

understand complicated anatomy about ear surgery, especially for novice surgeons.

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Free Papers (F832)

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Intraoperative Assessment of Ossicular Fixation

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Learning Objectives: The middle ear ossicles can be driven with a coil and magnet and the tiny vibration amplitudes can be measured with a laser vibrometer. Some information on the degree of ossicular mobility can be extracted by measuring the velocity ratios between different measurement points.

Introduction: Pathologies such as otosclerosis and sequels of chronic otitis media may cause fixation of the middle ear ossicles, leading to hearing impairment. Knowledge of the degree of ossicular mobility is useful in order to determine the best course of surgical treatment. Routine assessment of mobility is often performed by manual palpation during surgical exploration, but this is subjective and imprecise, and a more objective method would be welcome.

Methods: A method was developed that makes use of a small magnet and coil to vibrate the ossicles in surgery after the tympanic membrane has been elevated. The method allows the ossicles to be driven at acoustic frequencies while simultaneously allowing free visual access for a laser vibrometer.

The method was evaluated with measurements on human temporal bones. Ossicular fixation was simulated by applying glass ionomer cement to the anterior malleolar ligament, and to the stapes footplate. Measurements were made of the vibration response of the umbo, the incus long process, and at points on the stapes, before and after artificial fixation.

Results: The velocity ratios between different measurement points varies with the severity of the fixation. In the unfixed state the velocity ratios remain fairly consistent between temporal bones, but with increased fixation of the footplate the ratios diverge further from the unfixed.

The ratio of stapes to umbo velocity decreases when the degree of fixation increases, and may reduce by as much 40 dB in case of complete footplate fixation.

Conclusions: It is possible to drive the ossicles with a magnet and coil and measure ossicular motion with a laser vibrometer. Information on the degree of ossicular fixation could be gathered by examining the velocity ratios between different points on the ossicular chain. Since the results can be

displayed immediately after the measurements, the method may even be used to assess the results of an intervention intraoperatively.

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Tympanoplasty: does dry or wet temporalis fascia graft matter?

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Learning Objectives: To evaluate whether dry or wet temporalis fascia graft influences the outcome of tympanoplasty. Recent review of literature cites shrinkage of temporalis fascia graft as an important cause for failed tympanoplasty i.e. a dry graft rehydrates in the physiological environment of middle ear and shrinks. This might lead to alteration in the anatomical position of the placed graft, thereby surgical failure.

Objective: To evaluate the success rate of tympanoplasty type I by underlay technique using dry and wet temporalis fascia graft and to determine the role of fibroblasts.

Study design: A prospective, randomized study with control. Hundred adult cases of either sex of Chronic Suppurative Otitis Media-mucosal disease were divided into two groups of 50 each - Group A [underwent dry graft tympanoplasty] & Group B [underwent wet graft tympanoplasty]. Fibroblast count was also calculated in dry and wet grafts.

Results: An overall surgical success rate of 82% and 90% was observed in Group A and Group B respectively which was not found to be statistically significant. Further, a statistically significant high fibroblast count was observed in wet grafts, but it did not correlate with surgical success.

Conclusions: The nature of the graft, whether dry or wet does not influence the outcome of tympanoplasty type I.

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MRI evaluation of endolymphatic hydrops for middle ear surgery

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Learning Objectives:

Introduction: Visualization of endolymphatic hydrops (EH) has recently become possible using MRI with contrast agents. EH could be found in cases of candidates for middle ear surgery, such as otosclerosis or ossicular anomaly. Preoperative EH could be a risk factor for inner ear disturbances following surgery. We investigated the presence of EH on MRI in ears with clinical otosclerosis or ossicular anomaly, and evaluate the efficacy of such MRI evaluation for the management of middle ear surgery.

