Section: Physiology

Original Research Article

DETERMINATION OF AUDITORY DYSFUNCTION USING BERA IN MIGRAINEURS

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Abstract

Background: Migraine is the most commonly encountered primary headache in practice. Auditory brainstem response (ABR), also known as brainstem auditory Evoked Potentials (BAEP), is an objective measurement of auditory pathway function from the auditory nerve to the mesencephalon. This study is conducted to determine the auditory dysfunction using BERA in migraineurs and compare with normal individuals. Our aim is to determine BERA in Migraneurs and To compare the findings with normal individuals.**Materials and Methods:** 30 Subjects with age group of 20-50 years with migraine having intact hearing was selected as cases.30 subjects with age group of 20-50 years without migraine having intact hearing was selected as controls. BERA was recorded using RMS EMG ALERON 201 and the data were recorded. The data were statistically analyzed and their significance derived using independent samples T-Test and paired T-Test. **Result:** In this present study BAEP reports showed significant prolongation of I, III and V interpeak latency of wave I-III&I-V but no prolongation is observed in the interpeak latency of wave III-V in migraine when compared with controls. **Conclusion:** Prolongation or increase in latency in all peaks in migraineurs compared with controls substantiating that brain stem structures play an active role during the attack of migraine.

INTRODUCTION

Migraine is the most commonly encountered primary headache in practice. Migraine is a genetically influenced complex disorder characterized by episodes of moderate-to-severe headache, most often unilateral and generally associated with nausea and light and sound sensitivity. The word migraine is derived from the Greek word "hemikrania," which later was converted into Latin as "hemigranea." The French translation of such a term is "migraine." It is one of the cause of disability and loss of work. Migraine attacks are complex brain events that unfold over hours to days in a recurrent matter. The most common type of migraine is without aura (75% of cases).[1] Auditory brainstem response (ABR), also known as brainstem auditory Evoked Potentials (BAEP), is an objective measurement of auditory pathway function from the auditory nerve to the mesencephalon. The action potentials are recorded from the ear to vertex in response to brief auditory stimulation to assess the conduction of impulses through the auditory pathway to the midbrain. The auditory evoked potential (AEP) is produced by presenting auditory stimuli to each ear, which results in a sequence of waveforms that bear a close relationship to these auditory pathway structures and allows relatively 18 specific localization of pathology in the auditory pathway, particularly in the cochlear nerve and brainstem. ABR tests synchronous neural function and can estimate hearing sensitivity thresholds in individuals who are unable to tolerate traditional behavioral audiometry. Electrical activity from the eighth cranial nerve and neurons along the brainstem auditory pathway are recorded by surface electrodes placed on the scalp, forehead, and near the ears for 10 milliseconds after an acoustic stimulus.[2] The methods of electro neurophysiology are particularly appropriate for the study of migraine pathophysiology because they are atraumatic and able to detect functional abnormalities.[3] BERA though being primarily test the hearing function of an individual, its association with migraine can also be studied. Migraine is a primary, chronic, episodic headache, known for thousands of years, which is accompanied by neurological, gastrointestinal and autonomic changes in various combinations, and of which aural neurologic symptoms seen in one-third

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of the cases are known as the characteristic features.[4,5] The most common form of migraine is "migraine without aura" and 90% of the patients with migraine have this type of migraine.[5] In the rest of the cases, migraine attacks with aura occur alone or together with migraine attack without aura. Migraine disease induces a series of neurological symptoms such as vertigo, dizziness, hearing loss, tinnitus and aural ache in addition to the most common auditory symptom, phonophobia.[7] This study is conducted to determine the auditory dysfunction using BERA in migraineurs and compare with normal individuals.

Aim

1. To determine BERA in Migraneurs
2. To compare the findings with normal individuals.
3. To compare the latency and interpeak latency of BERA waves between migraine and normal subjects.

MATERIALS AND METHODS

Case control study was conducted with Control and patients (Subjects Fulfilling the Criteria Of Migraine As Per International Headache Society) at Department of Physiology, Tirunelveli Medical College, Tirunelveli. Inclusion Criteria for Study Group includes Age group 20 to 50 yrs / both gender, Migraine with Or Without Aura atleast For a Period of 6 Months, Patient With Normal Respiratory/ Cardiovascular/Hepatic Function and Patients with normal hearing and normal vision.

Inclusion Criteria for Control Group includes Age Group between 20-50-yrs and Subjects with Normal Hearing and Normal Vision.

All the participants were informed about the study, oral and written consent were obtained. Permission from the Institutional ethical committee was also obtained.

Exclusion Criteria were Known Hypertensive, Diabetes Mellitus, Ear Diseases, Anaemia, Known Smoker / Alcoholic / Any medication Any Other Neurological Illness and Those who are on medications which affects hearing,

Routine clinical examination was performed. Rinne ‘s , weber and pure tone audiometry was conducted. Following that BERA was done by using ‘RMS EMG-ALERON 201.Filter setting for BERA is as follows Low-cut filter: 10- 100 Hz High-cut filter: 3000 Hz.

