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First application of fully implantable hearing aids in patients with congenital auricular atresia

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Congenital auricular atresia is a malformation with an incidence of 1:8000. Whereas the inner ear anatomy and function is normal in most of these patients, they suffer from a conductive hearing loss with an air-bone gap of 60 dB. Conventional bone conducting hearing aids or bone anchored hearing aids (BAHA™) are current treatment options with several disadvantages. Transcutaneous implants require constant attention to hygiene to avoid infections. The mode of operation is to vibrate the entire skull, thereby destroying binaural cues that a patient might want to use for directional hearing and speech recognition in noise.

Surgical construction of the sound conducting apparatus has been performed by others and modified by us into a three-step procedure with in-vivo prefabrication of the external ear canal and the tympanic membrane (Laryngoscope 113, 2021 – 2029, 2003). Although the results improved after inauguration of our modifications, there still remains an air-bone gap that makes air conducting hearing aids necessary in many patients.

Implantable hearing aids have been developed for patients with perceptional hearing loss and normal middle ear function, but not for patients with middle ear disease or malformation.

We have modified the surgical instruments, the transducer and the operative technique of the only fully implantable hearing aid (Otologics Fully-Implantable MET™) clinically available and implanted it in five patients with congenital auricular atresia.

After activation and fitting of the devices we see an improvement of the sound-field thresholds up to 50 dB HL. The mean functional gain in a three frequency pure tone average is about 35 dB HL.

This technique seems to provide a completely new dimension for the audiological rehabilitation of patients with severe malformation of the middle ear.