

NORMATIVE FINDINGS OF ELECTRICALLY EVOKED COMPOUND ACTION POTENTIAL (ECAP) MEASUREMENTS USING THE NEURAL RESPONSE TELEMTRY (NRT) OF THE NUCLEUS CI24M COCHLEAR IMPLANT SYSTEM

Denise Cafarelli Dees¹, Norbert Dillier², WaiKong Lai², Ernst von Wallenberg³, Bas van Dijk⁴, Guido Smoorenburg⁵

¹Cochlear Europe Ltd., London, UK, ²UniversityHospital,Zurich, Switzerland, ³Cochlear AG, Basel, Switzerland, ⁴ Cochlear TechnologyCentre, Antwerp, Belgium, ⁵University Hospital Utrecht, Netherlands

147 adult recipients of the Nucleus 24 cochlear implant system, from 13 different European countries, were tested using Neural Response Telemetry (NRT) to measure the amplitude growth function (AGF) of the electrically evoked compound action potential (ECAP), according to a standardized postoperative measurement procedure, and to record the ECAP characteristics (waveform morphology, peak amplitudes and latencies, AGF slope, and extrapolated ECAP threshold, "T-NRT"). Consistent and reliable recordings were obtained in 96% of these subjects (141 out of 147, and in 96% of all tested electrodes (621 out of 647), with this standardized procedure.

While large inter-subject variability was found, results fell within a consistent pattern and a normative range of peak amplitudes and latencies, AGF slope, and ECAP thresholds (T-NRT) for the five test electrodes (Electrodes 20, 15, 10, 5, 3) was established. These NRT characteristics were also compared with recorded subject factors such as age, etiology and duration of deafness. A significant effect of age on the AGF slope was found. When age is categorized into four groups of 15 years, the slope at category 1 (age 15-30yrs) is significantly larger ($p > 0.05$) than in the other groups and the correlation is similar across all test electrodes.

The subjects' current stable MAP levels were also recorded with a wide variety of stimulation rates and coding strategies found. The correlation between the extrapolated T-NRT and MAP T/C Levels, for such a diverse group of subjects and settings, was statistically significant but weak. However, to investigate "the closeness of fit" for NRT MAP prediction methods and actual MAPs; differences (rms) between T-NRT levels and NRT predicted MAP levels based on 3 different fitting algorithms with the actual MAP levels were also calculated for different MAPs rates.

The results of this study on such a large and diverse group of subjects in so many different countries and by different clinicians provides a useful normative reference dataset for clinical application of NRT as well as future research studies.