BRAINSTEM AUDITORY EVOKED POTENTIALS WITH PONTOCEREBELLAR ANGLE TUMORS

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SUMMARY :

Brainstem auditory evoked potentials (BAEP) were obtained from 13 patients with pontocerebellar angle (PCA) tumors whose pathological diagnosis was as follows: 7 acoustic neurinoma, 3 meningioma, 1 neurinoma, 1 brainstem epidermoid tumor, 1 arteriovenous malformation. Notable abnormalities were observed in the BAEPs generated by stimulating the ear ipsilateral to the lesion.

KEY WORDS:

Pontocerebellar angle tumors, BAEP

INTRODUCTION

BAEP has been used as an electrophysiological means of searching and localizing a suspected lesion in the brainstem (1,10). The approximate neural generators of the first five waves was suggested by Jewett after lesion experiments in cats to be the acoustic nerve, ipsilateral cochlear nucleus, superior olivary complex, lateral lemniscus and inferior colliculi respectively (2).

It was reported by Stockard and Rossiter in 1977 that BAEP's were in similar localization in humans and the VIth and VIIth waves were composed of medial geniculate body and deep hemispheric areas respectively (10).

This electrophysiological investigation was studied on different brainstem lesions by several investigators and a real diagnostic value was proven in posterior fossa lesions besides other neurological and radiological investigations (3,4,10).

We have studied BAEP's of 13 patients with operatively proven tumors located within the cerebellopontin angle and demonstrated the usefulness of BAEP recordings in such cases.

MATERIAL AND METHODS

BAEP: BAEPs were obtained using Medelec MS 92 electroneuromyography instruments and Medelec ST-5 stimulator. Patients were placed in supine position and if necessary were given diazepam IM to facilitate muscle relaxation. The electroencephalogram (EEG) needle electrodes were placed on the vertex (Cz) as reference and mastoids subcutaneus as actives. Ground electode was placed on the forearm. 0.1 msec square wave pulses were monaurally given through alternating-click stimulation headphones at a rate of 10 per second and an intensity 65 decibels (db) above the mean hearing threshold. The ear contralateral to the one stimulated was masket by white noise. Sweep speed was 10 msec, band-pass was 200Hz-2khz. The averaged potentials were found as 1024 stimulus and this was repeated at each ear 2-4 times. The latencies of waves I, II, III, IV, V, interpeak latencies of waves I-III, III-V and amplitude rate of waves I/V were studied.

Table 1 summarizes the age, sex and clinical details of the 13 patients. As a control group 15 normal individuals (8 females, 7 males) between ages 19-60 (average being 38) are considered.

RESULTS

BAEP: A total of 13 patients were investigated. In 4 cases no BAEP record could be obtained following the first wave record in ipsilateral ear of lesion; in 2 of these cases prolongation in the III-V interpeak latencies in BAEP records of contralateral ear was recorded. In 5 cases prolongation of latency in waves III, IV, V was obtained; in 4 of these cases ipsilateral I-III, III-V interpeak latencies and in 1 case ipsilateral I-III interpeak latency were prolonged; in 2 cases ipsilateral wave V amplitude was decreased when compared with the controls. In 1 case ipsilateral IV, V waves couldn't have been recorded but I-III interpeak latency was prolonged. In 1 case ipsilateral II, III, IV waves were not recorded but I-V

	latencies (msec)					interpeak latencies (msec)		amplitude (μv)	
Waves	I	II	III	IV	V	I-III	III-V	I	V
$C_z - M_i$									
Mean	1,53∓	2,53∓	3,63∓	4,70∓	5,60∓	2,1∓	2,0∓	0,26∓	0,51∓
SD	0,15	0,199	0,202	0,20	0,211	0,1	0,18	0,134	0,18

