

ABSTRACTS

KURZ IMPLANTS, PRECISION INSTRUMENTS, VENTILATION TUBES

MIDDLE EAR SURGERY

T TP-TUEBINGEN TYPE PROSTHESIS

Ossiculoplasty With Titanium Prosthesis

Martins J., Silva H., Certal V. F., Amorim H., Carvalho C. F.

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Objectives: The goal of this study was to make a review of the patients who underwent Ossicular chain reconstruction with titanium prosthesis during an 8-year period in our Department.

Methods: A retrospective study was made on the ossiculoplasty cases over a period of eight years in a Public Hospital District. The information was extracted by clinical process consultation. Between 1999 and 2008, 124 ossiculoplasties using Kurz® titanium prosthesis for chronic otitis media were performed (78 partial ossicular chain reconstructions and 46 total Ossicular chain reconstructions). The single stage, staged and revision ossicular chain reconstruction were included in the analysis. All patients had a minimum of 6-month postoperative follow-up (mean 3 years and 4 months). Comparisons of preoperative and postoperative pure tone averages were performed. Air-bone gap and implant extrusion rates were measured. The success of the reconstruction was defined as a postoperative air-bone gap (ABG) of 20 dB or better.

Results: Successful ossiculoplasty was obtained in 73.1% of partial ossicular chain reconstructions and 30.4% of total ossicular chain reconstructions ($P < 0.05$). The postoperative pure-tone average air-bone gaps was 16 dB in partial reconstructions and 26.7 dB in total reconstructions ($P < 0.05$). There were five cases of prosthesis extrusion.

Conclusions: The majority of the ossiculoplasties improved the hearing status satisfactorily. There was no difference in hearing results in one-stage and two-stage partial ossicular chain reconstruction, but there were better hearing results in the cases of two-stage total Ossicular chain reconstruction.

Hearing results with the titanium ossicular replacement prostheses

Schmerber S., Troussier J., Dumas G., Lavieille J.-P., Nguyen D. O.

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DOI: 10.1007/s00405-005-1002-6

The purpose was to study the hearing results in patients receiving a Kurz titanium Bell partial ossicular replacement prosthesis (PORP) or an Aerial total ossicular replacement prosthesis (TORP). The study was a retrospective chart review in a tertiary otologic referral center. A computerized otologic database was used to identify 111 patients implanted with either a PORP or TORP prosthesis. Audiograms were reviewed and air-bone gaps were calculated for each patient. The improvement of the average air-bone gap (ABG) was 10.2 and 12.7 dB at 3 and 20 months after ossiculoplasty, respectively. Sixty-six percent of patients (73/111) had a postoperative air-bone gap of 20 dB or less. The ABG for the titanium PORP prosthesis was 14.3±/9.7 dB, compared with 25.2±/13.7 dB for the TORP prosthesis ($P < 0.05$).

The ABG to within 20 dB or less was obtained in the PORP group in 77% of the cases, versus 52% of the cases in the TORP group ($P < 0.05$). Two extrusions of the prostheses were observed at 17 and 20 months after surgery (1.8%). Revision procedures for functional failure were carried out in 20 patients (18%). The rate of sensorineural hearing loss was 3.6%. The major factors influencing good audiometric results were the surgical procedure preserving the external auditory canal and the presence of the stapes. The best hearing results were achieved when a PORP was used in an intact canal wall (ICW) procedure, and the worst hearing results were achieved when a TORP was used in a canal wall down (CWD) procedure. The titanium Kurz prosthesis has been an effective implant at our institution for ossicular reconstruction.

Accoustomechanical properties of open TTP® titanium middle ear prostheses

Zenner H.P., Freitag H.- G., Linti C., Steinhardt U., Rodriguez J. J., Preyer S., Mauz P.-S., Sürth M., Plank H., Baumann I., Lehner R., Eiber A.

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Objective: The purpose of the study was to identify acoustomechanical properties of various biostable and biocompatible materials to create a middle ear prosthesis with the following properties: (i) improved handling including a good view of the head of the stapes or footplate and adjustable length, (ii) improved acoustical characteristics that are adequate for ossiculoplastic. The identified material should serve to build CE and FDA approved prostheses for clinical use in patients.

Methods: Test models made of Teflon, polyetheretherketone, polyethyleneterephthalate, polysulfone, gold, Al₂O₃ ceramics, carbon and titanium were investigated for their potential to fulfill the requirements. Acoustical properties were investigated by laser Doppler velocimetry (LDV) in mechanical middle ear models (MMM). Measured data were fed in to a recently created computer model of the middle ear (multibody systems approach, MBS). Using computer-aided design (CAD) measured and computed data allowed creation and fine precision of titanium prostheses (Tubingen Titanium Prostheses, TTP). Their handling was tested in temporal bones. Acoustomechanical properties were investigated using the MBS and mechanical middle ear models.

Main Outcome Measures: Input impedance, mass, stiffness, and geometry of test models and prostheses were determined. Furthermore, their influence on the intraprosthesis transfer functions and on coupling to either tympanic membrane or stapes was investigated.

Results: Final results were FDA- and CE-approved filigreed titanium prostheses with an open head that fulfilled the four requirements detailed above. The prostheses (TTP) were developed in defined lengths of between 1.75 and 3.5 mm (partial) and 3.0 and 6.5 mm (total) as well as in adjustable lengths (TTP-Vario).

Conclusions: The results suggest acoustomechanical advantages of TTPs because they combine a significantly low mass with high stiffness. In contrast to closed prostheses, the open head and filigreed design allow an excellent view of the prosthesis foot during coupling to the head or footplate of stapes, contributing to an improved intraoperative reliability of prosthesis coupling.

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Open Tuebingen Titanium Prostheses for Ossiculoplasty: A Prospective Clinical Trial

Zenner H. P., Stegmaier A., Lehner R., Baumann I., Zimmermann R.

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Objective: The overall purpose of the study was the evaluation of the efficacy of Tübingen titanium prostheses (TTPs) for ossiculoplasty.

Study Design: A two-part clinical study of 216 patients undergoing ossiculoplasty was performed. The first part was a prospective study using TTPs (n = 114). The second part involved study of historical control patients (n = 102) with gold and ceramic prostheses. **Interventions:** All patients underwent ossiculoplasty.

Main Outcome Measures: Measures included median air conduction thresholds and air-bone gaps.

Results: All patients were per-protocol patients. When the air-bone gap "gold standard" (i.e., ≤ 10 dB) was investigated in the main speech spectrum, partial TTPs reached this level at 2 kHz in 44% (n = 22) and at 3 kHz in 38% (n = 19). Gold and ceramics revealed significantly lower values. Similar results were obtained for total prostheses. Differences for TTPs and ceramics were statistically significant (Mann-Whitney *U* test, $\alpha = 5\%$).

Conclusion: The use of TTPs for ossiculoplasty is an efficient treatment method.