In recording BERA, measures must be taken to assure the patients safety. The grounding and the chassis leakage current of all instruments connected to the patient are located in the same room as the patient must be periodically tested. Equipment should be designed to prevent inadvertent shock power –on, power –off and failures. The person should be seated in wooden chair .

Running the test One ear was tested at a time. Other ear was masked with white noise. Click stimuli of intensity 70dB above normal hearing threshold, at the rate of 10sec and 0.1 msec duration were presented monoaurally The other ear was masked by White noise-40Db HL.

Statistical analysis: The BAEP parameters such as latency, and inter peak latency of the study group was compared with the control group by using SPSS version.

The data were statistically analyzed and their significance derived using independent samples T-Test and paired T-Test.P value < 0.05 was considered significant, P value <0.01 was considered highly significant and P value < 0.001 was considered very highly significant.

RESULTS

[Table 1] shows no statistically significant difference in both control and study groups regarding age distribution, height, weight, gender and body mass index.

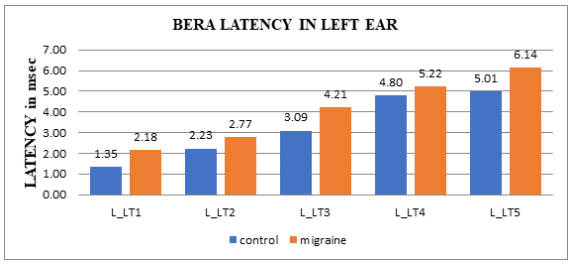

Figure 1: comparison of Bera latency in Left ear , The graph shows mean latency of control and migraine cases. Latency is prolonged in migraine compared to controls

The comparison of latencies between control and migraine patients showed high statistical significance in left ear

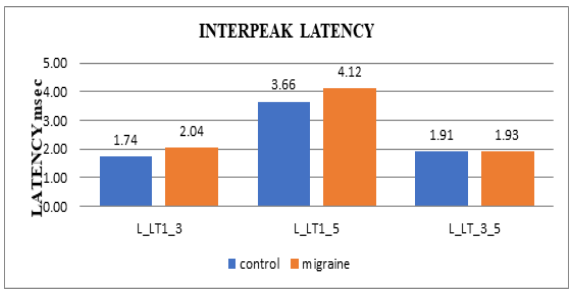

Figure 2: interpeak latency in left ear

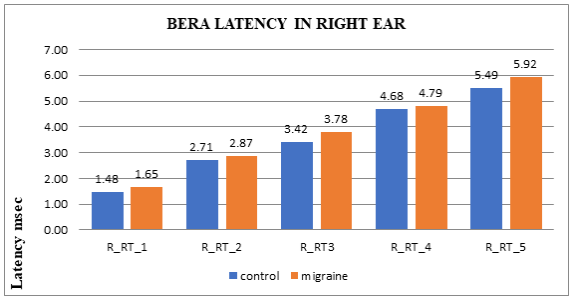

Figure 3: comparison of interpeak latency of the right ear.

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[Figure 2] shows interpeak latency(I-III,I-V,III-V) in left ear. The graph shows the mean interpeak latency is prolonged in migraine compared to controls

The comparison of interpeak latencies between control and migraine patients showed highly statistical significance in interpeak latencies I-III & I-V in left ear.

[Figure 3] shows Bera latency in Right ear. The graph shows mean latency of control and migraine cases. Latency is prolonged in migraine compared to controls migraine

The comparison of latencies between control and migraine patients showed statistical significance in Right ear.

[Figure 4] shows Bera interpeak latency(I-III,I-V,III-V) in Right ear. The graph shows mean latency of control and migraine cases. interpeak latency is prolonged in migraine compared to controls.

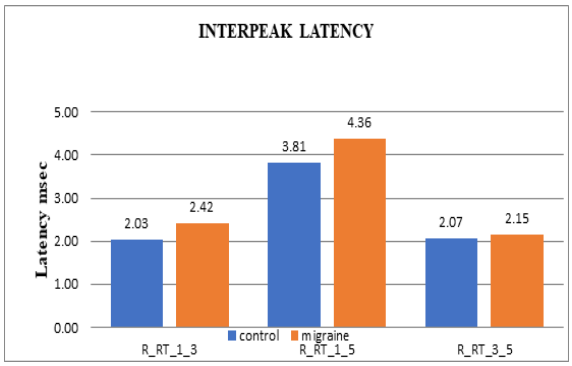

Figure 4: interpeak latency in right ear

Table 1: Age Distribution

Parameters	Control			Migraine patients			P value
	N	Mean	S.D	N	Mean	S.D	
Age	30	31.20	7.15	30	34.03	10.33	0.222
Height	30	157.10	5.53	30	153.67	4.95	0.014
Weight	30	57.07	6.19	30	56.57	5.01	0.732
Gender	30	1.80	0.41	30	1.93	0.25	0.133
BMI	30	22.73	2.35	30	23.77	2.57	0.109

p≤0.05 is significant; p≤0.01 is highly significant; p≤0.001 very highly significant.

