Research Article

Visual Evoked Potential Findings in Road Drilling Machine laborers

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Received: 14 March 2022; **Accepted:** 19 March 2022; **Published:** 21 March 2022

Citation: Fatemeh Sarzaeim, Mahboubeh Hashemzehi, Seyed Mohammad Masoud Shushtarian, Ahmad Shojaei. Visual Evoked Potential Findings in Road Drilling Machine laborers. Journal of Ophthalmology and Research 5 (2022): 43-47.

Abstract

Purpose:

Road drilling machine laborers are exposed to heavy vibration. Vibration may affect different organs of body. The aim of present work is to look for possible effect of vibration on visual pathway of these subjects using visual evoked potential.

Patients and methods:

Twelve male laborers (24 eyes) were selected for the purpose of present study. The age range of the laborers was in between 25-35 years. They had normal visual acuity. They were tested for visual evoked potential (VEP). Latency (msec) and amplitude (µv) of VEP, P100 peak were recorded for all subjects and 12 age and sex matched control laborers not encountered with vibration.

Result:

The mean age was 30.67 ±3.47 and 30.58±3.45 in the case and control groups, respectively. the mean BCVA was 10/10 is both groups. The mean latency was 103.58± 5.24 and 98.58±2.92 and in case of amplitude it was 7.67±1.93 and 7.75±1.36 in case and Control groups respectively. There was a statistically significant higher latency of visual evoked potential P100 peak in the case compared to control groups ($p<0.001$). No significant difference regarding the amplitude of VEP, P100 peak was observed between two groups ($P = 0.863$).

Conclusion:

Occupational vibration in road drilling machine might have adverse effect on visual system mainly visual pathway causing increased latency of VEP, P100 Peak measured using visual evoked potentials.

Keywords: Road drilling machine laborers, occupational vibration, visual pathway, visual evoked potential

1. Intruduction

Occupational health is an important subject for the laborers and other workers working in an area encounter with certain occupational hazards. Shushtarian SM and his colleagues on 2008 worked on mental stress of the workers exposed to humidity in a cheese processing factory. They concluded the adverse effect of humidity in 100 workers of the factory which was reflected as mental stress of workers [1].

Visual system is among the organs may be affected in working environment due to occupational hazards. Retinal damages in turner workers of a factory were studied on 2008.The laborers were exposed to intraocular foreign bodies. The authors used electro retinography (ERG) to screen the retina of the workers and found that the changes in ERG parameters which was a proof for pathological changes of the retina in the laborers [2]. One of occupational hazards is vibration. Excessive vibrations in certain occupation may affect the laborers of related activity. Shushtarian SM et al. on 2018 worked on pathological changes of retina in fifty laborers of a textile factory and they concluded that excessive vibration certainly affects the retina of the laborers which was proved by electro retinography technique [3].

It is a fact that laborers working with road drilling machine are exposed to heavy vibration, because of nature of the work and machine. Visual system mainly the visual pathway of the related laborers may be ill-treated in these subjects. Visual evoked potential (VEP) is a suitable technique to screen the visual pathway in different physiological & pathological situations.

Visual evoked potential was measured in female subjects during monthly course condition. It was observed that VEP, P100 Peak was increased during this period in healthy female subjects [4]. Sarzaeim, F and her research team worked on 16 head trauma patients and they resulted flash visual evoked potential as a suitable technique to evaluate the extent of injury to visual pathway following head trauma [5]. There are quite large references related to use fulness of VEP in different pathological conditions [6-8].

Base on aforesaid literature review a research was planned out to screen the visual pathway of road drilling machine operators using VEP to search for possible effect of vibration on visual pathway of these subjects.

2. Patients and Methods

This study was approved by an institutional ethic committee and all subjects gave written consent before entering the study. Twelve (24 eyes) male road drilling machine operators were selected as the case group. Subjects were in age range of 25-35 years. The laborers were selected with at least 5 years' experience of working with road drilling machine. The visual system of workers was examined using E-chart, ophthalmoscope and

retinoscope. Medical history of all laborers was also recorded. Along with these subjects twelve age and sex matched control were selected with no history of working with road drilling machine or any other vibration creating instruments.

All participants in the study underwent VEP recording. Latency (msec) and amplitude (µv) of VEP, P100 Peak were measured for each subject. Mangoni machine capable of recording VEP was used to record VEP. Conventional electrode attachments were used for attaching the electrodes to the subjects. Mean and standard deviation of latency and amplitude of VEP, P100 Peak in the case and control groups were calculated and compared. We performed the statistical analysis using SPSS software version 22 (IBM, Armonk. NY USA). P value less than 0.05 were considered significant.

3. Results

The demographic findings in the case and control groups doesn't shows statistically significant difference between the two groups, regarding the, sex (all male) age (p=0.954) and visual acuity (The mean BCVA in two groups was 10/10).

Table1: measurements of mean latency and amplitude of VEP, P100 Peak in case and control groups.

