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Influences of syllabic compression on speech evoked potentials in Cochlear Implant users.

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Background: Fitting of Cochlear Implants is usually based upon subjective statements of the patients about their auditory perception. Cortical Auditory Evoked Potentials (CAEP) are a well known method to get information about auditory perception without any cooperation of the subject. This paper describes speech evoked CAEP in cochlear implant listeners. In particular, the influence of syllabic compression was investigated for two consonant-vowel-syllables differing in the voicing of the consonant.

Methods: CAEP were recorded from ten cochlear implant listeners provided with a nucleus freedom implant. A sine burst and the natural syllables /ta/ and /da/ were used as stimuli for the CI implanted group, without and with activated acoustic preprocessing. Additionally, CAEP to the same speech and tone stimuli were derived in five normal hearing subjects serving as a reference group. All stimuli were presented at 60 dB SPL.

Results and Discussion: In all subjects CAEP could be reliably recorded and a clear N1-P2 complex was observed. In the CI group N1 and P2 latencies are significantly larger than those of the normal hearing group. While N1 amplitudes differ not significantly between the two groups P2 amplitude is decreased in the cochlear implant group. In all subjects the sine burst elicits earlier N1 and P2 components and larger N1 amplitudes than the spoken syllables.
The speech stimulus /ta/ elicits earlier N1 and P2 components than /da/ in both groups which can be explained by the different time-frequency properties of the voiced and unvoiced consonant, respectively. Latencies of both N1 and P2 decrease when syllabic compression is used, while N1 – P2 interpeak amplitude decreases. In summary, CAEP can be reliably recorded on CI users and a syllabic compression yields to significant changes in CAEP. These changes can be explained by a more spread activation along the electrode array as a result of the enhanced level. The study demonstrates that speech evoked CAEP are a candidate for objective evaluation of acoustic preprocessing algorithms. Furthermore, the study indicates different speech processing in CI listeners and in normal hearing listeners.