

# ABSTRACTS

## KURZ IMPLANTS, PRECISION INSTRUMENTS, VENTILATION TUBES

### MIDDLE EAR SURGERY

#### DUESSELDORF TYPE PROSTHESIS

##### Ossiculoplasty with titanium prostheses

Romer M., Vorburger M., Huber A.

**Published:** MEMRO 2006, 4th International Symposium on Middle Ear Mechanics in Research and Otology: Selected Abstracts

**Objective:** To determine the hearing results and the complication rate one year after ossiculoplasty with the Kurz titanium system.

**Material and Methods:** A retrospective chart review of 82 procedures in 77 patients. Included in the study were 36 Aerial-TORP and 46 Bell-PORP between October 2001 and October 2004. The air and bone conduction thresholds as well as the complication rate were evaluated.

**Results:** The mean preoperative air bone gap (ABG) was 32,9 (+/-13,4) dB. 16 (+/-7,2) months postoperatively the average ABG was 17,6 (+/-11,8) dB. The extrusion rate was 3/82 (3,7%). In one case (1,2%) the prosthesis perforated the stapes footplate and was dislocated into the vestibule without significant sensorineural hearing loss. The tympanic membrane reperforation rate and the cholesteatoma recurrence rate was 3/82 (3,7%) and 1/82 (1,2%) respectively.

**Conclusion:** The Kurz titanium prosthesis system provides hearing success comparable with current ossiculoplasty studies and low complication rate.

##### Results with Titanium Ossicular Reconstruction Prostheses

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DOI: 10.1097/00005537-200401000-00011

**Objectives/Hypothesis:** Despite the enthusiasm of recent short-term reviews, no center in the United States has published results meeting American Academy of Otolaryngology-Head and Neck Surgery guidelines with titanium-based prostheses. The purpose of the study was threefold. The first purpose was to review results with a titanium prosthesis system in cases meeting American Academy of Otolaryngology-Head and Neck Surgery reporting guidelines. The second was to compare these results with previously published results using non-titanium-based prostheses. The third was to examine the authors' results for any evidence of a "learning curve."

**Study Design:** Retrospective chart review was performed for the period from February 2000 to August 2001 and for the period from July 2002 to February 2003.

**Methods:** Of 313 cases, 130 consecutive cases were identified in the first period and 65 in the second time period. One hundred two patients had adequate follow-up for published guidelines. All cases were performed by the senior author (c.g.j.). Comparison data were obtained from a previous publication involving the senior author.

**Results:** Successful rehabilitation ( $\leq 20$  dB pure-tone average air-bone gap) of conductive hearing loss was obtained in 70% of partial ossicular chain reconstructions and 44% of total ossicular chain reconstructions when titanium prostheses were used. Comparison data revealed successful rehabilitation in 48% and 21% of non-titanium-based partial and total reconstructions, respectively. Postoperative pure-tone average air-bone gaps were not significantly different when compared with results in the period from July 2002 to February 2003.

**Conclusion:** Newer titanium-based ossicular reconstruction devices represent an improvement over previously used non-titanium-based prostheses. The authors think that this improvement is realized rapidly because no learning curve existed in their data.

##### Preliminary Ossiculoplasty Results using the Kurz Titanium Prostheses

Krueger W. W., Feghali J. G., Shelton C., Green J. D., Beatty C. W., Wilson D. F., Thedinger B. S., Barrs D. M., McElveen J. T.

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DOI: 10.1097/00129492-200211000-00004

**Objective:** Limitations in biocompatibility and hearing improvement with ossicular chain reconstruction prostheses are addressed with new, lightweight titanium prostheses designed to maximize visualization of the capitulum and footplate regions. The effectiveness of these new prostheses is being tested in a prospective multicenter study.

**Study Design:** Prospective case series. **Setting:** Multicenter (8 sites), primarily tertiary private practice or academic otologic clinics.

**Patients:** A convenience sample of 31 patients undergoing ossiculoplasty, with 16 partial ossicular chain reconstructions using the Bell prosthesis and 15 total reconstructions using the Aerial prosthesis.

**Intervention:** Ossiculoplasty using new Kurz titanium prostheses. Cartilage was interposed between the tympanic membrane and the prosthesis.

**Main Outcome Measures:** Air-bone gap for pure tone average and 3,000 and 4,000 Hz, assessed preoperatively and 3 months, 6 months, and 12 months postoperatively; percent of patients obtaining an air-bone gap of  $\leq 20$  dB; high-frequency average (1,000, 2,000, and 4,000 Hz) to evaluate sensorineural hearing loss; and extrusion rate.

**Results:** A postoperative air-bone gap of  $\leq 20$  dB was obtained in 81% of Bell prosthesis patients and 67% of Aerial prosthesis patients at 3 months. The results were stable to improved for later time intervals. High-frequency gaps were similar to the pure tone average gap. To date, there have been no instances of extrusion, and all the surgeons found the prostheses easy to use and thought that the design characteristics facilitated accurate placement.

