Brainstem Auditory Evoked Response (BAER) in Childhood Bacterial Meningitis


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Abstract. Brainstem auditory responses were recorded in 50 children of bacterial meningitis and age matched 50 normal children. Abnormal BAER was found in 32 (64%) patients of bacterial meningitis. These abnormalities included prolonged latency (56.2%); unilateral absent response (25%); bilateral absent response (25%) and prolonged interwave interval (25%).

Follow-up could be done in 23 patients of 46 survivors. All the patients with prolonged latency either became normal or improved. In majority of the patients having absent response, the abnormality persisted. Abnormal BAER was significantly associated with age < 2 years (p < 0.02), Modified GCS Score < 8 (p < 0.001), Seizures (p < 0.02), raised Intracranial Pressure (ICP) (p < 0.02) and CSF sugar < 20 mg% (p < 0.05). (Indian J Pediatr 1996; 63 : 217-225)

Key words : Bacterial meningitis; Brainstem auditory evoked response (BAER).

Partial or total deafness remains a frequent and unpredictable sequela of bacterial meningitis which is rarely diagnosed in the acute phase of the disease and for which no prevention or specific treatment is available1. The exact incidence of hearing loss following bacterial meningitis has not been established. However, it is generally accepted that about 10% of children who suffer from bacterial meningitis will develop some degree of deafness2.

The lack of a reliable objective method, until recently, resulted in a considerable delay in detecting hearing impairment, with the average age of detection being two to three years3. Availability of evoked potential techniques has made the assessment of hearing function much easier than those of the conventional audiometric techniques which cannot be applied in small children. The present study was undertaken with an aim to assess the brainstem auditory evoked response abnormalities in bacterial meningitis.

Material and Methods

The study group comprised of 50 consecutive patient’s of bacterial meningitis admitted in the children ward of K.G’s Medical College, Lucknow from November 1993 to May 1995. The inclusion criteria in the present study were, a definitive diagnosis of bacterial meningitis and the age group between 6 months to 12 years. Diagnosis of bacterial meningitis was based on clinical and cerebrospinal fluid (CSF) examination4. The patients excluded from the study were those whose clinical condition did not allow them to be shifted to neurophysiology laboratory. Informed consent was taken in each case.

A detailed history and physical exami-
ration were performed in each case which included general, systemic and detailed neurological examination. Auroscopic examination was conducted to exclude the presence of wax, secretions and perforation of the ear drum. Patients with abnormal sensorium were scored according to Modified Glasgow Coma Scale. CSF examination was done in every patient which included pressure, colour, cells, protein, sugar, gram stain and culture and sensitivity. Majority of the patients were treated with Penicillin G (4 lacs units/kg/day) or Ampicillin (300 mg/kg/day) plus Chloromycetin (100 mg/kg/day). Six patients received combination of Ampicillin and Gentamicin (5 mg/kg/day) while four patients were given third generation cephalosporins (Ceftriaxone 100 mg/kg/day). Forty-two (84%) patients were given steroid for 4 days along-with antibiotics from the start of therapy.

Hearing tests were performed using the brainstem auditory evoked response (BAER) technique according to method of Taylor. Recordings were obtained using a Neuro-Pack Four Machine (Nihon Kohden, Japan). Auditory threshold was measured in cooperative children and the normal mean auditory threshold for our laboratory was 21 ± 1.63 dB. Click stimuli with a click rate of 10/second alternating in polarity were used at an intensity of 90 dB hearing level which was approximately 70 dB above the normal mean auditory threshold. The electrical activity was filtered and averaged to 2000 responses. Two tracings were obtained and superimposed in order to check the replicability of wave forms. The first recording was done as soon as the condition of the patient permitted it but preferably within one week after admission. Wherever possible, a followup study was done after the patient was discharged from the hospital.

Normative data were gathered separately from 50 normal children of similar age group in order to compare the results. Twenty children were < 2 years of age. The criteria for abnormal BAER included absent response, prolonged latencies of various waves (> mean + 3 SD) and prolonged interwave interval (> mean + 3 SD). There was significant difference in the latency of various waves and interwave interval in children ≤ 2 years and > 2 years (Table 1 & 2).

Statistical analysis was done using the student’s 't' test. A univariate analysis was also done to find out if there was any correlation between the BAER abnormality and the various clinical features and CSF findings.

RESULTS

Fifty patients of bacterial meningitis were evaluated for BAER abnormality. The age ranged between 6 months to 12 years with a mean age of 4.25 years. Twenty-four (48%) patients were less than 2 years of age. The mean duration of illness prior to admission was 7.68 days with a range of 1-30 days. Thirty (60%) cases had a Modified Glasgow Coma Scale Score of upto 8 and the mean score was 8.68. During the period of study, 4 patients died after initial BAER and none of the other patient was excluded from the study.

CSF culture was positive in 6 cases (12%). The organisms isolated were pneumococcus (4 cases) and staphylococcus aureus (2 cases). All the patients having pneumococcal meningitis had bilateral sensorineural hearing loss (SHL).

Initial BAER recording in study group: