



Review Article

Auditory Evoked Potential and Its Application in Assessment of Auditory Functions in Children

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ABSTRACT

Auditory evoked potential (AEP) is an objective way of eliciting brain stem potentials in response to audiological click stimuli. AEP provides information regarding auditory function and sensitivity; it is not a substitute for other methods of audiological evaluation. It should be always viewed in conjunction with other audiological investigations. AEP is resistant to the effects of sleep, sedation, sleep and anesthesia.

Key words: Auditory evoked potential, Auditory brain stem response, ABR audiometry, BAER (Brainstem auditory evoked response audiometry).

INTRODUCTION

Auditory evoked potential (AEP) is an objective way of eliciting brain stem potentials in response to audiological click stimuli. These waves are recorded by electrodes placed over the scalp. This investigation was first described by Jewett and Williston in 1971. Even though AEP provides information regarding auditory function and sensitivity, it is not a substitute for other methods of audiological evaluation. It should be always viewed in conjunction with other audiological investigations.^[1]

Technique:

The stimulus either in the form of click or tone pip is transmitted to the ear via

a transducer placed in the insert ear phone or head phone. The wave forms of impulses generated at the level of brain stem are recorded by the placement of electrodes over the scalp.^[2,3]

Electrode placement:

As the electrodes should be placed over the head the hair must be oil free. The subject is advised to have shampoo bath before coming for investigation. The standard electrode configuration for AEP involves placing a non inverting electrode over the vertex of the head, and inverting electrodes placed over the ear lobe or mastoid prominence. One more earthing electrode is placed over the forehead. This earthing

electrode is important for proper functioning of preamplifier.

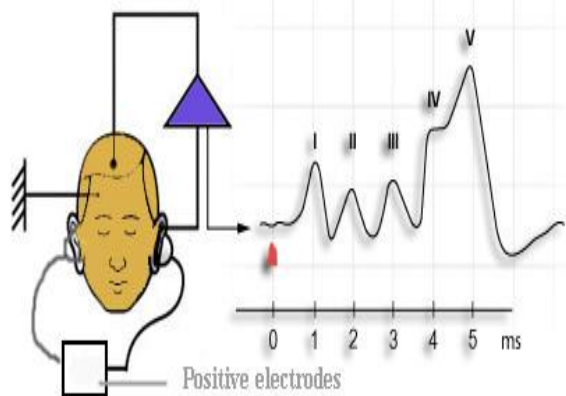


Figure showing placement of AEP electrodes

The potentials recorded away from the site of impulse generation, the wave forms recorded are weak and they need to be amplified. The amplification is achieved by improving the signal: noise ratio by-Filtering, Repeated stimulation and Polarity alteration.

In auditory evoked potential, the impulses are generated by the brain stem. These impulses when recorded contain a series of peaks and troughs. The positive peaks (vortex positive) are referred to by the Roman numerals I – VII. [4]

These peaks are considered to originate from the following anatomical sites:

1. Cochlear nerves - waves I and II
2. Cochlear nucleus - wave III
3. Superior olivary complex - wave IV
4. Nuclei of lateral lemniscus - wave V
5. Inferior colliculus - waves VI and VII

These peaks occur in most readable form in response to click stimuli over a period of 1 - 10 milliseconds after the stimulus in normal hearing. AEP is resistant to the effects of sleep, sedation, sleep and anesthesia. Its threshold has been found to be within 10dB as elicited by conventional audiometry.

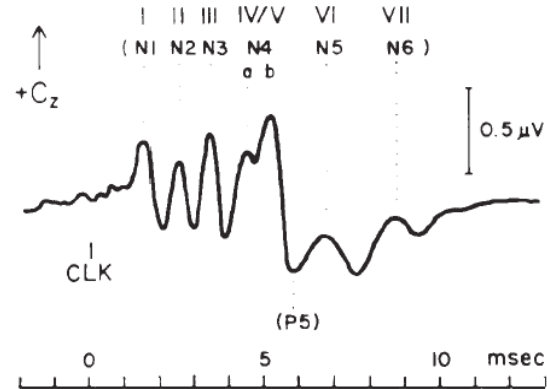


Illustration showing various wave forms of AEP

AEP is highly useful for objective threshold estimation of hearing as well as differential diagnostic purposes.

Salient features of AEP

1. Recording is made from brain stem potentials
2. Click stimulus is used
3. Responses are not frequency specific
4. Can be performed in awake and restless patients
5. Responses begin after 1 - 10 milliseconds after stimuli
6. Suitable for even young children

Uses of AEP:

1. It is an effective screening tool for evaluating cases of deafness due to retrocochlear pathology i.e. (Acoustic schwannoma). An abnormal AEP is an indication for MRI scan.
2. Used in screening newborns for deafness.
3. Used for intraoperative monitoring of central and peripheral nervous system.
4. Monitoring patients in intensive care units
5. Diagnosing suspected demyelinated disorders.

AEP has 90% sensitivity and 80% specificity in identifying cases of acoustic schwannoma. The sensitivity increases in proportion to the size of the tumor. [5]

AEP is a useful tool for screening newborn babies under following circumstances:

1. Parental concern about hearing levels in their child

2. Family history of hearing loss
3. Pre and post natal infections
4. Low birth weight babies
5. Hyperbilirubinemia
6. Cranio facial deformities
7. Head injury
8. Persistent otitis media
9. Exposure to ototoxic drugs

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