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The Patients with Reduced Vision Presenting for Neurophysiological VEP Analysis Most Commonly Show Reduced N75-P100 Amplitude

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Abstract: Study involves analysis of the VEPs of patients who had reduced vision and presented with diverse visual problems. We aimed to retrospectively analyze last 4 yr. VEPs specifically N75-P100 amplitudes and P100 latencies of the affected eye/eyes of the subject. Out of total selected 192 patients the data of 16 subjects was excluded for not being valid (n=12) or subjects not having reduced vision (n=4). The selected 176 patients (128 males and 48 Females) were grouped in to eight age groups of 10 yr. Subjects were assessed for the eye (right, left or both) having reduced vision. N75-P100 amplitude and P100 latency of the subjects were analyzed. Out of 176 patients with males (n=128; mean age 33.5 ± 23.38) and females (n=48; mean age 39.05 ± 24.83) maximum (22.16%, n=39) were of 0-10 yr age group. Both the eyes (LE- n= 60, 34.09 %; RE – n= 52, 29.55 %) were nearly equally affected. Unilateral and bilateral reduced vision was observed in 63.63 % (n=112) and 36.37 % (n=64) patients respectively. Maximum subjects (n=70, 39.77%) showed reduced N75-P100 amplitude. 27 (15.34 %) subjects showed increased P 100 latency and 48 (27.27 %) subjects showed normal VEP. <10 yr age patients more commonly present for assessment of VEPs. Frequency of unilateral involvement in both the eyes is nearly equal; however unilateral affection is more common than bilateral affection. Reduction of N75-P100 amplitude is the most commonly observed abnormal VEP parameter.
Key Words: Visual Evoked Potential (VEP); N75-P100 Amplitude, P 100 Latency.

INTRODUCTION

VEP is a gross electrical signal generated over the occipital region of the cortex in response to visual stimulation. It is more specific than the electroencephalogram (EEG) and more sensitive to changes in the visual stimulus[1]. VEPs are useful in evaluating patients with visual symptoms but no objective findings on examination and in patients without visual symptoms but with diseases that are known to involve the visual pathways sub clinically [2].

VEPs have proved to be useful in testing visual sensory function when clinical examination is not reliable and investigating purely subjective symptoms and detecting whether they have an organic origin [3].

Pattern reversal VEP waveforms and LED goggles both can be used for VEP recordings. Pattern induced VEPs more sensitively assess optic nerve lesions than flash evoked responses[3,4]. Central retinal stimulation with checkerboard pattern reversal is possible with LED and it gives comparable results to monitor and Maxwellian-view system [5]. P100 amplitude is considered as the most consistent and reliable wave therefore N75-P100 amplitude and P100 latency can be used as the best parameter for evaluating reduced vision [6,7].

Atilla *et al*. reported that ischemic optic neuropathies have more significant decreases in VEP amplitude, whereas optic neuritis has more significant delayed latency [8]. Although the amplitude and latency of VEP depends on the type of disorder [9,10].

Hence we designed a study to retrospectively analyze the VEPs of patients who presented with diverse visual problems and had reduced vision. We analyzed N75-P100 amplitudes and P100 latencies of the affected eye/eyes of the subject.

MATERIALS AND METHODS

This study was conducted at Saksham Imaging Diagnostic Center and Gajara Raja Medical College (GRMC) & associated Jaya Arogya Hospital (JAH) Gwalior, M.P., India. This is a cross sectional retrospective analytical study done on subjects having visual problems and presented for VEPs at our diagnostic center. In this study retrospective analysis of

192 patients was done. The patients, who presented at diagnostic Center during the period of February 2014 to January 2018 (4 years), were reviewed and analyzed. Recording of all the patients had been done using standard guidelines for VEP recording using LED goggles [3].

The data of patients was acquired. The patient's age, sex, side of the eye affected (left, right or both eye) and their VEPs findings were tabulated and analyzed.

Out of 192 patients the VEP data of 12 patients was found invalid and was not included in the final analysis. Further, the data of four more patients who had squint (2 patients), protruded eye ball (1 patient) and pain in bilateral eyes (1 patient) was also excluded in the view that they didn't had the history of reduced vision in any of the eye.

Hence final analysis included 176 patients where 128 were males and 48 were Females. Patients were grouped in to eight age groups (from A1 to A8) of 0 -10 yr, 11 - 20 yr, 21 – 30 yr and so on with last group of > 70 yr (Table No. 1). The grouping in these age groups was done to assess the occurrence of number of cases in different age groups.

Patients were further divided, in to affected left eye, affected right eye or both eyes affected, on the basis of which of their eye is having reduced vision (Table No. 2).

Further analysis of VEP was done to find out which of the parameters of VEP was affected. The VEP abnormality may be in the form of a reduction in the amplitude of N75-P100, a delayed P100 latency or complete absence of VEP wave [11]. Hence we retrieved and analyzed the patient's data of N75-P100 amplitude and P100 latency. Latency more than 15 ms compared to contralateral eye or >115ms was considered abnormal. Amplitude reduction of > 50% of contralateral eye or individual eye amplitude < 2 μV was considered abnormal [12]. The VEP interpretations were categorized in to reduced N75-P100 amplitude, prolonged P100 latency, both reduced N75-P100 amplitude & prolonged P100 latency, non-recordable VEP and normal VEP. The VEP interpretations were tabulated (Table No. 3).

RESULTS

VEP data of 176 patients, who presented with reduced vision in either or both the eyes were analyzed retrospectively. The mean age of the patients was 35.02 ± 23.84 yr. The number of male patients (72.73%, n=128; mean age 33.5 ± 23.38) was higher than the number female patients (27.27 %, n=48; mean age 39.05 ± 24.83).

