

Brief Overview and Experience of Visual Evoked Potential of First 67 cases at Referral Neuroscience Hospital in Bangladesh

Mohammad Enayet Hussain¹, Bithi Debnath², AFM Al Masum Khan³, Md. Ferdous Mian⁴,
Md. Nahidul Islam⁵, Md. Badrul Alam⁶, Quazi Deen Mohammad⁷, Rajib Nayan Chowdhury⁸

¹Associate Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ²Assistant Professor, Department of Paediatric Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ³Assistant Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ⁴Assistant Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ⁵Assistant Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ⁶Professor and Joint director, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ⁷Professor and Director, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; ⁸Associate Professor, Department of Neurophysiology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh

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Abstract

Background: The visual evoked potentials (VEP) is a valuable tool to document occult lesions of the central visual channels especially within the optic nerve. **Objectives:** The purpose of the present study was to observe the findings of first few cases of VEP done in the neurophysiology department of the National Institute of Neurosciences (NINS), Dhaka, Bangladesh. **Methodology:** This cross-sectional study was conducted in the Department of Neurophysiology at the National Institute of Neurosciences and Hospital, Dhaka, Bangladesh from September 2017 to March 2020. All patients referred to the Neurophysiology Department of NINS for VEP were included. Pattern reversal VEPs were done using standard protocol set by International Federation of Clinical Neurophysiology (IFCN). **Results:** The mean age of the study population was 30.70 (± 12.11) years (6-68 years) with 31 (46.3%) male and 36 (53.7%) female patients. The mean duration of illness was 8.71 (± 1.78) months (3 days- 120 months). Most common presenting symptom was blurring of vision (37.3%) and dimness of vision (32.8%). Patterned VEP revealed mixed type (both demyelinating and axonal) of abnormality in most cases [29(43.35)]. The most common clinical diagnosis was multiple sclerosis (29.85%) and optic neuropathy (26.87%). In the clinically suspected cases of multiple sclerosis, optic neuropathy and optic neuritis most of the cases of VEP were abnormal and the p value is 0.04 in optic neuropathy and optic neuritis. **Conclusion:** The commonest presentation of the patients in this series were blurring of vision and dimness of vision. The most common clinical diagnosis for which VEP was asked for, was optic neuritis and multiple sclerosis. Most abnormalities were of mixed pattern (demyelinating and axonal). [*Journal of National Institute of Neurosciences Bangladesh, July 2020;6(2): 74-77*]

Keywords: Visual evoked potential; multiple sclerosis; optic neuritis; optic neuropathy

Correspondence: Dr. Mohammad Enayet Hussain, Associate Professor, Department of Neurology, National Institute of Neurosciences & Hospital, Dhaka, Bangladesh; Email: enayetdmc@yahoo.com; Cell no.: +8801716215871

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Introduction

The Visual Evoked Potentials or the Visual Evoked Responses are the evoked potentials generated in the cortical and sub-cortical visual areas when the retina is stimulated with light (flashes/pattern stimulation) and

best recorded over the occipital region. It is a very important non-invasive tool in detecting abnormalities of visual system. It is not only useful for clinical neurophysiologist or ophthalmologist but also for neurologists and neurosurgeons, since many of the

neurological disorders present with visual abnormalities¹. VEPs provide a sensitive indication of abnormal conduction in the visual pathway. Increases in retino-striate conduction time caused by processes such as demyelination can be detected by measuring the latency of this cortical response. Abnormalities in the amplitude and waveform of the VEPs may also be caused by the loss of axons in the pathway. VEPs are therefore widely used in the investigation of demyelinating disease, optic neuritis, and other optic neuropathies². The major use of VEPs is in the detection of sub-clinical lesions within the visual system; asymptomatic optic neuritis is easily detected and its presence may aid in the diagnosis of MS. Optic nerves abnormalities are poorly visualized by MRI, making VEPs an important adjunct when the diagnosis of demyelinating disease is in doubt³. VEPs can also help distinguish blindness from hysteria and malingering: if a patient reports visual loss, a normal VEP strongly favors a psychogenic disorder⁴. Visual Evoked Potential has been started in the National Institute of Neurosciences since 2017. The purpose of the present study was to observe the findings of first few cases of VEP done in the neurophysiology department of the National Institute of Neurosciences (NINS), Dhaka, Bangladesh.

