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Physiology

ASSESSMENT OF COGNITIVE FUNCTION IN MIGRAINE PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Introduction: Migraine, the second most common cause of headache, is a neurological syndrome which may be associated with deep white matter lesion and subtle gray matter damage. Several studies have reported cognitive impairments like deficit of attention and impairment of memory in migraine subjects. ERP, is a non-invasive study in which brain activity is recorded during a cognitive task. It is one of the useful tools in investigating specific cognitive function. In this study, we intend to find out the association between cognitive functions in migraine subjects.

Methodology: This study was conducted in 50 clinically diagnosed Migraine subjects in the age group of 18-40 years of both genders as a prospective comparative study from May 2017 – March 2018 clinically diagnosed Migraine subjects in the age group of 18- 40 years of both gender with history of migraine for at least 2 years duration and with at least 3 migraine episodes per month were included**.** MMSE Questionnaire will be administered to all the subjects to assess the cognition. ERP (P300) will be recorded. P300 wave latency and amplitude will be recorded.

Results: The mean age of the Migraine subjects was 31 ± 6.69 years and that of control group was 30.18 ± 6.52 years. The mean duration of migraine among the cases was 4.06 ± 2.31 years. The MMSE score was found to be low in the Migraine group than the control group. The Cognitive evoked potentials shows Target N100, P200, N200 & P300 wave latencies were prolonged in Migraine subjects than the controls and this was statistically significant. The Target P300 wave Amplitude was less in Migraine subjects than controls and this was statistically significant.

Conclusion: Mini Mental State Examination is a reliable method to detect cognitive impairment in migraine subjects and can be used as a screening tool. Cognitive Evoked Potential study shows prolonged latency and reduced amplitude suggesting cognitive decline in Migraine subjects. Hence, Cognitive Evoked Potential study can be used as an investigatory tool in Migraine subjects to detect early cognitive impairment.

KEYWORDS : Migraine, MMSE, Cognitive evoked potential.

INTRODUCTION

Migraine is a chronic neurovascular disorder and is the second most common cause of headache. Migraine is one of the most frequent headaches related and neurologic cause of disability in the world. The estimated prevalence of a Migraine was approximately15% among women and 6% among men over a one-year period.[1] Migraine is characterized by an episodic headache, precipitated often by disturbances like sound, movement, sensitivity to light and is often associated with nausea and vomiting.[1] Migraine is a recurrent primary headache disorder affecting both neuronal and cerebrovascular systems.[2]

Migraine is associated with functional alteration which has both physical and emotional ramifications. Migraine is a chronic disorder causing interruption of cortical and subcortical circuit which may eventually lead to impairment of cognitive activity.[3] Episodic attack of migraine may also cause disruptions like deep white matter lesions.[4] Evidence of silent infarct like lesion and white matter hyperintensities in MRI have been linked to the increased risk of cognitive decline in Migraine.[5]

Cognition is the highest intellectual function of the brain. The various domains of cognition are memory, learning ability by both visual and verbal, attention or vigilance, concentration, abstract thinking, and problem solving. The cognitive decline of the individual poses a great burden on the self, family and community. Cognitive impairment affects emotional, functional, affective, communication and social skills. A good cognition is very much essential for any individual to lead a quality life.

There are various studies reporting neuro cognitive impairments such as slowing down of information processing speed, poor learning, poor memory and attention in Migraine subjects. The most affected cognitive domain reported being memory and attention. Information processing speed,[6] Visual -spatial processing,[7] working memory,[8] coordination and learning abilities were also affected in other studies.

Thus, the important aspect of treatment for Migraine subjects must include initial evaluation of cognition which will enable us to efficiently implement the management and hence improve the quality of life. In most of the studies, neuropsychological tests have been used to assess various domains of cognition. Very few studies in the literature have used electrophysiological tests to quantify cognitive impairment in Migraine.

In this study, cognitive function in Migraine subjects was assessed using Mini Mental State Examination (MMSE) and also by Cognitive evoked potentials (CEP) study. MMSE-Mini Mental State Examination,[9] is a brief, quick objective method of assessing global cognitive functioning. Cognitive evoked potentials (CEP) study is a basic, noninvasive electro physiological study using oddball paradigm and is used to assess the cognition. Event related potential study is used for detecting and quantifying early cognitive impairment.

The present study was undertaken to assess the cognition in the Migraine patients using Mini Mental State Examination and Cognitive Evoked Potential study. The possibility of using cognitive evoked potential as an investigatory tool in addition to neuropsychological test to detect early cognitive impairment in Migraine subjects has been explored in the present study.

