Original Article

Suitable Stimulation Technique to Record Visual Evoked Potential in Migraine Patients

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Abstract

Background: Migraine is a very common primary headache disorder associated with intermittent attacks and great suffering. To deal with these patients, different diagnostic techniques may be used. Visual evoked potential (VEP) is one of useful techniques in this respect. Flash (F) and pattern reversal checkerboard (PRC) are two stimulating techniques to record VEP. The aim of present work is to compare these two techniques in migraine patients & look for the optimum technique.
Material and Methods: Flash and pattern reversal checkerboard visual evoked potential was recorded in 20 migraine patients (with 40 eyes). The age range was 20 -30 years and BCVA was 10/10 in total subjects. Latency (msec) and amplitude (μv) of VEP, and P_{100} Peak were noted for each patient. The results obtained were compared together.
Results: The mean latencies were 103.65 ± 11.89 and 112.07 ± 4.39 for pattern reversal checkerboard and flash stimulation, respectively. On the other hand, the mean amplitudes were 8.16 ± 1.60 and 8.34 ± 2.15 for pattern reversal checkerboard and flash stimulations, respectively. The VEP difference were significant ($P < 0.001$) for latency whereas the amplitude difference is not significant ($P = 0.513$), as far as two types of stimulations were concerned.
Conclusion: From the present work results, one can conclude that pattern reversal checkerboard is a suitable technique to record VEP in migraine patients.
Keywords: Migraine; Pattern Reversal Checkerboard Visual Evoked Potential; Flash Visual Evoked Potential; Stimulation Technique.

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Introduction

Migraine is usually a moderate or severe headache felt as a throbbing pain on one side of head. There are different diagnostic techniques for screening these patients. Visual evoked potential (VEP) is among the useful techniques in migraine patients. Visual evoked potential allows looking for pathological and non-pathological changes on visual pathway.

Shushtarian and his team (1999) reported the VEP changes during natural monthly course of female subjects. The reason for this change was hormonal changes during this period [1].

In a recent work, Hashemzehi M. et.al. (2022) reported visual pathway disturbances in road drilling machine laborers. The reason for these pathological changes is nothing but occupational vibration which was proved by increased VEP latency, P_{100} Peak [2]. This effect was also reported in other occupations, i.e., textile factory and related laborers [3].

In addition to the above work, there are number of researches related to VEP usefulness in the visual pathway disturbance diagnosis [4-7].

Visual evoked potential is also used in migraine patients. In this regard, Boylu E. and his team measured latency and amplitude of different VEP peaks in migraine patients. They found persisting dysfunction of pre-cortical visual processing [8].

Visual stimulation types in VEP recording are an important factor to be taken into consideration for these patients.

Naser M. and her research team (2014) worked on a suitable visual stimulator for recording migraine VEP with aura patients; they concluded that in migraine with aura pattern, the reversal checkerboard is an optimum technique to record VE [9].

Finally, in present work we plan to measure VEP in migraine patients regardless of the migraine type, in order to reach a suitable Visual stimulator to record VEP.

Material and Methods

Suitable stimulation technique is the aim of present study among migraine patients. For this purpose, 20 patients (40 eyes) were selected randomly. They were in age range of 20 – 30 years. All patients have 10/10 BCVA.

The patients were tested for visual evoked potential with two types of routine stimulation techniques, namely, pattern reversal checkerboard (PRC) and flash (F). To record Visual evoked potential, three electrodes were used. The electrodes connect the patients to VEP machine. Biomedical Mangoni was the unit utilized for this purpose. Active, reference and earth electrodes were attached to occipital, earlobe and forehead, respectively. Electro-physiological conductive gel was used between electrodes and the skin.

Latency (msec) & amplitude (μv) of VEP, P_{100} Peaks were measured for each patient. Mean and standard deviation were calculated for two types of stimulations.

The results obtained for two types of stimulation techniques were compared using SPSS version 13 to check for the suitable stimulation technique.

This study has been accepted by ethical committee of Tehran Islamic Azad University of Medical Sciences; ethical code: IR.IAU.PS. REC. 1399. 280.

Results

The patients in the present study have the following conditions.

The patients under study were 7 females and 6 males. The age range were between 20 to 30 years and finally all had 10/10 BCVA.

Table 1, shows the measurement findings for

Table 1: Measurements of mean latency and amplitude of VEP, P_{100} peak in case of patients group with two types of stimulations. i.e., Pattern reversal checkerboard (PRC) and flash (F)

Variable	Number of patients	(Mean ± SD)	P value	
Latency (msec)	20	103.65 ± 11.89	112.07 ± 4.39	0.001
Amplitude (mV)	20	8 ± 1.6	8.34 ± 2.15	0.513

latency and amplitude of VEP, P_{100} Peak in case of total patients' group with two types of stimulations, i.e., pattern reversal checkerboard and flash. There was a statistically significant difference in mean latency between two types of stimulations ($P < 0.001$), whereas the difference in amplitude was not significant ($P = 0.513$).

Discussion

Extensive research was planned out to look for a suitable stimulation technique for patients suffering from migraine. The present work characteristics is nothing but considering migraine patients without types, because patients and VEP recording operators are usually not aware of migraine types.

Twenty patients (40 eyes) with age range of 20 – 30 years and full BCVA, i.e., 10/10, were selected as the present work purpose. VEP using two stimulator types, namely, Pattern reversal checkerboard (PRC) and flash (f), were recorded for these patients. As far as VEP, P_{100} peak latency and amplitude is concerned, significant differences ($P < 0.001$) were observed in case of latency but not amplitude ($P = 0.513$) between two stimulator types.

It is a fact in some physiological and pathological conditions that significantly higher VEP latency, P_{100} peak is observed.

In research conducted on 1999, it was observed that mean VEP, P_{100} latency among female subjects during normal monthly course is significantly higher in case of flash stimulator compared to pattern reversal checkerboard stimulation [1].

In research carried out by shushtarian S.M. (2009) on VEP recording using two stimulation types, it was observed that mean VEP, P_{100} latency is higher in case of flash in comparison to pattern reversal checkerboard stimulations [10].

The most related work is done on 2014. Extensive research was done on 75 migraineurs with aura patients. They used both types of flash and pattern reversal stimulations to recover VEP in total population and they resulted higher VEP latencies, P_{100} peak flash rather than pattern reversal checkerboard stimulation [9] which is a proof for the present work results.

Finally, authors suggest to use pattern reversal VEP in migraine patients. The reasons may be stated as follows.

It is a well-known fact that certain stimulus can provoke the patients and thereby produce headache, flickering or flashing light are among these stimuli [11].

Mortin et al used very bright stroboscopic light for patients with a regular headache history; the result was more headaches in response to stimulus compared to controls with no headache history [12]. Finally, in a case study reported by shushtarian and his colleagues (2017), a female patient suspected to multiple

sclerosis suffered from severe headache during VEP recording using flash stimulation type. The patients' history shows that she had migraine headache experience [13].

Conclusion

From the present research results one can conclude that pattern reversal checkerboard is a suitable stimulation technique to record visual evoked potential in migraineur patents, unless the visual patient condition is so severe that flash stimulation type is unavoidable to record VEP.

Ethical approval

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