Research Article

Flash Visual Evoked Potential as a Suitable Technique to Evaluate the Extent of Injury to Visual Pathway Following Head Trauma

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Abstract

Aim: A head injury is any trauma to the scalp, skull or brain. This may cause vision problems, such as blurred or double vision and difficulty with eye movements focus and finally total blindness. Visual evoked potential is an electrophysiological technique to survey the visual pathway. The aim of present work is to look for visual pathway disturbances in patients with visual dysfunction due to head trauma.

Patients and Methods: Twenty eyes with different stages of visual fall due to head accident were taken for the purpose of present research work. The patients were all male with age range of 18 to 30 years. The latency and amplitude of visual evoked potential P100 peak was recorded for these patients and 16 age and sex matched control with healthy visual system mainly visual pathway.

Results: The mean age was 24.45±4.86 and 24.7±4.21 in case and control groups respectively. Both case and control groups were male and therefore the difference in values were not statistically significant as far as age (P =0.698) and sex were concerned. The visual acuity in case and

control were 0 ± 0 and 1.42 ± 0.94 respectively which was statistically significant in two groups (P <0.001).

The values for mean latency were 130.3 ± 7.16 and 99 ± 2.93 for case and control groups respectively. In case of mean amplitude, the values were 1.5 ± 0.6 and 7.6 ± 1.9 in case and control groups respectively. The values for visual evoked potential were statistically significant for latency (P <0.001) and amplitude (P <0.001) in between case and control groups.

Conclusion: Head trauma might produce visual dysfunction mostly visual pathway which can be diagnosed by latency and amplitude of visual evoked potential P100 peak.

Keywords: Head trauma; Visual dysfunction; Visual evoked potential

1. Intruduction

Trauma is an emotional response to a terrible event like an accident, rape or natural disaster. Head trauma is a type of trauma describes a vast array of injuries that occur to the scalp, skull, brain and underlying tissue and blood vessels in the head. Worldwide an estimated 10 million people are affected by traumatic brain injury (TBI). More than 5 million Americans currently live with long-term disability as a result of TBI and more than 1.5 million individuals sustain a new TBI each year [1]. Visual dysfunctions and symptoms are commonly experienced after even mild traumatic brain injury despite excellent visual acuity. All individual who have experienced for a TBI / concussion should be screened for vision symptoms and visual dysfunction [2].

Head trauma may cause severe damage to visual system. Traumatic optic neuropathy (TON) is an important cause of severe visual loss following blunt or penetrating head trauma. Following the initial insult optic nerve canal or compression by bone fragments are thought to result in secondary retinal ganglion cell loss [3]. There are different techniques to look for extent of injury caused by head trauma. Imaging is an indispensable part of the initial assessment and subsequent management of patients with head trauma. Initially it is important for diagnosing the extent of injury and the prompt recognition of treatable injuries to reduce mortality.

Magnetic resonance imaging (MRI) is among the imaging protocols used in the evaluation of patient with head trauma [4]. Visual evoked potential is among the diagnostic techniques in patients with head trauma. This technique is mostly advantageous in patients with no significant clinical and neuro image findings [5]. Visual evoked potential is a suitable technique to screen the visual pathway disturbances. There are quite a large number of references or effectiveness of VEP on physiological and pathological condition which affects visual pathway [6-9]. Base on above review of literature a research was planned out to screen the visual pathway of patients with visual dysfunction due to head trauma.

2. Patients and Methods

In this case control study sixteen male patients (20 eyes) with head trauma and thereby visual dysfunction were selected as the case group. They were in age range of 18 to 30 years. The patients were tested for visual acuity which was ranging from light perception to 2/10 (BCVA). Visual evoked potential with flash type of stimulation method was

performed to evaluate the visual pathway of patients. Latency (msec) and amplitude (μV) of VEP, P100 Peak was measured for all patients using Mangoni 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 patients respectively. The same procedure was repeated for 16 age and sex matched healthy (visual system mainly visual pathway) individual (20 eyes) as control group. The results obtained in two groups were compared for probable differences between two groups.

3. Results

Table 1 show the demographic findings i.e., age and visual acuity in case and control groups and there is not statistically significant difference between the two groups regarding the age (P = 0.698), however the difference in visual acuity is significant (P < 0.001).

Table1: Demographic findings in the case and control groups

Variable	Number of participants	groups (Mean ± SD)		P value*
		Control	Case	
Age	20	24.7±4.21	24.45 ± 4.86	0.698
VA LogMar	20	0 ± 0	1.42 ± 0.94	0.000

*Based on Mann-Whitney Test

Table 2, show the measurement of mean latency and amplitude of VEP, P100 Peak in the case and control groups. There is statistically significant VEP, P100 Peak as far as latency (P<0.001) and amplitude (p<0.001) were concerned.

Table2: Measurements of mean of latency and amplitude VEP P100 peak in the case and control groups

Variable	Number of participants	groups (Mean ± SD)		P value*
		Control	Case	
Latency (msec)	20	99 ± 2.93	130.3 ± 7.16	0.000
Amplitude (μv)	20	7.6 ± 1.9	1.5 ± 0.6	0.000

*Based on Mann-Whitney Test

4. Discussion

Damage to visual pathway is frequent during head trauma. Visual evoked potential is suitable technique to screen the visual pathway disturbances occurred in these patients. In present study both latency and amplitude of VEP, P100 Peak was significantly changed due to head trauma. The following references were reviewed to supports the result of present work.

In a case study done on traumatic optic neuropathy, visual evoked potential was used as a diagnostic technique which is the technique used in present study and hence reliability of the technique [11]. In a most relevant work Mohammed MA et al on 2021 made an extensive work on 30 patients with indirect traumatic optic neuropathy using flash visual evoked potential [12]. They observed significant change in

implicit time and amplitude of VEP, P100 Peak of the patients which supports the result of present work.

There are quite enough research works on usefulness of visual evoked potential in evaluating the extent of damage on visual pathway in head trauma patients. They all report significant change in VEP, P100 Peak which is similar to result of present work [5, 12, 13].

5. Conclusion

Head trauma can damage the visual pathway which bring fall in eye sight and can be diagnosed by flash visual evoked potential.

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