

ABSTRACTS

KURZ IMPLANTS, PRECISION INSTRUMENTS, VENTILATION TUBES

MIDDLE EAR SURGERY

TTP-VARIAC SYSTEM

Middle Ear Reconstruction Using the Titanium Kurz Variac Partial Ossicular Replacement Prosthesis

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Importance: Satisfactory functional results following ossicular chain reconstruction mainly depend on a stable connection between the tympanic membrane and the stapes, which is in turn dependent on the type of prosthesis used. Knowledge about the safety and functional outcome of the commercially available middle ear prostheses is therefore of great importance.

Objective: To evaluate the efficacy and safety of the Kurz TTP-Variac System partial ossicular replacement prosthesis (PORP) in ossiculoplasty.

Design, Setting and Participants: Retrospective review of all ossiculoplasties performed by 1 surgeon at a secondary referral center from August 2006 through July 2012. Participants were patients with cholesteatoma, chronic otitis media, or ossicular chain disruption in the absence of inflammatory disease who underwent ossicular reconstruction.

Exposure: Ossiculoplasty using a Kurz TTP-Variac System PORP.

Main Outcome and Measures: Mean preoperative and postoperative air-bone gaps (ABGs) and improvements in ABG were analyzed for each frequency by means of a 4-frequency pure-tone average. Successful postoperative hearing was defined as postoperative ABG smaller than 20 dB.

Results: Eighty-nine ears in 83 patients aged 7 to 85 years were included. Transmeatal tympanoplasty was performed in 17 ears (19%). Seven ears (8%) underwent tympanoplasty with canal wall-down mastoidectomy, and 65 ears (73%) underwent canal wall-up (combined approach) tympanoplasty with mastoidectomy. The study population comprised 61 primary tympanoplasties (69%) and 28 revision cases (31%). Mean follow-up was 13 months. Overall, the ABG significantly improved from a mean (SD; range) of 26.19 (11.53; 3.75-51.25) dB to 15.58 (9.80; 0-48.75) dB ($P < .01$ for all frequencies). Mean ABG improvement was 10.62 dB. Successful postoperative hearing was obtained in 65 ears (73%). Revision surgery, especially in ears with ossicular chain disruption without inflammatory disease, was associated with poorer functional outcome, whereas preservation of the malleus was associated with a better functional outcome ($P < .05$). There were few complications (1 prosthesis extrusion, 2 prosthesis dislocations, 2 reperforations, 3 cases of residual cholesteatoma, and 3 of light sensorineural hearing loss).

Conclusion and Relevance: The titanium Kurz TTP-Variac System PORP is an effective prosthesis to reconstruct the ossicular chain. Complications are rare, illustrating the safety of the prosthesis.

Long-term hearing result using Kurz titanium ossicular implants

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Titanium implants in middle ear surgery were introduced in the late 90s and are now frequently used in middle ear surgery. However, long-term studies of patient outcome are few and have only been published in subgroups of patients. We report the long-term effect of titanium middle ear implants for ossicular reconstruction in chronic ear disease investigated in a Norwegian tertiary otological referral centre. Retrospective chart reviews were performed for procedures involving 76 titanium implants between 2000 and 2007. All patients who underwent surgery using the Kurz Vario titanium implant were included in the study. Audiological parameters using four frequencies, 0.5, 1, 2, and 3 kHz, according to AAO-HNS guidelines, was assessed pre and postoperatively. Otosurgical procedures, complications, revisions, and extrusion rates were analyzed. The study had no drop-outs. The partial ossicular replacement prosthesis (PORP) was used in 44 procedures and the total ossicular replacement prosthesis (TORP) in 32 procedures, respectively. Mean follow-up was 5.2 years (62 months). The ossiculoplasties were performed as staging procedures or in combination with other chronic ear surgery. The same surgeon performed all the procedures. A postoperative air-bone gap of ≤ 20 dB was obtained in 74 % of the patients, 82 % for the Bell (PORP) prosthesis, and 63 % for the Arial (TORP) prosthesis. The extrusion rate was 5 %.

We conclude that titanium ossicular implants give stable and excellent long-term hearing results.

Variable length titanium prostheses for type III tympanoplasty. Intraoperative length adjustment and fixation of the cartilage overlay

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Introduction: For type III tympanoplasty by partial ossicular replacement prosthesis (PORP) or total ossicular replacement prosthesis (TORP), the length of the prosthesis must match the individual intraoperative anatomical and physiological characteristics.

Materials and Methods: Databanks were used to determine the necessary sizer length of the sizer disc. The measurement template for the size of the cartilage to overlay the prosthesis headplate was derived from the headplates of the Tuebinger titanium prostheses (TTP®) and the Dresdener titanium prostheses. Finally all functions were integrated into a synthetic plate.