Table 2: Comparison of Bera Latency of the Left Ear

	Control			Migraine			
Latency (m sec)	N	Mean	S.D	N	Mean	S.D	P value
Lat 1	30	1.35	0.40	30	2.18	0.23	0.000
Lat 2	30	2.23	0.56	30	2.77	0.43	0.000
Lat3	30	3.09	0.37	30	4.21	0.29	0.000
Lat4	30	4.80	0.18	30	5.22	0.34	0.000
Lat5	30	5.01	0.31	30	6.14	0.29	0.000

p≤0.05 is significant; p≤0.01 is highly significant; p≤0.001 very highly significant.

Table 3: Comparison of interpeak latency of the left ear.

	Control			Migraine patients			P. Value
Latency (msec)	N	Mean	S.D	N	Mean	S.D	
Lat 1-3	30	1.74	0.58	30	2.04	0.43	0.029
Lat 1-5	30	3.66	0.47	30	4.12	0.34	0.005
Lat 3-5	30	1.91	0.48	30	1.93	0.44	0.904

p≤0.05 is significant; p≤0.01 is highly significant; p≤0.001 very highly significant

Table 4: comparison of Bera latency in right ear

	Control			Migraine patients			P Value
Latency (m sec)	N	Mean	S.D	N	Mean	S.D	
Lat 1	30	1.48	0.28	30	1.65	0.22	0.011
Lat 2	30	2.71	0.23	30	2.87	0.26	0.016
Lat 3	30	3.42	0.18	30	3.78	0.45	0.006
Lat 4	30	4.68	0.22	30	4.79	0.29	0.081
Lat 5	30	5.49	0.37	30	5.92	0.32	0.001

	Control			Migraine patients			P Value
Latency (m sec)	N	Mean	S.D	N	Mean	S.D	
Lat 1-3	30	2.03	0.36	30	2.42	0.68	0.007
Lat 1-5	30	3.81	0.55	30	4.36	0.57	0.000
Lat 3-5	30	2.07	0.37	30	2.15	0.57	0.005

DISCUSSION

In the present study, Brainstem auditory Evoked Potential parameters were evaluated in Migraine patients in order to find out whether cortex or Brainstem is involved in Migraine patients.

In this present study BAEP reports showed significant prolongation of interpeak latency of wave

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I-III&I-V which reflects the conduction from lower pons to midbrain but no prolongation is observed in the interpeak latency of wave III-V in migraine when compared with controls. This results were supported by studies of D Kaushal, S Sanjay Munjal, M Modi, N Panda who evaluated BAEP in 25 patients with migraine. Anil K Dash et al conducted audio vestibular funtions study in migraine patients presenting with vertigo and without vertigo, observed significant increase in latencies of wave l,ll & V and interpeak latencies of I-III, III-V&I-V. They concluded that BAEP findings are one of the early sign of impending auditory dysfunctions in patients with migraine which is consistant with our findings.

Zgorzalewicz M et al., the study evaluated BAEP in children and adolescents with primary headaches. They reported significant prolongation in latencies of wave III in Migraine children when compared with TTH.[8]

Laila EL Mosly et al10Evaluated the effect of Migraine on quality of life in females by observing the changes in evoked potentials. They measured BAEP in 30 Migraine patients and recorded there was prolongation of wave III & wave V latency and I- III & I- V interpeak latency due to hyperexcitability of the cerebral cortex but no significant change in III – V interpeak latency both during an attack and in the interictal phase. In migraine patients the abnormalities reflect not only dysfunctions at the cortical level and found that precortical visual processing is also impaired.

Vijayalakshmi TN et al concluded that there is potentiation in the wave V of BERA generated by inferior colliculus during the continuous period of stimulation of 15 minutes in migraine patients showing potentiation. There is increase in the amplitude of wave 1 of BERA generated by eighth nerve in the fourth block in migraine patients which is not statistically significant. There is a significant increase in the A/R (amplitude ratio) in the fourth block when compared to the first block in migraine patients.[9]

Drake M et al, measured BAEP in 50 patients with migraine and found that there was significant prolongation of I – V and III- V interpeak latency in Migraine patients. This study concluded that prolongation was due to dysfunction of brainstem centres and possibly related to endorphin or serotonin neurotransmission.

Similar study by Bayazit Y et al, in 20 Migraine patients, they reported abnormal BAEP findings in seven patients with increased latency of waves I , III & V and the interpeak latency III-V. They suggest that cochlear vestibular symptoms can be seen in Migraine patients and there is dysfunction of neuronal excitability in Migraine, due to defective neurotransmitter signaling and cerebral bioelectrical dysrhythmia.[10,11]

CONCLUSION

From the present study the following conclusions are made · There is prolongation of latency I, III and V which is statistically significant and reflects waves generated from lower brain stem structure mediating defective neurotransmitter signaling · Prolongation of interpeak latency of I-III and I-V is also statistically significant and it reveals that the prolongation is due to involvement of upper brain stem structures causing bioelectrical dysrhythmia. BAER can be used as an effective non-invasive, reliable, and diagnostic technique and earliest indicator of impending auditory involvement in migraine patients making neurophysiological evaluation of the auditory pathway & early intervention even in migraine patients without aura.

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