

Abstract EFAS/DGA 2007

Implantable hearing aid transducers: Output measured for different coupling parameters

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Background/Aims:

Several principles of implantable hearing systems exist. In this study the influence of coupling parameters of different output transducers was investigated i.e. Direct acoustical cochlear stimulator (DACS), Floating mass transducer (FMT), a driving rod transducer (DRT) and a contactless electromagnetic transducer (CLT).

Material and Methods:

Experiments were performed with Laser doppler vibrometry on a life size mechanical ear model, fresh human temporal bones, as well as on human cadaver whole heads fixated according to Thiel.

The mechanical middle ear model offers direct access to the middle ear cavity to perform implantation and Laser measurements. On the other hand a mastoidectomy and facial recess approach was performed in the temporal bones and the Thiel fixed whole heads. A specific set of coupling parameters was tested for each transducer.

Results:

Results show a substantial impact of coupling parameter variations on the output of the CLT, FMT and less on the DACS and DRT. e.g. a load on the FMT cable alone already has an effect up to 20 dB in the frequencies important for speech intelligibility i.e. 500-1500Hz. Results from Thiel and the mechanical middle ear model are comparable to those of fresh temporal bones.

Conclusion:

Specific coupling parameters have to be considered in most of the transducers while implantation. Secondary, our experiments showed similar Laser doppler vibrometry characteristics for heads fixated according to Thiel and fresh temporal bones and a life size mechanical middle ear model.