Methodology

This cross-sectional study was conducted in the Department of Neurophysiology at the National Institute of Neurosciences and Hospital, Dhaka, Bangladesh from September 2017 to March 2020. All patients referred to Neurophysiology department during this period for visual evoked potentials were included in the study. Patients were first evaluated clinically. Then pattern reversal VEPs were recorded using standard protocol set by International Federation of Clinical Neurophysiology (IFCN)⁵. The visual stimulus was a

high contrast black-and-white checkerboard spanning the central 200 to 300 of the visual field whose black and white squares periodically exchange places. The VEP was the averaged response to this reversal. The responses were recorded from three electrodes spanning the occipital region with a mid-frontal electrode as the voltage reference. The signal at the midline occipital electrode normally contained a prominent positive component which occurred approximately 100 ms after the pattern reversal (called P100). It was usually preceded by a smaller negative component with a latency of about 75 ms (N75). The waveforms at the lateral electrodes were rather variable and so the latency of P100 at the midline electrode was taken as the measure of retino-striate conduction time.

Results

A total of 67 cases were included in the study. The mean age of the study population was 30.70 (±12.11) years (6-68 years) with 31 (46.3%) male and 36 (53.7%) female patients. Patterned VEP revealed mixed type (both demyelinating and axonal) of abnormality in most cases [29(43.35)] (Table 1).

Table 1: VEP Findings of Studied Population

VEP Findings	Frequency	Percent
Normal	15	22.4
Demyelinating	19	28.4
Axonal	4	6
Mixed	29	43.3

P 100 latency is prolonged in 40.3% cases and absent in 14.9% cases in the right eye, while in the left eye the latency is prolonged in 47.8% and absent in 14.9%. The P100 amplitude is reduced in 11.9% and absent in 19.4% in the right eye while in the left eye it is reduced in 13.4% and absent in 22.4% (Table 2, 3).

Table 2: P 100 latency of studied population

Eye	Normal		Prolonged		Absent	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Right eye	30	44.8	27	40.3	10	14.9
Left eye	25	37.3	32	47.8	10	14.9

Table 3: P 100 amplitude of studied population

Eye	Normal		Prolonged		Absent	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Right eye	46	68.7	8	11.9	13	19.4
Left eye	43	64.2	9	13.4	15	22.4

The mean duration of illness was 8.71 (± 1.78) months (3 days- 120 months). Most common presenting symptom was blurring of vision (37.3%) and dimness of vision (32.8%) (Table 4).

Table 4: Symptoms of the patient (Multiple response table)

Symptoms	Responses		Percent of Cases
	Frequency	Percent	
Headache	16	13.8	23.9
Pain in eye	7	6.0	10.4
Photophobia	1	0.9	1.5
Blurring of vision	25	21.6	37.3
Hemiplegia	7	6.0	10.4
Paraplegia	6	5.2	9.0
Quadriplegia	7	6.0	10.4
Vomiting	2	1.7	3.0
Vertigo	4	3.4	6.0
Diplopia	6	5.2	9.0
Dimness of vision	22	19.0	32.8
Sudden loss of vision	10	8.6	14.9
History of trauma to eye	2	1.7	3.0
Ptosis	1	0.9	1.5
Total	116	100.0	173.1

The most common clinical diagnosis was multiple sclerosis (29.85%), optic neuropathy (26.87%) and optic neuritis (16.42%) (Figure I).