Results: The result was a simple and reasonably priced disposable multi-functional instrument (Tuebinger sizer disc TSD) which allowed an exact measurement for every prosthesis in TORP and PORP. For the TTP®-Variac, the TSD enabled the simple intraoperative production of prostheses with the length desired by the surgeon. For PORP the TSD enabled an adaptation of the diameter of the prosthesis foot for TTP®, TTP®-Vario and TTP®-Variac and provided a template for the size determination of the cartilage overlay of the titanium prosthesis head. The sizers and the resulting prostheses were used for initial tympanoplastic operations. Audiometric investigations carried out 6 weeks postoperatively gave results corresponding to those previously obtained in a study with TTP® and TTP®-Vario using the old instrumentation.

Conclusions: The new instrumentation leads to an improvement of the intraoperative practicability and a simplification. The audiological results remain the same.

Ossiculoplasty with KURZ titanium prosthesis

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Objectives: Report the functional and anatomic results of ossicular reconstruction by titanium prosthesis.

Materials and Methods: Retrospective chart reviews were performed for 111 patients who had undergone titanium ossicular implants between November 1998 and 2002 (61 PORP, 50 TORP). The anatomical and audiometric data were analyzed on average at 3 and 20 months.

Results: At 20 months, the improvement of air-bone-gap mean was 12.7 dB with better results at low frequencies. The global success rate was 66% (PORP 77%, TORP 52%). It decreased significantly in the open techniques. Extrusion rate was low (2/111) and the labyrinthization rate was 3.6%. Twenty patients required a surgical revision (18%). In 9 patients, the prosthesis was too short. At long-term follow-up, the gains were stable in 60 patients, improved in 32 patients and worsened in 19 patients.

Conclusion: The success rate is higher in the group of the PORP with the closed technique. The stability of the TORP in open technique still remains problematic. In all cases, the risk of extrusion requires a large cartilage graft recovering the plate of the prosthesis. The high rate of luxation (9/111 prosthesis too short) has led us to increase slightly the length of the prosthesis (+1.22 mm mean).

Preliminary ossiculoplasty results using the Kurz® titanium middle ear implants

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Titanium has been an accepted prosthetic material for decades in craniofacial and orthopaedic surgery. The last decennium, studies were published reporting the results of titanium prostheses used for ossiculoplasty. The new, lightweight titanium prostheses are designed to maximize visualization of the capitulum and footplate region. Mechanically they are characterized by a high degree of rigidity and low weight. Acoustically they have low sound damping, low acoustic impedance, and a second resonance that might increase to broadband frequency transmission. These characteristics suggest the possibility of improved signal transfer in the main speech frequencies at around 2 kHz. A prospective clinical study was started to evaluate the efficacy of the variable (= adjustable length) Tübingen titanium prosthesis (TTP-Vario). Twenty patients were evaluated. A canal wall up procedure was performed in 3 cases, a canal wall down procedure in 17 cases. A postoperative air bone gap of < 20 dB was obtained in 60% of bell prosthesis patients and < 25dB in all bell prosthesis patients. The pure-tone average air-bone gap for the aerial prosthesis was < 20 dB in 43%, < 25 dB in 64% and < 30 dB in 85% at 1 month. The results were stable or improved for later time intervals. To date there have been no extrusion. The surgeon finds the prosthesis easy to handle and the open head of the prosthesis facilitates correct placement on the capitulum of the stapes or on the footplate. From a surgical point of view, the Kurz titanium prosthesis is an excellent middle ear prosthesis due to the design and the possibility of individual adjustment. The hearing results are good. Further studies are needed to confirm long-term efficacy.

Synchronous ossiculoplasty with titanium prosthesis during canal wall down surgery for advanced cholesteatoma: anatomical and hearing outcomes

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Objective: To analyse patients with cholesteatoma undergoing canal wall down mastoidectomy together with ossicular reconstruction with a titanium prosthesis, in order to identify factors associated with hearing outcomes.

Study Design: Retrospective review of 97 cases undergoing single-stage surgical management.

Methods: All patients underwent canal wall down mastoidectomy. Kurz titanium ossicular prostheses were used for ossicular chain reconstruction. Pre-operative and post-operative air conduction and bone conduction hearing thresholds were obtained at 500, 1000, 2000 and 3000 Hz.

Results: The mean pure tone average improved from 46.02 ± 14.54 dB pre-operatively to 29.32 ± 14.64 dB postoperatively, for both total and partial ossicular replacement prosthesis groups combined. The mean air-bone gap improved from 30.38 ± 11.12 dB pre-operatively to 15.62 ± 9.65 dB post-operatively, for both groups combined.

Conclusion: Reconstruction with a titanium prosthesis offers good functional results when performed during canal wall down surgery for advanced cholesteatoma as a single-stage procedure.