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Evaluation of Brainstem Auditory Evoked Potentials in Preterm Infants: Application of Physics into Clinical Pediatrics and Neonatology

Kumar Senthil P.*, Bhat Kamalakshi, Kumar Vijaya K.***, Kumar Kaushlendra****, Adhikari Prabha*****, Jaganathan******

*Professor, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation (Maharishi Markandeshwar University), Mullana- Ambala, Haryana, India.

**Professor, Dept of Pediatrics, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.

***Associate professor, PhD Candidate, Dept of Physiotherapy, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.

****Selection Grade Lecturer, Dept. of Audiology, Speach Language and Pathology, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.

*****Professor, Dept of Medicine, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.

******Professor, Department of Physiology, Kasturba Medical College (Manipal University), Mangalore, Karnataka, India.

Abstract

This short communication paper was intended to provide an insight towards application of Physics into the field of Clinical Pediatrics and Neonatology through studies on evaluation of Brainstem auditory evoked potentials (BAEPs) in preterm infants. BAEP testing had high sensitivity and specificity in detecting sensorineural hearing loss; high risk infants demonstrated prolonged wave I latency; the peak V latency and I to V interval latency decreased with increasing conceptional age; shortening of the I-V interval and increase in wave I latency, wave I latency was inversely related to infant's weight; BAEP findings were correlated with diffusion tensor imaging, and BAEPs did not provide much diagnostic values in infants without hearing impairments when correlated with MRI findings. The existing evidence supported the use of BAEPs in pediatric/ neonatologic examination of preterm infants.

Keywords: Braisntem auditory evoked potentials; Applied physics; Neonatologic examination; Pediatric examination.

This short communication paper was intended to provide an insight towards application of Physics into the field of Clinical Pediatrics and Neonatology through studies on evaluation of Brainstem auditory evoked potentials (BAEPs) in preterm infants.

BAEPs could be used to identify sensorineural hearing loss in preterm infants as it was found by Bradford *et al*[1] who studied BAEPs in 117 newborn infants of less than 33 weeks of gestation. There was absence of potentials in 10 infants (bilaterally in eight and unilaterally in two) and present in 107. Nine of the 10 infants with absent BAEPs had sensory neural hearing loss and none of the 107 infants with normal BAEP had sensory neural hearing loss. The study demonstrated high sensitivity and sensitivity of BAEP although the sample size was very small.

Streletz *et al*[2] studied BAEPs 93 newborns (49 preterm and 44 fullterm) of which 42 infants (28-42 wk CA) were considered at low risk for perinatal complications and served as

Corresponding Author: Senthil P. Kumar, Professor, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation (Maharishi Markandeshwar University), Mullana- Ambala, Haryana, India. E-mail: senthilparamasivamkumar@gmail.com

control whereas two groups of high risk infants with clinically significant hyperbilirubinemia (31 infants) or hypoxemia (20 infants) were identified and studied. The BAEP abnormalities in the high risk infants consisted predominantly of wave I latency prolongations in hypoxemic infants indicating dysfunction in peripheral auditory processes.

Vles *et al*[3] recorded BAEPs of nine 'healthy' preterm infants at weekly intervals between 32 and 36 weeks conceptional age. The peak V latency and the I to V interval latency was found to decrease with increasing conceptional age.

Soares *et al*[4] recorded BAEPs in 39 preterm infants (3 groups: small-for-gestational-age, with a birthweight less than or equal to 1500 g (SGA); appropriate-for-gestational-age, with a birthweight less than or equal to 1500 g (AGA1); and appropriate-for-gestational-age, with a birthweight higher than 1500 g (AGA2). The authors found a shortening of the I-V interval due to an increase in wave I latency was found in the SGA group. Negative correlations were also found between wave I latency and weight at the time of the examination.

In the absence of hearing impairment, BAEPs did not much provide utility value as found by Olsén *et al*[5] who compared BAEP findings of 42 8-year-old preterm children and those of the full-term born control children, and correlated it with linguistic problems and to the MRI findings.Contrary to expectations, there was no differences found in the absolute latencies nor in the interpeak intervals and in the I/V amplitude ratio. Also there was no correlation with the linguistic problems or to the findings of periventricular leukomalacia (PVL) in MRI.

Reiman *et al*[6] correlated the BAEP findings with diffusion tensor imaging (DTI) of the inferior colliculus in 56 very low birth weight or preterm infants since the latter had been shown to be associated with perinatal white-matter injury and reduced fractional anisotropy (FA) in patients with sensorineural hearing loss. Shorter BAEP wave I, III, and V latencies and I-III and I-V intervals and higher wave V amplitude was found to be correlated with higher FA of the inferior colliculus which suggested that DTI can be used to assess the integrity of the auditory pathway in preterm infants.

Roopakala *et al*[7] compared the BAEP waveforms (absolute and interpeak latencies) in 25 preterm and 25 full-term infants, and found increased latency of BAEP waveform V in preterm babies which suggested a retarded myelination of the central auditory pathway.

BAEP testing had high sensitivity and specificity in detecting sensorineural hearing loss; high risk infants demonstrated prolonged wave I latency; the peak V latency and I to V interval latency decreased with increasing conceptional age; shortening of the I-V interval and increase in wave I latency, wave I latency was inversely related to infant's weight; BAEP findings were correlated with diffusion tensor imaging, and BAEPs did not provide much diagnostic values in infants without hearing impairments when correlated with MRI findings. The existing evidence supported the use of BAEPs in pediatric/ neonatologic examination of preterm infants.

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