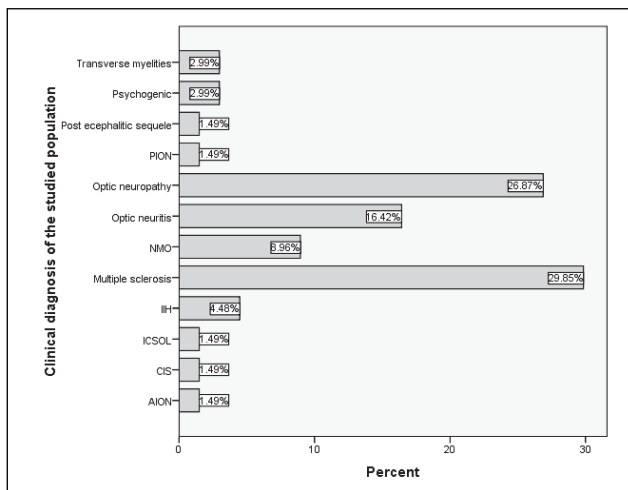


Figure I: Clinical diagnosis of studied population

In the clinically suspected cases of multiple sclerosis, optic neuropathy and optic neuritis most of the cases of VEP were abnormal and the p value is 0.04 in optic neuropathy and optic neuritis (Table 5).

Table 5: Comparison of VEP findings of the studied population with suspected clinical diagnosis

Variables	VEP findings	Frequency	Percent
Multiple sclerosis	Normal	5	0.48
	Abnormal	15	
NMO	Normal	1	0.59
	Abnormal	5	
Optic neuropathy	Normal	1	0.04*
	Abnormal	17	
Optic neuritis	Normal	1	0.04*
	Abnormal	10	

Discussion

In this study most of the VEP abnormalities were of mixed type (both demyelinating and axonal) reflected by a prolonged or absent P100 latency, reduced or absent P100 amplitude. A delayed P100 in the full field VEPs of both eyes is frequently found in demyelination and in other disorders in which the reduction of conduction velocity is widely disseminated. Abnormalities restricted to one eye signify a problem affecting that eye or its optic nerve and are particularly common in optic neuritis. The abnormality may take the form of a delayed P100, a reduction in the amplitude of P100 or its complete absence, or a response with an abnormal waveform. The wave shape may also be unusually prolonged (dispersed) or may have an abnormal number of inflections. These effects are attributed to the loss or impairment in conduction of axons within the visual pathway.

Anything which impairs conduction in the retino-striate pathway is likely to give rise to abnormalities in the latency, amplitude, or waveform of the VEPs. These are therefore associated with demyelination whether the disease is multiple sclerosis⁶, familial ataxia including Friedreich's ataxia⁷, or adrenoleucodystrophy⁸. VEPs are frequently delayed after traumatic brain injury, presumably as a result of diffuse axonal injury, and the magnitude of the delay is correlated with other measures of injury severity such as the extent of cognitive impairment⁹. Toxic and nutritional causes of nerve conduction disorder, including B¹² deficiency and alcohol- tobacco amblyopia, are associated with delayed VEPs. Other disorders in which the VEPs may be abnormal include the optic atrophies¹⁰, compressive lesions affecting the visual pathway¹¹, and sarcoidosis¹². In this series the most common clinical diagnosis was multiple sclerosis and optic neuropathy. While the advent of MRI has transformed the diagnosis of MS, VEPs provide a slight improvement in the sensitivity of contemporary diagnostic criteria by adding an extra

site, the optic nerve, to the dissemination in space (DIS) criteria¹³. Sub-clinical optic nerve involvement is common. Many patients with objective evidence of optic nerve damage have no history of symptomatic ON¹⁴. The subclinical nature of visual dysfunction in MS necessitates the use of this para-clinical tool in its assessment.

Conclusion

The commonest presentation of the patients in this series were blurring of vision and dimness of vision. The most common clinical diagnosis for which VEP was asked for, was optic neuritis and multiple sclerosis. Most abnormalities were of mixed pattern (demyelinating and axonal).

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