9.8

Functional evaluation of middle ear prostheses

H. Mojallal[3], M. Stieve[3], C. Turck[3], I. Krueger[1], F. Dimpfel[2], N. Witteck[1], B. Süß[1], P. Behrens[1], P. Mueller[2], T. Lenarz[3], Hannover[1,3], Braunschweig[2]; Germany

In order to improve new materials for middle ear prostheses, a method for evaluation of the transfer function of these materials had to be developed. The measurements were performed in three stages. Firstly, a mechanical middle ear model was designed which should simulate the mechanical and acoustical characteristics of an intact middle ear. In this model different conventional and new prostheses were measured by means of laser Doppler velocimetry (LDV). To control the stiffness of the system, we used tympanometry as well as multifrequency tympanometry (MFT). In the second and third stages the same evaluations were followed in fresh human temporal bones and animal experiments. The measurements in the mechanical middle ear model indicated a good comparability with the transfer function of an intact middle ear, particularly up to resonance frequency of the middle ear, which was about 1200-1500 Hz. The influences of mass and stiffness could be determined appropriately using the middle ear model. The measurements with different prostheses resulted in no significant variations in the transfer functions of commercial and new implants. The results of experiments on fresh temporal bones again showed no significant variation in the transfer functions of different prostheses. A median damping of about 15 to 20 dB particularly beyond the resonance frequency, was measured using implanted prostheses relative to the transfer function of an intact ossicular chain. Also the results of LDV and MFT measurements in animals on the implanted and non-implanted side (300 days postoperative) will be presented.