Effects of Stimulus Intensity on Electrocochleography in Individuals at Risk of Hidden Hearing Loss

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Objectives: The present study aimed to find an Electrocochleograhy (ECochG) protocol sensitive enough to detect the presence of hidden hearing loss in individuals with a history of noise exposure by exploring the changes in the summation potential (SP) and AP amplitude ratio of low and high risk individuals as the stimulus intensity was decreased.

Background: Hidden hearing loss is the undetected loss in neural output at the ribbon synapses. ECochG is a viable option for identifying such loss. Specifically recording ECochG potentials at lower intensity levels can have negative impact on the action potential (AP) amplitude and latency, thus allowing for the investigation of the neuron firing patterns in patients with and without suspected hidden hearing loss.

Methods: 18 young females underwent: pure tone testing from 250-12000 Hz, tympanometry, acoustic reflexes at 500-4000Hz, DPOAEs, speech in quiet and speech in noise testing, and ECochG recordings made using a 9.1 clicks/sec stimulus at 50, 60, 70, and 80 dB nHL. A split-plot repeated measures analysis of variance (ANOVA) was conducted to evaluate the effects of changes in intensity on AP amplitude and latency. An independent samples t-test was used to compare SP/AP amplitude ratio at 80 dB nHL.

Results: Split-plot ANOVA of AP amplitude revealed a significant interaction between group intensity levels effects. Split-plot ANOVA of AP latency revealed no significant difference between groups, or interaction between groups and intensity levels. The t-test analyses of SP/AP amplitude ratio showed a statistically significant difference between the two groups.

Conclusions: The results revealed that intensity level has an effect on AP amplitude that is dependent on the history of noise exposure. This reduction in AP amplitude resulted in increased SP/AP amplitude ratio which could help identify individuals at risk of hidden hearing loss.