Variable	Number of participants	groups (Mean ± SD)		P value*
		Control	Case	
Latency (msec)	12	98.58 ±2.92	103.58 ±5.24	0.000
Amplitude (µv)	12	7.75 ±1.36	7.67 ±1.93	0.863

*T-Test

Table 1 shows the measurement results for latency and amplitude of VEP, P100 Peak in the case and control groups. There was a statistically significant higher latency of the visual evoked potential, P100 Peak in the case group compared to the control group (p<0.001). No significant difference regarding the amplitude of VEP, P100 Peak was observed between the two groups (P=0.863).

4. Discussion

Visual evoked potential P100 Peak was measured in 12 (24 eyes) road drilling machine laborers exposed to heavy vibration due to nature of work and machine. Latency of VEP, P100 Peak was significantly delayed in these laborers in comparison to control group. The authors could not find references on VEP recording in road drilling machine laborers, however there are some related findings which may supports the results of present work.

Shushtarian SM et al. on 2017, worked on effect of occupational vibration on fifty workers from a textile factory segment with machinery creating high levels of vibration. They found that excessive vibration affects visual pathway which was proved by increase in latency of VEP, P100 Peak in related laborers in comparison to laborers working in other sections of factory not exposed to vibration [9]. which supports the findings of present research work.

In a study including workers who were exposed to heavy hand-arm vibration. Stromberg et al., [10] reported demyelination and vibration induced

neuropathy, which was associated with edema and incomplete regeneration and could finally cause neuro fibrosis.

Lopata et al., studied the effect of long-term low frequency vibration on the sciatic and plantar nerves of Wistar rats. They found a reduction in the total number of nerve fibers, which was associated with altered distribution of myelinated fiber diameter, disturbances in axon structure and fiber demyelination to the extent of the lesion depended on the duration of exposure and distance from the source of vibration [11]. Takeuchi et al, observed pathological changes in finger biopsy of patients with vibration- induced white finger. They also noticed demyelinating neuropathy in peripheral nerves with marked loss of nerve fibers [12].

5. Conclusion

Occupational vibration is created by road drilling machine might have adverse effect on visual system mainly visual pathway of concerned laborers. This effect produce increase in latency of P100 Peak measured by visual evoked potential.

References

1. Shushtarian SM, Hajipour AH & Rastegari Y. Mental stress in the workers exposed to humidity in a cheese processing factory. *Indian Journal of Occupational and Environmental Medicine* 12 (2008): 37.
2. Shushtarian SM, Mirdehghan MS & Valiollahi P. Retinal damages in turner workers of a factory exposed to intraocular foreign bodies. *Indian Journal of Occupational and Environmental Medicine*, 12 (2008): 136.
3. Shushtarian SMM, Mohammad-Rabei H & Raki STB. Effect of Occupational Vibration on Human Retina Measured by Electroretinography. *Journal of Ophthalmic and Optometric Sciences* 2 (2018): 14-17.
4. Shushtarian SM & Yahyavi SH. Study of visual evoked potentials during normal monthly cycle in normal female subjects. *Biomedical sciences instrumentation* 35 (1999): 165-167.
5. Sarzaeim F, Hashemzehi M, Shushtarian SMM, Shojaei A & Naghib J. Flash Visual Evoked Potential as a Suitable Technique to Evaluate the Extent of Injury to Visual Pathway Following Head Trauma. *Journal of Ophthalmology and Research* 5 (2022): 20-23.
6. Ojani F, Shushtarian SMM, Shojaei A & Naghib J. Visual Evoked Potential Findings of Bardet-Biedl Syndrome. *Journal of Ophthalmology and Research* 4 (2021): 254-257.
7. Keramti S, Ojani F, Shushtarian SMM, Shojaei A & Mohammad-Rabei, H. Early Diagnosis of Pathological Changes in Visual System of Prolactinoma Patients Using Visual Evoked Potential. *Journal of Ophthalmology and Research* 4 (2021): 289-293.
8. Allahdady F, Aghazadeh Amiri M, Shushtarian M, Tabatabaee SM, Sahraei F, Shojaei Baghini A, & Sheibani K. Comparison of visual evoked potential and electrooculogram tests in early detection of hydroxychloroquine retinal toxicity. *Journal of Ophthalmic and Optometric Sciences. Volume* 1 (2016).

9. Shushtarian SM, Kalantari AS, Tajik F & Adhami-Moghadam F. Effect of occupational vibration on visual pathway measured by visual evoked potentials. *Journal of Ophthalmic and Optometric Sciences* 1 (2017): 7-11.
10. Strömberg T, Dahlin LB, Brun A, Lundborg G. Structural nerve changes at wrist level in workers exposed to vibration. Occup Environ Med 54 (1997): 307-11.
11. Lopata P, Mikusek J, Karmańska W, Karmański A. Changes in the peripheral nerves in rats induced by vibration. Folia Morphol (Warsz) 53 (1994): 95-104.
12. Takeuchi T, Futatsuka M, Imanishi H, Yamada S. Pathological changes observed in the finger biopsy of patients with vibration-induced white finger. Scand J Work Environ Health 12 (1986): 280-3.