Longitudinal Changes in eERPs in Children with ABIs: Preliminary Results Recorded over Three Years

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Disclosures

- Craig A. Buchman is a member of Cochlear Corp. Surgeon’s Advisory Board.

- Holly F.B. Teagle is a member of Cochlear Corp. Audiology Advisory Board.
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Introduction

- Electrically evoked auditory event-related potentials (eERPs) are cortically generated responses to electrical stimulation that can be recorded from scalp electrodes.

- eERPs can be used to document maturational changes in the auditory pathway in children with cochlear implants (Ponton et al., 1996).
Introduction

- The feasibility of measuring the eERP in children with auditory brainstem implants (ABIs) has been established in our previous studies (He et al., 2015, 2016).

- eERPs recorded within the first six months of ABI use showed good test-retest reliability (He et al., 2016).
Study Aims

- To evaluate longitudinal changes in eERPs in children with ABIs.
- To explore whether these changes could be accounted by maturation in the central auditory system in these patients.
Methods

Subjects:
- Five children with ABIs (S1- S5) ranged in age between 4.1 and 7.5 years at the time of the most recent test session.
  - S1, S4 and S5 had listening experience with CIs prior to the ABI.

Stimuli:
- Pulse trains with a pulse rate of 250 pps presented at the C level.
- The speech processor was bypassed and the pulse train was directly delivered to individual electrodes.
Methods

- **eERP recordings:**
  - Responses were recorded in at least two test sessions. The inter-session interval varied between one to 35 months.
  - Intra-class correlation (ICC) test was used to evaluate test-retest reliability of responses recorded across test sessions.
    - Poor test-retest reliability: ICC correlation $\leq 0.4$
Results: S1
Results: S1

Strong contraction of ipsilateral sternocleidomastoid muscle.
Results: S1

Strong contraction of ipsilateral sternocleidomastoid muscle.
Results: S2

- This participant has Michel aplasia.
- eERPs were not recorded at one, six, or nine months.
- Trace recorded at nine and 12 months were evoked using the same stimulating parameters.
- S2 only showed reliable behavioral responses to electrical stimulation of the ABI after the emergence of the eERP.
Results: S3
Results: S3

No repeatable response was measured at 30 months using the same stimulating parameters.
Results: S4 and S5

S4

 ICC
0.91 → 0.37*
0.87 → 0.19*
0.59 → 0.27*
0.96 → 0.08*
0.41 → 0.23*
0.83 → 0.27*
0.74 → 0.31*
0.46 → 0.04*
0.60 → 0.13*
0.21* → 0.12*

S5

 ICC
0.63 → 0.37*
0.81 → 0.66
0.83 → 0.68
0.81 → 0.73
0.14* → 0.75
0.83 → 0.69
Conclusions

- eERPs in children with ABIs could change over a long period of time.

- Maturation of the central auditory system could not fully account for these observed changes.

- Children with ABIs need to be closely monitored for potential changes in auditory perception and unfavorable non-auditory sensations.

- Further studies with neuroimaging techniques are needed to better understand the emergence of non-auditory stimulation over time in these children.
Thank you!