Original Article

Measurement of Visual Evoked Potentials in Patients with Spastic Cerebral Palsy

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Abstract

Purpose: To evaluate the visual evoked potentials in patients with spastic cerebral palsy.

Patients and Methods: Fifty children with spastic cerebral palsy were selected. They were all male in age range of l0 to 13 years. The visual evoked potentials measured using the checker board stimulation method was used to evaluate the visual pathway of patients. Latency (msec) and amplitude (μv) of VEP, P100 peak was measured for all participants. The same procedure was repeated for fifty age and sex matched healthy individuals as the control group. The results obtained in two groups were compared to look for probable differences.

Results: There was no statistically significant difference between the case and control groups regarding their mean age. The mean latencies for VEP, P100 peak in the case and control groups were 115 ± 15 msec and 95 ± 5 msec respectively ($P < 0.001$). The mean amplitudes for VEP, P100 peak were 82 ± 0.7 μv and 5 ± 2.15 μv in the case and control groups respectively ($P < 0.001$) .

Conclusion: Visual evoked potential is a suitable technique to check the visual pathway of patients with spastic cerebral palsy. The pathway shows pathological changes in patients with spastic cerebral palsy, which can be monitored using visual evoked potential recording.

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Introduction

Cerebral palsy (CP) is a group of permanent movement disorders which appears in early childhood. Patients with CP generally suffer from poor coordination, stiff and weak muscles and tremors [1]. Along with these symptoms they may also have sensation, vision, hearing, swallowing, and speaking problems [1]. Spastic cerebral palsy is the most common type of CP accompanied by stiff muscles and movements [2]. One of the main complains of patients with CP is refractive errors and high prevalence of strabismus [3]. Measurement of visual acuity can be difficult especially in children with spastic CP, which might lead to false reports of very low visual acuity [3,4].

Visual pathway is a part of visual system which may be affected in patients with spastic CP [5]. Visual pathway disturbances in these patients make the visual problems more severe and accurate correction would be very hard to achieve. To check the brain and visual pathway in patients with CP certain imaging modalities such as x-ray computed tomography (CT), magnetic resonance imaging (MRI), and electroencephalogram (EEG) are used. Evoked potentials (EP) are among the diagnostic techniques which may be utilized in these patients [6]. Among EP tests, visual evoked potential (VEP) is a techniques which is widely used in patients with spastic CP [7-10].

Teflioudi et al., [11] in 2011 worked on fifty one children with bilateral spastic cerebral palsy (31 boys, 20 girls with age range of 24-168 months) and found that sensory impairments in these patients is strongly related with abnormal visual evoked potentials. In another study by Kułak et al.,[12] the authors found a significant difference in the latencies of VEP, P100 peak between the patients with CP and controls. The present study was performed to further evaluate the changes in visual evoked potentials among patients with spastic cerebral palsy.

Patients and Methods

This study was approved by the ethics committee of Basir Eye Health Center, Tehran, Iran, and participants' guardians gave written consent before patients entering the study.

In this case control study fifty children with spastic cerebral palsy were selected as the case group. They were all male in age range of 10 to 13 years. The visual evoked potential test using the checker board stimulation method was performed to evaluate the visual pathways of patients. Latency (msec) and amplitude (μv) of VEP, P100 peak was measured for all participants using Pantops-PC2 (Biophysic Medical, Clermont-Ferrand, France) machine. In summary three electrodes were used to connect the machine to the patients. Active, reference and ground electrodes were attached to occipital, vertex and forehead of patient respectively.

The same procedure was repeated for fifty age and sex matched healthy individuals as the control group. The results obtained in two groups were compared to look for probable differences between the two groups.

Results

The mean age was 11.54 ± 1.16 in the case group and 13.98 ± 16.91 in the control group showing no statistically significant difference (Table 1). The mean visual acuity was 0.18 ± 0.11 (LogMAR) and 0 ± 0 (LogMAR) in the case and control groups respectively.

The mean latencies of VEP, P100 peaks in the case and control groups were 115 ± 15 and 95 ± 5 msec respectively indicating a statistically significant difference ($P < 0.001$) (Table 2). The mean amplitude of VEP, P100

Table 1: The demographic findings among case and control groups

Variable	Group		P value*
	Case	Control	
Age	11.54 ± 1.16	13.98 ± 16.91	0.311
Visual Acuity (LogMAR)	0.18 ± 0.11	0 ± 0	< 0.001
* T Test			

peak was 2 ± 0.7 μv and 5 ± 2.15 μv in the case and control groups (Table 2). The difference between the case and control groups regarding the mean amplitude of VEP, P100 peak was also statistically significant (P < 0.001).

Discussion

Medical examination of patients with spastic cerebral palsy is difficult because of their minimal cooperation. Examination of visual system among these patients is not exempted from this difficulty. Regardless of the best efforts by the ophthalmologist and optometrist to check the visual acuity of patient with CP correct estimation of visual acuity and its proper correction is not fully achievable [4]. In this regard looking for pathological changes in visual pathway of such patients, which affect their vision, might help the examiner to better evaluate the visual condition of the patients. In the present study we found a significant delay in the mean latency and reduction in mean amplitude of VEP, P100 peak in a group of 50 male children in age range of 10 to 12 years compared to controls.

Kulak et al., [12] in 2006 evaluated 15 children with spastic diplegic CP. Similar to our results they found a significant increase in mean latency of VEP, P100 peak among patients with CP compared to the control group [12]. They also reported that amplitudes of VEP, P100 peak in the subjects with CP were lower than in the healthy children, but did not differ significantly, which might be due to their limited sample size.

Galas-Zgorzalewicz et al., [13] recorded VEPs of 100 children and adolescents, aged 2 to 19 years, with spastic CP. They reported significantly longer latencies and shorter amplitudes of VEP, P100 peak, which is similar to the result of the present study. Kothari et al., [14] in 2010 worked on fifteen children with spastic CP in the age range of 4 months to 10 years. They also found a significant difference in VEP readings between the subjects and controls indicating the prolongation of absolute latency of wave V, interpeak latencies of III-V and lowered I-V ratio. They attributed these changes in VEP results to neurological deficits present in cases with CP.

A relative strength of the present study compared to previous similar studies is the

Table 2: Latencies and peak-to-peak amplitudes of VEP, P100 peak in children with cerebral palsy (CP) and controls

Variable	Group		P value*
	Case	Control	
Latency (m sec)	116.82 ± 7.7	92.32 ±5.08	< 0.001
Amplitude (μv)	2.8 ± 1.08	5.72 ± 1.56	< 0.001
* T Test			

relatively higher number of age and sex matched participants in the case and control groups. Further studies to correlate the changes in VEP findings with the clinical conditions of patients with CP are suggested.

Conclusion

Visual evoked potential is a suitable technique to check the visual pathway of patients with spastic cerebral palsy. The pathway shows pathological changes in patients with spastic cerebral palsy, which can be monitored using visual evoked potentials recording.

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Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present study.