

Cortical Maturation in Children with Conductive, Mixed, and Unilateral Hearing Losses

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BACKGROUND

Microtia/Atresia

- Microtia/atresia is a small pinna and absence of an ear canal that occurs at birth and leads to conductive hearing loss¹
- One possible treatment for this is a bone conduction or osseointegrated device (OID). This sends sounds directly to the cochlea, bypassing the outer and middle ear¹

Cortical Auditory Evoked Potentials (CAEP)

- The P1 CAEP response is a biomarker of auditory cortex maturation that can provide objective information about cortical development and effects of intervention^{2,3,4}

CAEPs in Conductive and Mixed Hearing Losses

- There are few studies investigating CAEPs in mixed and conductive hearing loss cases
- One study measured CAEPs in a child with bilateral conductive/mixed hearing loss utilizing an OID that indicated CAEP response indicating delayed maturation of central auditory pathways for this child⁵

AIM: This poster will examine a case study of a patient with unilateral congenital microtia/atresia for 40 years to examine the impact of conductive hearing loss on cortical maturation and methods of eliciting the CAEP response.

METHODS

- P1 CAEPs measured in a sound booth in response to an auditory speech stimulus (i.e. /ba/)
- 5 electrodes placed on the scalp and face
- Presented in the following configurations:
 1. Speaker
 2. Bone oscillator with non-atresia ear masked (via insert earphone)
 - Masking done by playing a speech-weighted noise to the contralateral ear to isolate the ear with microtia/atresia

CASE STUDY: Unilateral Congenital Microtia/Atresia

Case History

- Patient born with unilateral microtia/atresia of the left ear
- **Left ear:** Moderate to severe conductive hearing loss
- **Right ear:** Mild to moderate sensorineural hearing loss from 2-4 kHz (otherwise normal thresholds) in the right ear
- Patient is to be fit with an OID but currently utilizing no devices at this time

Results

- P1 CAEP shows morphology and latency within normal range
- No differences in P1 CAEP latency observed when comparing speech presented binaurally through the speakers versus speech presented to the microtia/atresia ear via bone conduction with the non-atresia ear masked

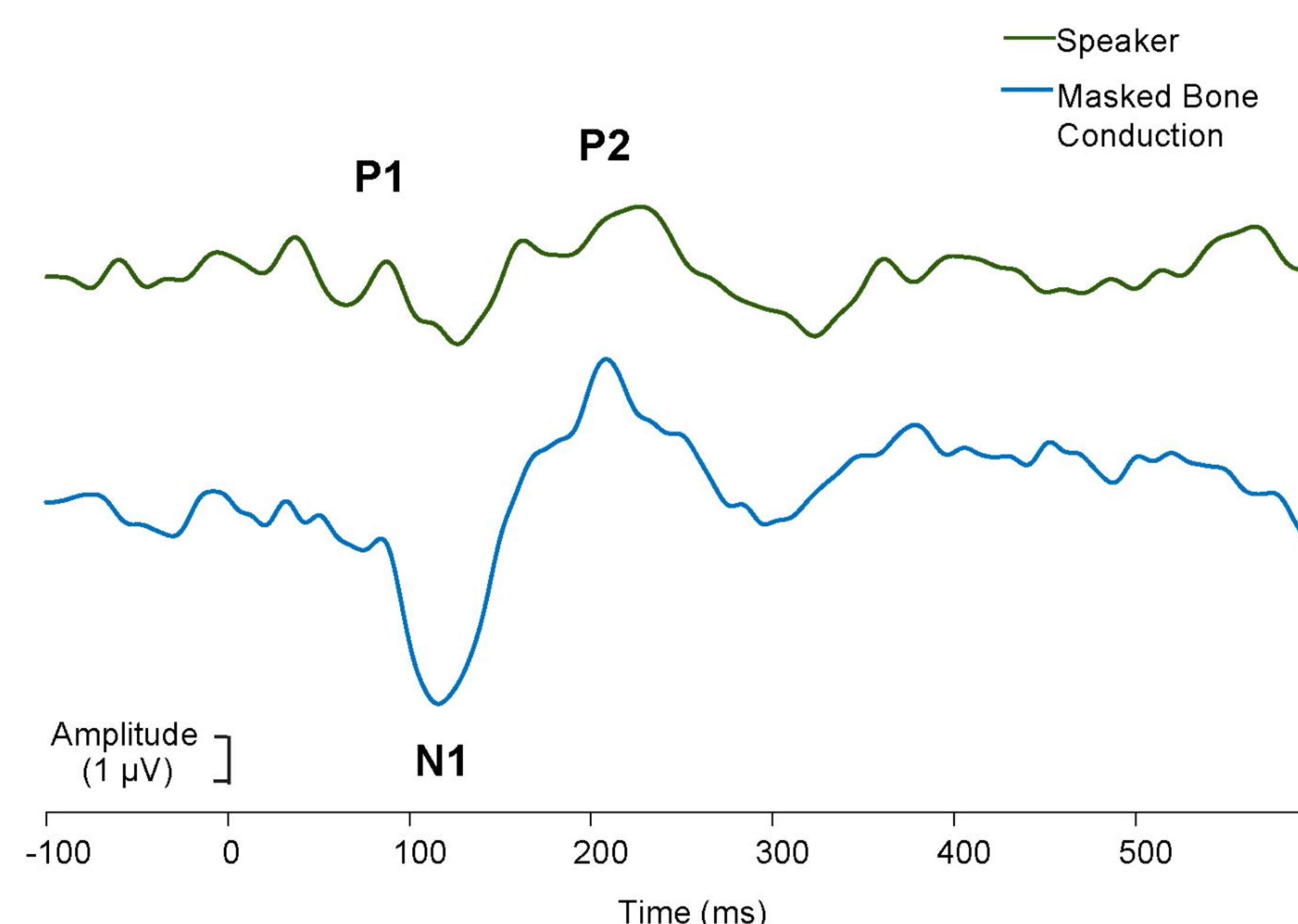


Figure 1. CAEP presented in the soundfield (top, green) and through the bone oscillator with non-atresia ear masked via insert (masked bone conduction) (bottom, blue).

Clinical Implications

- Despite reduced hearing in the left ear from untreated microtia/atresia, P1 CAEP latencies are normal, indicating appropriate cortical maturation.
- Testing was similar when speech presented to both ears in the soundfield and when the microtia/atresia ear was isolated when presenting via bone conduction and masking the opposite ear
- We plan to repeat testing after implanted with OID to examine differences

DISCUSSION & CONCLUSIONS

- While CAEP testing has been well established in sensorineural hearing loss (SNHL), less research has been done examining the impact of conductive and mixed hearing losses on cortical maturation⁶
- Testing from this case study indicates feasibility of testing CAEPs both binaurally and ear specific for patients with microtia/atresia and those with bone conduction devices
- This information may be important when considering treatment and early intervention for children with conductive and mixed hearing losses considering bone conduction devices

Future directions

- Continue to measure CAEPs in additional children and adults with conductive, mixed, and unilateral hearing losses with and without bone conduction devices

If you know persons with conductive or mixed hearing loss who may be interested in participating in our study, please contact Dr. Anu Sharma in the Brain & Behavior laboratory at CU Boulder: EEGLab@Colorado.edu

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