Table 2: BAEPs in the ipsilateral ($C_z - M_i$) recordings in 15 normal controls

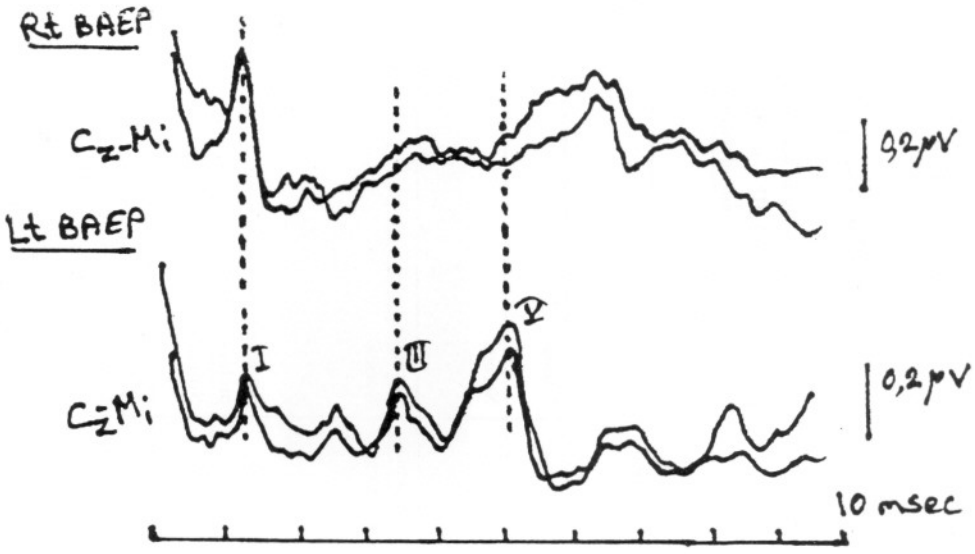

Figure 1 = BAEPs in case 13. Right BAEP: absence of waves II, III, IV, and prolongation of I-V interpeak latency. Left BAEP: normal.

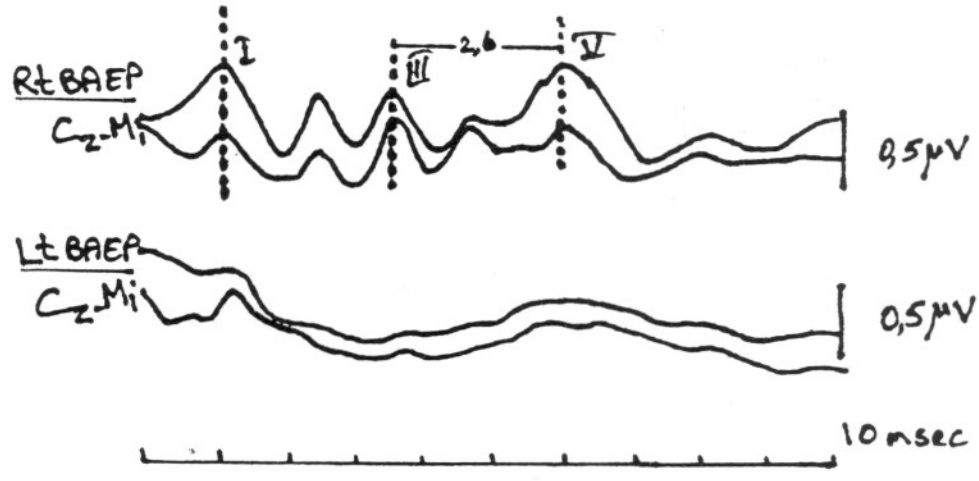

Figure 2 = BAEPs in case 1. Right BAEP: prolongation of III-V interpeak latency. Left BAEP: no potentials after wave I.

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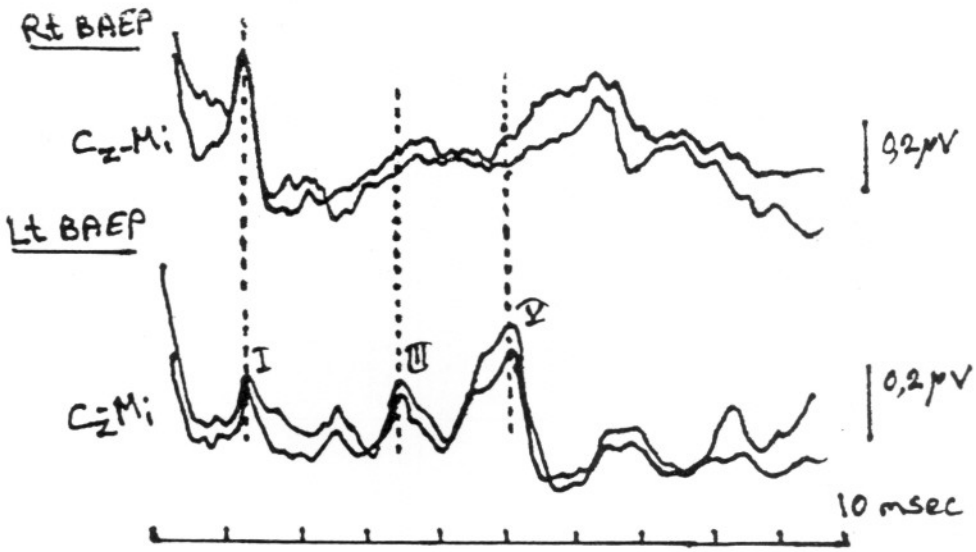

