

Original Research Article

Brainstem Auditory Evoked Potential in Primary Hypertension

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Abstract: Arterial hypertension is a frequent worldwide health disorder prevalent in a large percentage of the population and has adverse effects on the brain throughout one's lifespan. This study was undertaken to evaluate the BERA as potential markers of early nervous system damage in essential hypertension and also to correlate the changes if any, between blood pressure and BERA in patients with essential hypertension. In the present study, 30 patients of primary hypertension were examined along with a group of 30 normotensive individuals as controls. Primary hypertensive individuals, in the age range of 30-70 years were selected from hypertensive clinic and 30 controls selected from amongst the staff of college. All the subjects of the two groups then underwent BERA assessment test in the neurophysiology laboratory as per the procedure mentioned under the methodology. Mean values of BERA in the two groups of subjects compared, showed Prolongation of the absolute latencies of BAEP waves I and IV in hypertensive group compared to normotensive group showed statistically significant difference. The latencies of other absolute waves were also found to be prolonged but the statistical significance could not be established.

Keywords: Brainstem auditory evoked potential, primary hypertension, BERA

INTRODUCTION

Systemic hypertension or Essential hypertension is a major public health problem in fact is one of the most common chronic diseases in our society. Though usually asymptomatic, hypertension may leads to a number of complications involving almost all organ systems but its effects on cardiovascular system, the kidneys and the brain contribute to the major part of morbidity and mortality. This might be due to arterial and arteriolar spasm in the blood vessels of the brain [1]. Neuronal dysfunction in hypertension might have multifactor etiology. White matter lesions in brain have been associated with hypertension [2, 3]. Subclinical changes in the central nervous system function may not be easily detected with traditional methods of clinical assessment [4].

BERA have been used as diagnostic methods to detect abnormalities in the respective pathways involving their central connections. It is relatively cheap, easy to perform diagnostic methods to detect early damage. Extensive literature search however did

not reveal much information regarding the changes in BERA in patients with essential hypertension.

In the present study, 30 patients of primary hypertension were examined along with a group of 30 normotensive individuals as controls. The study was aimed at assessing the BERA of these subjects and to compare the results between the hypertensive and normotensives and to find correlation, if any, between the blood pressure and various parameters of BERA.

MATERIALS AND METHODS

The study comprised of 30 subjects of essential hypertension selected from hypertensive clinic and 30 controls selected from amongst the staff of government hospital. An informed written consent was taken and a proforma for a detailed medical history was filled for the entire subject.

Inclusion criteria

1. Subjects of either sex in age group of 30 to 70 yrs.
2. Subjects having normal hearing.

Exclusion criteria

1. Patients with <30 and >.70 yrs in age.
2. Patients with any positive history or physical examination findings suggestive of CNS disease.
3. Patients with well controlled blood pressure.
4. Subjects with metabolic disorders, known to affect hearing like diabetes, hypothyroidism etc.
5. Subject with any external ear, middle ear or cochlear disease.
6. Subjects taking ototoxic drugs.
7. Subjects with history of chronic smoking and /or alcohol abuse.

Study design

Control group

Age and sex matched controls were normotensives and free from the diseases were selected. Subjects with SBP \leq 120 mmHg or DBP \leq 80mmHg were enlisted after obtaining an informed written consent.

Detailed history was taken and physical examination performed in all the cases. Ear examination was done to rule out hearing abnormality.

Study group

The BP was measured using sphygmomanometer under ideal conditions. Blood samples were collected for hematological and biochemical parameters like Haemogram, lipid profile, blood sugar, serum creatinine.

Apart from this routine urine examination was also done. The patients were excluded from the study if they had shown any probable cause of secondary hypertension, based on physical examination, history and above mentioned lab test.

Recording of blood pressure

The blood pressure was measured using a mercury sphygmomanometer under ideal conditions. The patients were then graded as per the JNC VIII5 classification of hypertension and were investigated further. Blood and urine samples were collected for hematological and biological parameters as mentioned above.

Apart from these the patients were also tested for an ECG. Patients with Hb more than 10gm% with normal RBS, Blood urea and Sr. creatinine were then enrolled for the study. On the suitable patients BERA was performed using RMS Portable Aleron and RMS Mark II machines.

RESULTS AND DISCUSSION:

The current study showed an increased in the absolute latencies of all the waves of BAER. The changes were significant in the absolute latencies of Wave I and Wave IV (Table 1). The results of the

present study are in accordance with those reported by Tandon *et al.*; [6] where a significant increase in the absolute peak latencies of I, II, V and IPL III-V in one patient with stage 3 hypertension was noted. The results of the present study also showed a similar trend of raised latencies but significant increase was found in wave I and wave IV.