MATERIAL AND METHODS:

This study was conducted in 50 clinically diagnosed Migraine subjects in the age group of 18-40 years of both genders as a prospective comparative study. Subjects with a minimum of two years of migraine history were selected for the study from the Neurology outpatient department, Stanley Medical College, Chennai for a period of one year. After eliciting detailed history, General and Clinical examination was done. Cognitive function was assessed using Mini Mental State Examination (questionnaire) and Event related Potential (ERP) Study. A Control group with 50 health individuals was recruited from the Master Health Checkup, in Stanley medical college and Hospital and the accompanying persons who volunteered for the study. They were age and gender matched and had similar educational qualification and socioeconomic background.

Patients with any other type of head ache, neurological disorders, psychiatric illness, Auditory dysfunction, H/O Head injury affecting auditory functions / central nervous system, Diabetes mellitus, Hypertension, Thyroid disorder were excluded All the subjects were

explained about the nature and procedures involved in this study. Their consent was obtained.

The demographic details were obtained. Duration of disease, type and nature of headache, duration of headache, number of episodes per day / week / month, other associated symptoms and treatment history were recorded. Details regarding the precipitating factors were also recorded. Assessment of Cognition was done using Mini Mental State Examination (MMSE) questionnaire which contains details about orientation, registration, attention and calculation, recall, language, copying, construction.

Cognitive evoked potential study was done for all the study subjects. using a computerized recorder. The machine includes a stimulator, recording electrodes, filter, amplifier, signal 90 verge, electrical safety. The waves recorded were computed separately for rare and frequent stimuli, the latency of the N 100, P 200, N 200 and P 300 waves, and P 300 wave amplitude of the rare stimuli were noted down.

SPSS Version 20.0 was used for statistical analysis. The results were expressed as mean ± standard deviation and independent t test. The correlation was tested by Pearson's correlation. The difference was considered significant when $p < 0.05$.

RESULTS

This study was conducted in 50 clinically diagnosed Migraine subjects in the age group of 18-40 years of both genders as a prospective comparative study The mean age of the Migraine subjects was 31 ± 6.69 years and that of control group was 30.18 ± 6.52 years. In our study among migraine cases 3 were male and rest were female whereas in control group six were male and rest were female. The mean height among cases were 155.72 ± 4.18 and among controls is 159.4 ± 4.09. Mean weight among cases is 58.38 ± 8.84 and among controls is 59.52 ± 8.63.

The mean duration of Migraine subjects was 4.06 ± 2.31 years, 13 patients had two tear history, 12 patients had 3-year history of migraine, 5 patients had 4-year history and rest had more than 5-year history of migraine. The MMSE score was found to be low in Migraine subjects than the Control group and the difference was found to be statistically significant.

Table.1 Comparison of mean value of MMSE score between Migraine and Control

Groups	Mean	SD	p-value
Migraine	27.62	1.93	< 0.05
Control	29.32	0.978	

On Cognitive evoked potential evaluation, The Target N100 wave Latency value was found to be prolonged in Migraine subjects than the Control group and the difference was found to be statistically significant. The target P200 wave Latency was also found to be prolonged in Migraine subjects than the Control group and the difference was found to be statistically significant. Similarly, the Target N200 wave Latency was found to be prolonged in Migraine subjects than the Control group and the difference was found to be statistically significant. Also, the Target P300 wave Latency was found to be prolonged in Migraine subjects than the Control group and the difference was found to be statistically significant. The Target P300 wave Amplitude was found to be low in Migraine subjects than the Control group and the difference was found to be statistically significant.

Table.2 Comparison of mean value between Migraine and Control group

TARGET LATENCY	Groups	Mean	SD	p-value
N100	**Migraine**	79.01	2.23	< 0.05
	Control	75.52	4.26	
P100	**Migraine**	162	2.81	< 0.05
	Control	155	4.67	
N200	**Migraine**	205.19	7.73	< 0.05
	Control	193.87	4.44	
P300	**Migraine**	299.07	10.89	< 0.05
	Control	287.75	10.46	

DISCUSSION

The study groups included 50 Migraine subjects and 50 healthy controls**.** The mean age of the migraine subjects was 31±6.69 years and that of the control was 30.18±6.52 years. 94% of the cases were females and 91% of the controls were females. Both the cases and control groups were similar with respect to both age and gender. The mean duration of migraine was found to be 4.06 ± 2.31 years.

The MMSE score for Migraine subjects was 27.62 ± 1.96 while that of the controls was 29.32 ± 0.978. The difference observed was found to be statistically significant. As per the MMSE Score, the measured cognitive levels were lower among the Migraine subjects than the controls. Similar results were reported by Huang et al. They have assessed the cognitive function using Montreal Cognitive Assessment Tool and Rey – Ossterith Complex tool.[10] Mourtan et al[11] had done a study in children with Migraine and without Migraine to find out their cognitive performance.