Maximum number (22.16%, n=39) of patients were in A1 (0-10 yr) age group and least number (07.39%, n=13) of patients were observed in A8 (>70 yr) age group, with other groups having approximately same number of patients (Table No. 1).

Both the eyes were affected with nearly equal frequency with slight preponderance to left eye (LE- n= 60, 34.09 %; RE – n= 52, 29.55 %). 63.63 % (n=112) patients presented with unilateral reduced vision while 36.37 % (n=64) patients presented with bilateral eye reduced vision (Table No.2).

Out of the total 176 subjects maximum number of subjects (n=70, 39.77%) showed reduced N75-P100 amplitude, followed by this 27 (15.34 %) showed increased P 100 latency. 48 (27.27 %) subjects showed normal VEP (Table no.3).

Figure 1 show that in each of the affected eye category i.e. right eye, left eye or both eye affected, reduced N75-P100 amplitude was the commonest abnormal VEP finding.

Table-1: Age and sex wise distribution of patients

Age Group	Age (yr)	Males	Females	Total(%of Total)
A1	0 to 10	29	10	39 (22.16 %)
A2	11 to 20	17	3	20 (11.36 %)
A3	21 to 30	19	8	27 (15.34 %)
A4	31 to 40	19	2	21 (11.93 %)
A5	41 to 50	10	7	17 (09.96 %)
A6	51 to 60	16	7	23 (13.07 %)
A7	61 to 70	9	7	16 (09.09 %)
A8	>70	9	4	13 (7.39 %)
Total		128	48	176

Table-2: Patients distribution on the basis of eye affected

Eye Affected	Males	Females	Total (% of Total)
Left Eye	49	11	60 (34.09 %)
Right Eye	37	15	52 (29.55 %)
Both Eyes	42	22	64 (36.36 %)
Total	128 (72.73%)	48 (27.27 %)	176

Table-3: Abnormal VEP parameters in the affected eyes of the subjects

VEP parameters	Left Eye (n=60)	Right Eye (n=52)	Both Eye (n=64)	Total (% of Total)
Reduced N75-P100 Amplitude	28	22	20	70 (39.77)
Increased P100 Latency	10	10	7	27 (15.34)
Both N75-P100 amplitude and P 100 Latency Affected	5	7	6	18 (10.23)
Non Recordable VEP	3	2	8	13 (7.39)
Normal VEP	14	11	23	48 (27.27)
Total	60	52	64	176

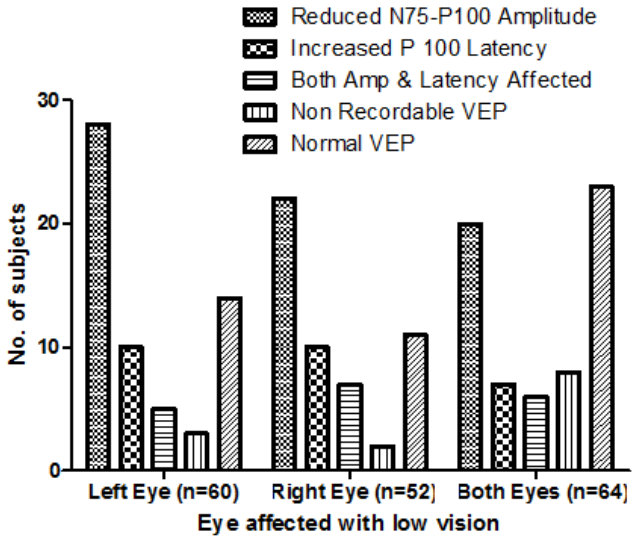

Fig-1: Figure shows the number of subjects having Abnormal VEP parameters in their affected eye/eyes

DISCUSSION

This study retrospectively analyzed the VEPs of eye patients who presented with the complaint of reduced vision in either or both the eyes. Only those patients who had no any remarkable abnormality during examination and were suspected of optic neuropathies presented for recording of VEPs. In this study 176 male and female patients VEP recordings were analyzed.

The male participants were more than the female participants in this study. Some eye conditions have been found to be more prevalent in males [13], where other reports the females more commonly affected with blindness[14,15]. Our study was retrospective analysis of patients referred for VEP, hence may not reflect the actual population demographics.

Most common presentation was below the age of 10 yr of age. Children are prone for hypoxic ischemic encephalopathy at the time of birth and this is a very common cause of optic nerve neuropathy [16,17].

We observed that frequency of affection of either of the eye is approximately same. There are no any subtle reasons to presume that any one eye is more affected with visual problems than the other. Previous studies have also found that unilateral affection is more common compared to bilateral affection [18,19].

We observed that N75-P100 amplitudes of the affected eye were reduced in maximum number of the subjects. N75-P100 amplitudes have been considered as the hallmark of axonal integrity of optic nerve while P100 latency is considered to be related to demyelination of optic nerve [11,20]. Thus maximum number of subjects were having axonal lesion of optic nerve as the cause of their reduced vision. Optic neuropathy involving axonal lesion have been

previously documented as the most common cause of blindness [21]. We also observed normal VEP cases in all the age groups and in each eye category, reflecting that reduced vision is always not involving optic nerve. There may be other causes of reduced vision in such patients.

CONCLUSION

We conclude that <10 yr age patients more commonly present for assessment of VEPs. Frequency of unilateral involvement in both the eyes is nearly equal, however more number of patients present with unilateral affection than bilateral affection. Reduction of N75-P100 amplitude is the most commonly observed abnormal VEP parameter suggesting that maximum number of subjects have axonal lesion of optic nerve as the cause of their reduced vision.

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