Subjects and methods: Subjects diagnosed as having otosclerosis and agreed to MRI examination were randomly recruited in the study. Ears were evaluated by MRI performed 4 h after intravenous injection of gadolinium. The degree of EH in the vestibule and cochlea was classified into three grades (none, mild, and significant). Imaging data were compared with clinical findings. In ears operated, imaging data concerning the degree of EH were compared with postoperative clinical findings.

Results: Varying degrees of cochlear EH and vestibular EH were observed. Episodes of acute sensorineural hearing loss with rotatory vertigo occurred in some ears that showed severe EH in the cochleae and vestibules. Severe EH, however, was also observed in ears without such symptoms. The postoperative course in all ears with no EH in the vestibule was uneventful, with successful improvement of hearing levels, but a case with severe EH in the vestibule had postoperative nystagmus and long period of dizziness.

Conclusions: The presence of EH in ears with otosclerosis was clearly visualized in the present patient series. Moreover, the presence of EH in the vestibule on MRI might be a high risk factor in ears that are candidates for stapes surgery. Such MRI evaluation could provide useful information for managing symptoms related to EH.

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Free Papers (F832)**ID: 832.5****A New Postoperative Adjustable Middle Ear Prosthesis**Presenting Author: **Ismail Kuru**Ismail Kuru¹, Hannes Maier², Thomas Lenarz², Tim C. Lueth¹¹Technische Universität München, ²Hannover Medical School

Learning Objectives: • A new concept of a self-adapting middle ear implant for ossicular chain reconstruction in Tympanoplasty • The prosthesis has a spring-damper-element, that conducts the sound and adapts the length of the prosthesis • The spring-damper-element is made of implantable silicone material.

Introduction: The Tympanoplastic-III is a common method to treat conductive hearing loss by reconstructing the ossicular chain with a passive prosthesis. However, the state-of-art prostheses can only be adjusted intraoperatively and cannot adapt to the postoperative changes. Hence, suboptimal tensions on the tissues and hearing may result. Furthermore, these changes may cause prosthesis luxation, if the prosthesis is too short, or extrusion, if it is too long. Both complications require revision surgery.

Methods: We propose a new postoperative adjustable prosthesis for ossicular chain reconstruction with a spring-damper-element (SDE). The SDE conducts the sound waves from the prosthesis head to the prosthesis foot, while it can adapt the distance between them. The SDE consists of a closed elastic cover (spring) and a fluid fill (damper), both made of implantable silicone material. Under dynamic loads (e.g. sound waves) the damper stiffens and conducts. Under static loads (e.g. ambient pressure variations), the damper yields to a constant force when the spring contracts or extends the prosthesis.

Results: We have built a prototype as total ossicular replacement prosthesis (TORP). We have tested our prototype in our custom middle ear model. The prototype was built too long for the model, so that we could simulate a suboptimal reconstruction. Our preliminary measurements on the stapes footplate response to sound showed that the sound conduction of our prototype was approx. 4.5 dB higher compared to a commercial TORP of the same length. In a second experiment, we could show that the prototype could reduce the tension on the stapes footplate under varying ambient pressure compared to the commercial TORP.

Conclusion: Our results show, that an implantable SDE can be manufactured and it is a promising way to limit the preload, to prevent extrusion, stabilize the prosthesis against luxation and maximize sound conduction, so that the complications can be reduced to a minimum.

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Free Papers (F832)**ID: 832.6****Tissue engineered mastoid air cells' regeneration for intractable otitis media**Presenting Author: **Shin-ichi Kanemaru**Shin-ichi Kanemaru¹, Rie Kanai¹¹Medical research institute, Kitano Hospital**Learning Objectives:** How to regenerate middle ear gas exchange function.

Aim: Most chronic otitis media(OMC) are observed poor development of mastoid air cells(MACs) and poor function of Eustachian tube. In order to a complete recovery from intractable otitis media, regeneration of the MACs' gas exchange functions is thought to be need. In this study, we implanted autologous bone fragments as a scaffold and gelatin sponge soaked in basic-fibroblast growth factor (b-