They have reported that there was no significant difference in the cognitive performance between the groups, even-though children with Migraine showed poor scores in various domains like information, arithmetic vocabulary and object assembly.[12]Similar results were reported by Santangelo G et al.[13] Araujo CMD et al have also reported the cognitive impairment in Migraine subjects.[14] Wen K et al had observed that the cognitive test scores were better among migraine subjects with aura than those without history of aura.[15] In contrary to the findings of the present study, Cognitive Evoked potential Study

The mean N100 wave latency (msec) for the Migraine subjects was 79.01 ± 2.23 and that of the controls was 75.52 ± 4.26. Migraine subjects were found to have prolonged N100 latency than the controls. This difference in the mean N100 latency was found to be statistically significant. The N 100 wave is considered to reflect initial sensory processing and early selective attention capacities during stimulus processing causing arousal and attention. The significantly prolonged N 100 wave latency and decreased P 300 amplitude in Migraine implies impaired attention. Drake ME jr et al have reported that there was no significant difference in the N100 wave latency between Migraine and the controls.[16] Similar results were reported by Chen W et al.[17]

The mean P200 wave latency (msec) in Migraine subjects was 162 ± 2.81 and that of the control group was 155 ± 4.67. The mean P200 wave latency was found to be prolonged in the Migraine than the control group. The observed difference was also found to be statistically significant with a P- value < 0.05. The Target P200 wave considered to indicate early attention capability associated to stimulus processing. In contrary to the current study, Drake ME Jr et al reported that there was no significant difference in P200 wave latency between migraine subjects and the controls.[16]Similar results were obtained by Chen W et al.[17]

The mean N200 wave latency (msec) among Migraine subjects was 205.19 ± 7.73 and that of the controls was 193.87 ± 4.44. The Migraine group was found to have prolonged mean N200 wave latency than the control group. The above difference was also found to be statistically significant. The Target N200 wave reflects index of stimulus detection. In contrary to the current study, Drake ME Jr et al reported that there was no significant difference in N200 wave latency between migraine subjects and the controls.[16]Similar results were obtained by Chen W et al.[17]

The mean P300 wave latency (msec) among the Migraine subjects was 299.07 ± 10.89 and that of the controls was 287.75 ± 10.46. The P300 wave latency was prolonged among the Migraine subjects than the control group. The above difference was found to be statistically significant with P-value of < 0.05. The P 300 wave latency reflects the information processing and it is strongly associated with short term memory. The significant prolongation of P300 latency in Migraine implies defective information processing and impaired m Migraine memory. Prolonged Target P300 wave latency was reported by Arun S et al.[3] Drake ME jr et al, also had reported a prolonged latency among the Migraine subjects than the controls.[16]In contrary to the above, Chen W et al reported that there was no difference in P300 wave latency between the Migraine and the healthy subjects.[17]

The mean P300 wave Amplitude (μV) among the Migraine subjects was 5.53 ± 1.01 and that of the control group was 8.53 ± 0.86. The P300 wave amplitude was lower among the migraine group than the control group. The above difference was found to be statistically significant.

P300 wave Amplitude depends on the selective attention of the individual. It is greater with attentive individual, and with better motivation and task priority. Similar lower P300 wave amplitude among Migraine subjects were reported by Wang W and Schoenen J et al in their study, but the difference was not found to be statistically significant in their study.[18] Drake ME Jr et al also reported significantly reduced P300 wave amplitude among the Migraine subjects than the controls.[16] Chen W et al also reported a similar reduction in P300 wave amplitude among Migraine subjects than the healthy controls.[17] Koo YS et al also reported that P300 wave amplitude was significantly lower in Migraine than in the controls.[19]

This present study shows that there was a significant cognitive impairment in Migraine subjects when compared to the control group reflected by low MMSE and Cognitive Evoked potential study.

CONCLUSION

There is significant cognitive impairment in Migraine subjects as evidenced by MMSE score and Cognitive Evoked Potential study. Mini Mental State Examination is a reliable method to detect cognitive impairment in migraine subjects and can be used as a screening tool. Cognitive Evoked Potential study shows prolonged latency and reduced amplitude suggesting cognitive decline in Migraine subjects. Hence, Cognitive Evoked Potential study can be used as an investigatory tool in Migraine subjects to detect early cognitive impairment. Hence, in Migraine subjects MMSE, Cognitive Evoked potential study can be recommended to assess the cognitive impairment, so that the suitable intervention may be planned to improve their quality of life.

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