Bilateral Cochlear Implantation: Sensitivity to Binaural Information

Laback[1] B., Pok[1] S. M., Schmid[1] K., Deutsch[1] W. A., Baumgartner[2] W. D.
[1]*Acoustics Research Institute, Austrian Academy of Sciences*
[2]*ENT-Department, Vienna University Hospital*

Objectives:
To measure the sensitivity of binaural cochlear implant listeners to interaural level and time differences (ILD and ITD) and to quantify the bilateral benefit for speech discrimination in noise, using unsynchronized CI-processors.

Study Design:
Two binaural CI-users completed a series of experiments, including adaptive measurement of JNDs for ILD and ITD for various stimulus configurations, lateralisation based on ILD and ITD, and adaptive measurement of speech reception thresholds in noise under different interaural conditions.

Results:
Both subjects showed similar performance in all experiments. The sensitivity to ILD was within the range of normal hearing reference subjects. This holded both for different types of broadband signals and for stimulation of single pitch-matched electrode pairs. Regarding ITD, the observed JNDs were considerably larger than for normal hearing subjects. Clicktrains worked better than stochastic noise signals or a short speech fragment. ILDs produced lateral positions comparable to normal hearing listeners, whereas larger ITDs were needed to obtain a comparable degree of lateralisation. The speech-reception thresholds in noise yielded a diotic summation effect of 0.5-1 dB and a binaural squelch effect ($S_0N_\pi/S_\pi N_0 - S_0N_0$) of 0.3-2.1 dB.

Conclusions:
In the tested subjects, interaurally unsynchronized state-of-the-art CI-processors provided access to binaural advantages based on ILDs similar to NHs, and limited access to interaural temporal disparities.

Contact:
Bernhard Laback
Acoustics Research Institute, Austrian Academy of Sciences
Liebigg. 5, A-1010-Wien, Austria
Tel.: 0043-01-4277-29514
Fax.: 0043-01-4277-9296
email.: Bernhard.Laback@oeaw.ac.at