## H2-7 Bilateral Signal PreProcessing for cochlear Implant users

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OBJECTIVES:

Speech understanding in real-life noisy environments represents a significant challenge to most CI-recipients. Bilateral signal preprocessing might improve auditory communication in these situations.

STUDY DESIGN: A wearable, real-time signal preprocessing unit is connected to a standard speech processor via auxiliary input. The subject carries a two-microphone endfire-array on each ear. FIR-Filtering and summation of the signals from the front and back microphone elements creates restricted super-directive signals for the left and right ear. These signals are then routed into an adaptive spectral subtraction unit, which attenuates uncorrelated sound components. The resulting noise reduced two-channel output signal can be presented either to the two speech processors of a bilaterally implanted subject, or it can be summed and presented to the single speech processor of a monaurally implanted cochlear implant user.

Speech reception thresholds for 50% intelligibility were measured using sentences in noise (SN50), both with and without the processing scheme. Subjective impressions were also recorded.

RESULTS:

Our recent studies suggest an improvement of the SN50 due to the preprocessing scheme of up to 8dB in diffuse noise, i.e. perception of speech could be increased by 30 to 80%. In a busy cafeteria, all subjects noted a substantially reduced background-noise and an improved ability to communicate, as soon as the preprocessing was activated.

CONCLUSION:

Bilateral signal preprocessing can improve auditory communication for cochlear implant users in challenging acoustic environments considerably and may be integrated in future advanced signal processing speech processors.

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## H2-8 Self-reported benefit from bilateral cochlear implantation in post-lingually deafened adults: interim results from a randomised controlled trial.

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AIMS:

To measure the benefit to post-lingually deafened adult patients of receiving a second multi-channel cochlear implant, while controlling for late-emerging benefits of the first implant.

METHOD:

Users of Nucleus unilateral multi-channel implants (N = 28) were randomised either to receive a second implant immediately (Experimental Group), or to wait 12 months and then receive a second implant (Control Group). Outcomes were measured at the start of the study, and 3 and 9 months after the start, using self report instruments in four domains: (1) spatial hearing and speech perception in the presence of competing sounds, (2) otologically-relevant quality of life, (3) generic quality of life, and (4) health utility. The instruments selected for domains (2), (3), and (4) have previously shown significant benefits from unilateral implantation. The instruments in domains (3) and (4) can contribute estimates of utility for cost-utility calculations.

RESULTS:

Nine months after receiving their second implant, the Experimental Group attained significantly higher scores than the Control Group in domains (1) and (2), but not in domains (3) and (4). In domain (1), skills in spatial hearing were reported to improve more than skills in speech perception in the presence of competing sounds.

CONCLUSIONS:

Receiving a second multi-channel implant has significant beneficial effects on spatial hearing and aspects of quality of life. However, these benefits are not sufficiently impactful to register on instruments that measure generic quality of life and health utility.

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## H2-9 The effect of deep electrode insertion on sound source localization in users of the MED-EL COMBI 40 + cochlear implant

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OBJECTIVES:

To assess the effect of electrode insertion depth on the ability to localise sounds in bilateral cochlear implant users.

STUDY DESIGN:

Localisation tests are performed with a nine loudspeaker set-up in the frontal horizontal plane. Levels are randomised at 60/70/80 dB SPL. Bursts of CCITT noise are used as test items. Five presentations per level and loudspeaker are used. The contribution of different sections of the cochlea is assessed in tests with 4-electrode configurations located in the apex, the middle and the base of the cochlea on both sides. The effect of extending the insertion depth whilst keeping the number of electrodes constant is investigated in tests with 8 electrodes gathered at the base of the cochlea, 8 electrodes gathered at the apex, and 8 electrodes spread over the complete length of the cochlea, on both sides. The effect of different less-than-full insertion depths between sides is assessed in tests using 8 electrode configurations which are or are not shifted in cochlear position between sides.

PATIENTS:

Subjects are adults which are bilaterally implanted with MED-EL COMBI 40/40 + implants.

MEASURES:

Measures of performance include the average deviation of the response azimuth from the azimuth from which a stimulus was presented, and the standard deviation of the responses.

Results: Results so far show that the insertion depth does have an effect on sound localisation.

CONCLUSIONS:

Deep electrode insertion provides an advantage to bilateral cochlear implant users.

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