

Bilateral Cochlear Implant and Bimodal Hearing with Cochlear Implant and Hearing Aid

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After successful cochlear implantation on one ear, some patients continue to use their hearing aid at the opposite side. They report an improved understanding of speech especially in noise as well as a better perception of music when hearing aid and cochlear implant are worn in combination. A survey with 11 bimodal and 4 bilateral supplied subjects was carried out to assess speech understanding and localization ability. The bimodal subject group was provided with the same type of hearing aid. A week after the initial fitting a fine tuning of the hearing aid program was performed and speech tests were conducted subsequently. The localization tests were carried out in an anechoic room in complete darkness. To minimize non-binaural hints a roving level paradigm was used. Subjects pointed to the direction of sound incidence by use of a trackball with a computer-controlled laser-pointer. The high precision of the method permits the discussion of the displayed localization results in terms of the accuracy of localization.

Results: The additional usage of a hearing aid improved speech understanding in 9/11 subjects of the bimodal supported group. Two subjects with substantial residual hearing of the bimodal group also showed improved localization ability, five subjects were able to differentiate the side of sound origin. All subjects of the bilateral cochlear implant subject group displayed localization ability with varying precision. One bilateral supplied subject showed a localization accuracy of 10 degrees. An explanation for these remarkable results is difficult as the bilateral cochlear implants are controlled by two independent speech processor devices running without a common clock, thus interaural time difference cues seem to be distorted. Interaural level differences seem to carry enough directional coding information although different compression schemes might distort the interaural envelope differences to some extent.