosis. *J Clin Neurophysiol.* 2013;30(4):376-81.
9. Weinstein GW, Odom JV, Cavender S. Visually evoked potentials and electroretinography in neurologic evaluation. *Neurol Clin.* 1991;9(1):225-42.
10. Meigen T. Electrophysiology in ophthalmology. *Ophthalmologie.* 2015;112(6):533-44; (Article in German)

Footnotes and Financial Disclosures

Conflict of Interest:

The authors declare no conflict of interest with the subject matter of the present manuscript.