

Making the most of cochlear reserve with acoustic implants

Hannes Maier¹, Thomas Lenarz¹

¹Medizinische Hochschule Hannover, Hannover

Introduction

Active Middle Ear Implants (AMEIs), Direct Acoustic Implants (DACIs) and Bone Conduction Instruments (BCI) are a cornerstone for treating conductive (CHL) and mixed hearing loss (MHL) in clinical routine. On one side conventional hearing aids (HA) offer a noninvasive alternative and on the other side cochlear implants (CI) are an option if sensorineural hearing losses are too pronounced.

Method

As indication ranges overlap differential indication criteria can be divided into two separate questions: (1) When is the residual hearing (cochlear reserve) good enough to get better results with acoustic stimulation compared a cochlear implant (CI) and (2) Which category (AMEI, DACI, BCI, HA) can cover a large enough part of the residual dynamic range to get sufficient results?

Results

According to our results (Kludt et al., 2016) with direct acoustic stimulation speech in quiet is only slightly superior or equivalent whereas speech in noise is statistically significant superior to a CI. Further, results are better predictable for the Codacs due to small variability and the necessary rehabilitation time is much shorter.

In cases of moderate – severe sensorineural hearing loss (SNHL) it was demonstrated that HA do not reach their full potential, compared to headphones (Hoppe et al., 2015). Here our data shows that acoustic implants may be advantageous to HA.

Technical restrictions of HA even more apply in MHL where up-to-date HA and BCI come to their limitations in terms of MPO and/or gain (Zwartenkot et al., 2014). Here the surgical reduction of the air-bone-gap (ABG) is a possible option to enable sufficient benefit from HAs. However, our analysis shows that a significant proportion cannot be satisfied with state-of-the-art power HA postoperatively.

Conclusion

Although expensive and invasive, AMEIs and DACIs that circumvent the middle ear are an indispensable option for optimal treatment results.

Reference List

1. Hoppe, U., A. Hast, and T. Hocke. 2015. Audiometry-Based Screening Procedure for Cochlear Implant Candidacy. *Otol Neurotol* 36:1001-1005.
2. Kludt, E., A. Buchner, B. Schwab, T. Lenarz, and H. Maier. 2016. Indication of direct acoustical cochlear stimulation in comparison to cochlear implants. *Hear Res* 340:185-190.
3. Zwartenkot, J. W., A. F. M. Snik, E. A. M. Mylanus, and J. J. S. Mulder. 2014. Amplification Options for Patients With Mixed Hearing Loss. *Otology & Neurotology* 35.