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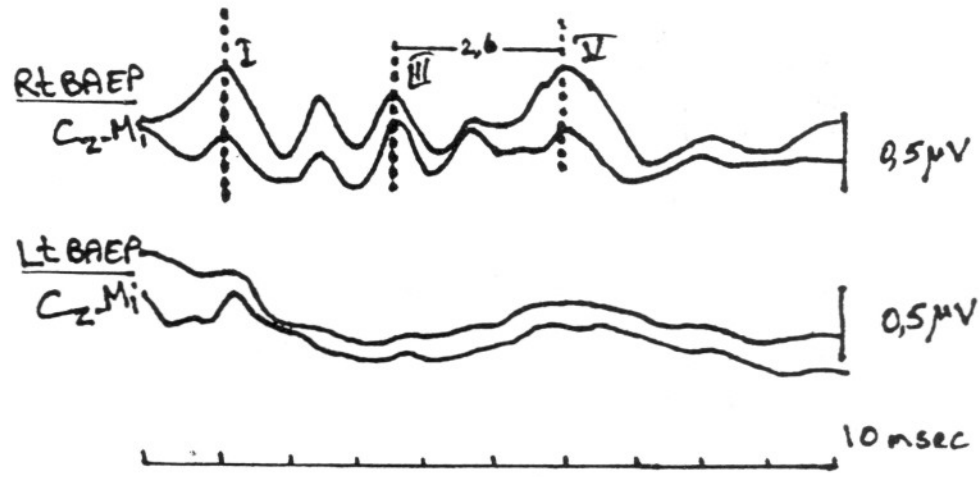

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interpeak latency was prolonged. In 1 case ipsilateral I-III interpeak latency was minimal prolonged. In 1 case the BAEP recordings were normal (Table 1,2. Figure 1,2).

DISCUSSION

Nuclear medicine, CT, MRI reveals the presence of spaceoccupying processes, haemorrhages, structural alterations, oedematous swelling, and substance defects as density differences or zones of different signal intensity. But these radiological methods are unable to differentiate the functional disorders of multisectional brainstem. So, besides clinical investigation, additional electrophysiological measures are necessary for this purpose. Several studies were made in order to investigate the topodiagnostic importance of BAEP in brainstem lesions (3,4,5,7,8,9,10).

Parker et al recorded ipsilateral abnormal BAEP's in all fifty patients with cerebellopontin angle tumors (comprising 41 acoustic neurinomas and 9 meningiomas) by using interpeak latency parameters. CT was normal in 9 of these patients and standard audiometry was normal in 3 of them. Parker suggested that: I-III, III-V interpeak latency abnormalities were the most specific abnormalities, but the absolute latency increase of waves, inter-ear V wave absolute latency difference abnormalities and failure in recording all waves were not that much specific and could be seen in peripheric hearing loss (8). Stockard et al showed that abnormalities of human auditory evoked response were correlated with the location and extent of various brainstem lesions and useful in evaluation of brainstem dysfunction in patients whom radiologic procedures and other laboratory tests had been noncontributory (10).

In our study we couldn't record the potentials after I wave in one patient of seven acoustic neurinomas. In 3 patients (cases 3,7,9) wave latencies III, IV, V and interpeak latencies I-III, III-V were prolonged, wave 5 amplitude reduced. In one case (case 6) waves IV and V couldn't be recorded and I-III interpeak latency was prolonged. Case 9 was operated in 1986 July for left acoustic neurinoma and during his follow-up in 1989 February, waves II, III, IV couldn't be recorded and I-V interpeak latency was prolonged in contralateral side so other radiological investigations were performed and a 1×2cm mass was shown on right PCA. He was operated and the pathology revealed facial neurinoma. In one case (case 13) waves II, III, IV were not recorded and I-V interpeak latency was prolonged. In another case (case 8) BAEP wave latencies were in normal levels but I-III interpeak latency were slightly prolonged. In two of the three meningioma cases (cases 1,4) no BAEP potentials were recorded in ipsilateral ear of lesion except for wave I but III-V interpeak latency was prolonged contralaterally.

In 24 patients with acoustic neurinoma who were studied by Klug and Csecsei, all BAEP waves on the tumor side were absent and displacement of the brainstem to the opposite side with compression of the large neurinomas led to severe deformation of the IV-Vth waves in the contralateral (4). In our two cases 4×5 cm & 5×7 cm tumor masses compressed the brainstem to the opposite side and gave similar BAEP results as above. In case 5, III, IV, V. wave latencies and I-III interpeak latency were prolonged. In case 11 (neurinoma), the potentials after wave 1 couldn't have been recorded but in case 12 (epidermoid tumor), III, IV, V wave latencies and III-V interpeak latencies were prolonged, the amplitude of wave 5 was decreased. In case 10 (arterio-venous malformation) BAEP records were bilaterally normal. We couldn't find an exact correlation between the BAEP results and tumor size. In 16 posterior fossa lesion series which Musiek et al studied, the abnormality in wave III was more than wave I and wave 5 demonstrated the highest incidence of abnormality. Musiek suggested that there were no obvious relationship between the BAEP findings and pure-tone hearing versus tumor size. This finding indicated that other factors such as tumor consistancy, rate of tumor growth, exact site of the tumor, and neural plasticity might prevent the correlation of tumor size and hearing loss (6). Also in this study no significant correlation between the size of the tumor and BAEP findings was observed.

RESULTS

Clinical findings alone do not lead to a definite diagnosis of cerebellopontin angle pathologies. However in such cases BAEPs can show asymmetric specific changes. For this reason, elecrodiagnostic investigations should be considered as part of routine examinations of suspected CPA pathologies.

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