ABSTRACTS

KURZ IMPLANTS, PRECISION INSTRUMENTS, VENTILATION TUBES

MIDDLE EAR SURGERY

KURZ PRECISE CARTIL AGE KNIFE

Cartilage Plate Tympanoplasty

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Objectives: The purpose of this work was to report our modified cartilage plate tympanoplasty technique ("tulip leaves") and to analyze its clinical outcome in primary and recurrent cases of chronic otitis media with and without cholesteatoma.

Study Design: Clinical retrospective study.

Methods: Patients being operated on with this technique at the University Department of Otorhinolaryngology, Dresden, Germany, between 1993 and 2001 were invited for survey, otomicroscopy, and pure-tone audiometry in 2003. Patients' charts were used to draw necessary conclusions.

Results: A total of 39 patients who were treated with this technique af-ter canal wall down tympanomastoidectomy and cavity obliteration were included in this long-term analysis after a median follow-up of 6 years. Seventeen patients (44%) experienced chronic otitis media with choleste-atoma, whereas 22 (56%) of them had a diagnosis of chronic otitis media without cholesteatoma. At the time of examination, all patients displayed a closed tympanic membrane. However, retractions were observed in 19 patients (48%). One patient required (3%) revision surgery for recurrent cholesteatoma due to prosthesis extrusion during the study period.

Conclusion: On the basis of this study, we recommend the tuliplike ar-rangement of thin but large auricular cartilage slices for the reconstruction of tympanic membrane defects in high-risk ears. This combination proved its high stability and long-lasting vitality in our long-term study. These characteristics are crucial for permanent disease removal and for reducing the risk of recurrent pathologic abnormality.

Type III tympanoplasty applying the palisade cartilage technique: a study of 61 cases

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Objective: To determine the morphologic and hearing results of the combined application of the palisade cartilage technique and titanium ossicular replacement prostheses in Type III tympanoplasty.

Study Design: Retrospective review of 61 tympanoplasties.

Setting: Tertiary referral center.

Patients: 59 patients (39 women and 20 men, mean age 36 years, range 7-81 years) consecutively operated on because of cholesteatoma, adhesive otitis, chronic otitis media, subtotal tympanic membrane defects, and tympanofibrosis requiring tympanoplasty with ossiculoplasty.

Interventions: Tympanoplasty Type III, with application of the palisade car-tilage technique and total or partial titanium ossicular replacement prosthesis.

Main Outcome Measures: Otoscopic findings and hearing results using a four-frequency pure tone average air-bone gap.

Results: A recurrent defect was seen in 1 ear (1.6%). The graft take rate was 100%. There were no extrusions of prostheses. Preoperatively, a pure tone average air-bone gap of 0 to 10 dB was seen in 1 ear, 11 to 30 dB in 30, and 31 to 50 dB in another 30 ears. Postoperatively, the corresponding numbers were 11, 41, and 9 ears, respectively. Hearing results were better in the total ossicular replacement prosthesis group.

Conclusion: The palisade cartilage technique is suitable to manage difficult pathologic conditions in middle ear surgery. It was demonstrated that the palisade cartilage technique can be combined safely with titanium ossicular replacement prostheses. Regarding postoperative hearing results, the nega-tive preselection of pathologic conditions must be considered.

Acoustic properties of different cartilage reconstruction techniques of the tympanic membrane

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Objectives/Hypothesis: The use of cartilage in reconstruction of the tym-panic membrane has been established especially in cases such as tubal dys-function and adhesive processes. Cartilage offers the advantage of higher mechanical stability compared with membranous transplants but may alter the acoustic transfer characteristics of the graft. Apart from material proper-ties, it can be assumed that, also, the microsurgical reconstruction technique might influence the sound transmission properties of the reconstructed tym-panic membrane. The purpose of the study was to investigate the acoustic transfer characteristics of different cartilage transplants being typically used in different reconstruction techniques of the tympanic membrane.

Methods: Cartilage plates of different thicknesses (1.0, 0.7, 0.5, and 0.3 mm), cartilage palisades, and cartilage island transplants of varying size were investigated by means of an ear canal-tympanic membrane model. In contrast to former single-point measurements, sound-induced vibrational amplitudes of the entire transplant were measured by scanning laser Dop-pler vibrometry (measuring points, n = 133) (PSV-200, Polytec, Waldbronn, Germany). Frequency response functions (displacement vs. sound pressure) of all measured points were determined in the frequency range of 200 Hz to 4 kHz for the different transplants.

Results: Cutting thick cartilage transplants into thin plates or palisades de-creased the first resonance frequency and increased its amplitude, reflecting improved sound transmission properties of the transplant. From an acous-tical point of view, the 0.5-mm cartilage plate seems preferable compared with the palisade technique. Cartilage island techniques showed vibration characteristics superior to plate or palisade techniques.

Conclusions: Apart from material characteristics, the sound transmission properties of the reconstructed tympanic membrane are strongly influenced by the reconstruction technique. The choice of the surgical technique should consider requirements based on mechanical stability and acoustic transfer characteristics of the transplant.

Experimental investigations of the use of cartilage in tympanic membrane reconstruction

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Background: Temporalis fascia, perichondrium, and cartilage are common-ly used for reconstruction of the tympanic membrane in middle ear surgery. Cartilage grafts offer the advantage of higher mechanical stability, partic-ularly in cases of chronic tubal dysfunction, adhesive processes, or total defects of the tympanic membrane, in contrast to fascia and perichondrium, which presumably offer better acoustic quality.

Hypothesis: The purpose of this study was to determine the acoustic trans-fer characteristics of cartilage of varying thickness and its mechanical de-formation when exposed to fluctuations in atmospheric pressure.

Method: Ten pairs of cartilage specimens from the cavum conchae and the tragus were obtained from fresh human cadavers. Young's modulus was de-termined by mechanical tension tests and statistically evaluated using the t test. The acoustic transfer characteristics of an additional 10 specimens were measured by a laser Doppler Interferometer after stimulation with white noise in an external auditory canal--tympanic membrane model. Me-chanical stability was determined by measuring displacement of the carti-lage using static pressure loads of ≤ 4 kPa.

Results: Young's modulus determinations for conchal and tragal cartilage were 3.4 N/mm2 and 2.8 N/mm2, respectively, but the difference was not significant. Acoustic testing showed a 5-dB higher vibration amplitude in the midfrequency range for conchal compared with tragal cartilage, but the differ-ence was not significant. Reducing cartilage thickness led to an improvement of its acoustic transfer qualities, with a thickness ≤ 500 microm resulting in an acceptable acoustic transfer loss compared with the tympanic membrane.

Conclusion: Both conchal and tragal cartilage are useful for reconstruction of the tympanic membrane from the perspective of their acoustic proper-ties. The acoustic transfer loss of cartilage can be reduced by decreasing its thickness. A thickness of 500 microm is regarded as a good compromise between sufficient mechanical stability and low acoustic transfer loss.