The difference was however not more significant in comparison to control in both the studies. This could be due to the small number of patients. A large study is more likely to show some significant findings.

The present study also showed non-significant but, prolonged IPLs in hypertension group when compared to the control group (Table 2). These findings are consistent with those observed by Tandon *et al.*; [6]

Study by Tandon *et al.*; [6] suggests that the changes were more severe in the higher degrees of hypertension. Since in our study most subjects are in pre hypertensive or stage 1 hypertensive group the relation of increased latencies with severity of hypertension cannot be justified.

The current study also showed correlation between systolic blood pressure and absolute wave latencies of waves I. Our study also showed correlation between diastolic blood pressure and absolute latencies of wave I (Table 3). These findings were similar to those found by Tandon *et al.*; [6]

The statistical insignificance in Inter peak latencies could be due to the less severe and smaller duration of hypertension in subjects of the study.

The present study results also show that in hypertension not only is the peripheral auditory pathway threatened, the central brainstem pathway of transmission of auditory stimulus also shows a prolongation in the conduction time.

The changes in hypertensive patients, as observed, can be due to multiple factors that include associated dyslipidemia, oxidative stress or arteriosclerosis leading to poor blood supply to different organs. Due to paucity of studies conducted in this aspect, a definite cause cannot be attributed to these changes. However, in view of the consistent changes seen in many studies, it does emphasize the need for more research in this field. The changes in the neuronal conduction may not be permanent, and show improvement with control of BP. There was a rising pattern of abnormal BAER with the increasing severity of hypertension. This suggests that BAER can act as potential marker of early neurological damage and emphasizes the need for more research in the field.

It can be seen from table 1 that the mean±SD values of absolute latencies of wave I and wave IV of the study group was found to be prolonged compared to the normotensive subjects and the difference is statistically significant (P value :0.003 and 0.0003 for wave I and IV respectively). Although, the mean±SD values of rest of the absolute wave latencies were found to be prolonged in the study group. However, its

statistical significance (P<0.05) could not be established.

It can be seen from table 2 that No significant statistical difference could be established between the interpeak latencies and amplitudes of wave I and wave V in the two groups of the subjects.

Table 1: Mean values of absolute latencies of BAEP of both ears in the two groups

Absolute Latencies	Normotensives Mean±SD (n=30)	Hypertensives Mean±SD (n=30)	P value
Wave I (msec)	1.709 ±0.16	1.737 ±0.21	<0.05 (S)
Wave II (msec)	2.76±0.12	2.799±0.18	> 0.05 (NS)
Wave III (msec)	3.583±0.20	3.685±0.19	> 0.05 (NS)
Wave IV (msec)	4.813±0.16	4.820±0.21	< 0.05 (S)
Wave V (msec)	5.48±0.19	5.59±0.28	> 0.05 (NS)

S: Significant (P<0.05); NS: Non Significant (P>0.05)

Table 2: Mean values of BAEP in both ears – interpeak latencies (IPL) and amplitude of wave I and wave V in two groups

	Normotensives Mean±SD (n=30)	Hypertensives Mean±SD (n=30)	P value
IPL I-III (msec)	1.878±0.18	1.98±0.21	> 0.05 (NS)
IPL III-V (msec)	1.90±0.28	1.89±0.34	> 0.05 (NS)
IPL I-V (msec)	3.78±0.20	3.87±0.32	> 0.05 (NS)
Amplitude I (µv)	0.31±0.18	0.36±0.25	> 0.05 (NS)
Amplitude V (µv)	0.55±0.21	0.57±0.30	> 0.05 (NS)

S: Significant (P<0.05); NS: Non Significant (P>0.05)

Table 3: Correlation between Blood Pressure and BAEP latencies (Karl Pearson’s coefficient of correlation)

BAEP Waves	Systolic BP	Diastolic BP
	Correlation coefficient (r)	Correlation coefficient (r)
Wave I	0.56 (S)	0.51 (S)
Wave IV	0.08 (NS)	0.16 (NS)

* Significant correlation (r>0.5)

CONCLUSION:

There are changes in the BAEP in patients with hypertension but the result was statistically significant from normotensive group only in absolute wave latencies of wave I & IV. However statistical significance could not be established for rest of the parameters. The findings of the current study, thus suggests that hypertension does affect the neuronal excitation/conduction in the auditory pathways. The absence of significant differences between all the waves of hypertensives and normotensives could be due to the small number of subjects in all the groups and this needs larger studies for further interpretation. As to what is the exact cause of this derangement is still a matter of debate. Thus our findings suggest that hypertension does affect the neural excitation/conduction in the auditory pathways. Both the peripheral auditory pathway and the central brainstem pathway of transmission are affected.

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