**Conclusions:** Initial evaluation of the Kurz titanium prostheses produced low extrusion rates (none to date) with excellent hearing results, including good high-frequency conduction. Good visualization and accurate placement were easy to achieve. Further studies are needed to confirm long-term efficacy.

## **Reconstruction of the ossicular chain with titanium implants. Results of a multicenter study**

**Begall K., Zimmermann H.**

**Published:** Laryngo-Rhino-Otol 2000, 79 (3):139-145. (German)  
DOI: 10.1055/s-2000-298

**Background:** For decades, oto-surgeons have been trying to find suitable alloplastic materials for replacing ossicles in the case of morphological and functional disorders in the middle ear. The focus of attention has been on tissue tolerance and functionality.

**Patients:** A retrospective analysis of the implantation of titanium prostheses is presented (Type "Duesseldorf", Heinz Kurz GmbH, Dusslingen, Germany) in 528 patients operated in 14 ENT hospitals. The hospitals involved are ENT hospitals with different fields of specialization presenting a representative cross-section of surgical ENT treatment. Evaluated were healing results, hearing gain and surgical handling of the implants.

**Results:** Despite pathological middle ear conditions, the tissue-implant healing rate was very high. In 4.4% of the patients the implants were rejected. In the case of partial ossicular reconstruction, an average hearing gain between 10 and 20 dB was achieved. Total reconstruction of the ossicular chain showed even better audiological results (15 to 20 dB on average).

**Conclusion:** Due to the good morphological and functional results achieved, titanium implants have proven their worth for middle ear micro-surgery. Their advantages are their light weight and delicate structure, facilitating very good micro-surgical handling. It is advisable to place a thin layer of cartilage between the prosthesis headplate and the tympanic membrane. In this manner, the number of material extrusions can be safely reduced, however, extrusions cannot completely be avoided.

## **Replacement of ear ossicles with titanium prostheses**

**Stupp C. H., Stupp H. F., Grün D.**

**Published:** Laryngorhinootologie. 1996 Jun;75(6):335-7. (German)  
DOI: 10.1055/s-2007-997590

**Background:** Titanium has been a well established implant material for many years. New material processing techniques now permit the manufacture of small implants for ossicular chain reconstruction.

**Methods:** Between November 1994 and September 1995, 100 titanium middle ear implants (55 PORP, 45 TORP) were used for reconstruction of the ossicular chain. A range of five different sizes for partial and total prostheses suits all implantation needs. The shape of the implants can be altered by bending. Time consuming intraoperative shaping and trimming is avoided.

**Results:** At a follow-up time of three months (33 patients) and six months (17 patients), no adverse reactions or extrusions occurred. Biologic fixation between the foot of the partial prosthesis and the head of the stapes was found eight months after implantation. A hearing result of 0-20 dB residual air-bone gap was achieved in 79%.

**Conclusion:** Titanium middle ear implants show good bio-compatibility and are readily integrated into the ossicular chain. Although delicate in shape, they offer excellent mechanical properties in respect to sound conduction and implantation. Initial results show Titanium to be a perfect implant material for middle ear prostheses, although long-term results are not yet available.

## **Three years experience with titanium implants in the middle ear**

**Stupp C. H., Dalchow C., Grün D., Stupp H. F., Wustrow J.**

**Published:** Laryngorhinootologie 1999 Jun;78(6):299-303. (German)  
DOI: 10.1055/s-2007-996875

**Background:** In continuation of our previously published report on initial experience with titanium implants in the middle ear [13], we now present the results of routine use over a three year period.

**Methods:** From November 1994 to November 1997, 661 titanium implants (Dusseldorf model) were implanted in the authors' clinics (355 PORP, 306 TORP). There was no preselection of patients. Five hundred eighty-two follow up examinations were performed with a medium follow up time of 11.6 months.

**Results:** The good initial results of the previous study with respect to biocompatibility and functional hearing results were confirmed in the long term follow-up. The average air-bone gap was calculated over the frequencies 0.5, 1, 2, and 4 kHz. Closure to within 20 dB was achieved in 72% of cases. The air-bone gap tended to decrease with increasing time of implantation. Adverse reaction to the prostheses did not occur. Extrusion occurred in one case of complete middle ear atelectasis with resorption of the interposed cartilage. Insufficient improvement of hearing was attributable to a short implant in 12 cases (1.8%). In three cases (0.5%) insufficient stability of the PORP was attributable to eroded stapes suprastructure, and in three others (0.5%) a dislocation was responsible for a poor hearing result. Middle ear fibrosis with impairment of sound transmission was seen in 3 patients (0.5%).

**Conclusion:** The superior acoustic properties of the delicate yet rigid low-weight titanium implants combined with excellent biocompatibility lead to a good hearing result if a meticulous surgical technique is employed. The easy handling makes it a pleasure to work with these prostheses.