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Bio-mechanics of the middle ear (R736)

ID: 736.1

Mechanical effects of tympanic membrane replacement with cartilage and other materials

Presenting Author: **Manohar Bance**

Manohar Bance, Mostafa Salem

Dalhousie University

Learning Objectives: 1. To understand the mechanical effects of replacing the TM with other materials 2. To compare different materials used for reconstruction of the TM from a micromechanical sense.

We will present our results in cadaveric temporal bones measuring the vibration responses of overlaying cartilage at different sites on the TM, replacing different parts of the TM with cartilage, with perichondrium, with silastic, and with ointment.

We report both TM malleus vibrations and stapes vibrations.

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Bio-mechanics of the middle ear (R736)

ID: 736.2

Influence of tension and positioning in middle ear reconstruction

Presenting Author: **Thomas Zahnert**

Thomas Zahnert, Matthias Bornitz, Marcus Neudert, Thomas Beleites

TU-Dresden

Learning Objectives: Optimal prosthesis position at tympanic membrane and stapes; optimal prosthesis length; tension of annular ligament in middle ear reconstruction, tympanoplasty.

Introduction: For an optimal sound transfer function (STF) positioning and coupling are the most important factors in middle ear reconstruction with passive implants. Middle ear ventilation problems can change the position and coupling of prosthesis after surgery leading to dislocation or tension of the ligaments. Therefore mechanism and techniques in prosthesis design had to be established to prevent dislocation and tension.

Methods: STF between tympanic membrane and footplate was calculated in a Finite Element Model of the middle ear and measured with Laser-Doppler-Vibrometry in temporal bones. The coupling to the tympanic membrane, malleus handle, stapes head and footplate was compared. The influence of prosthesis' length was measured in temporal bones using a memory-metal TORP. For the investigation of a new prosthesis concept a new flexible TORP was developed and measured in temporal bones during atmospheric pressure alternations.

Results: Malleus attachment near its neck improves the STF in higher frequencies in comparison to tympanic membrane coupling. The stapes head and the center of the footplate are both best suitable for prosthesis coupling. The elongation of prosthesis length between 50 and 200 μm leads to a frequency dependent STF reduction of 5 to 25 dB below 1.0 kHz. At frequencies >2.0 kHz the reduction was less prominent or the STF showed even an improvement of up to 10 dB (SPL).

Conclusion: At the tympanic membrane malleus handle is optimal for prosthesis coupling. At the footplate the center is the optimal position for TORPs. The correct length of implanted prostheses (functional length) should be measured before implantation to prevent tension at the annular ligament. In the future, prosthesis with pressure compensation elements might reduce the risk of dislocation and annular ligament tension. Tension has a significant impact on the STF in middle ear reconstruction.

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Bio-mechanics of the middle ear (R736)

ID: 736.3

Session R736: Round Table on The BioMechanics of the Ear

Presenting Author: **John Rosowski**

John Rosowski

Massachusetts Eye and Ear Infirmary

Learning Objectives: Learn about the latest ideas on how the biomechanics of the middle ear affect our understanding of ear disease and its treatment.

Presentations and discussions on middle-ear biomechanics with some of the leading surgeon scientists familiar with the topics: Manohar Bance of Dalhousie University of Halifax Canada, Thomas Zahnert of the University of Dresden Germany and Karl-Bernd Hüttenbrink of the University of Köln Germany. Topics to be discussed include: The normal and reconstructed tympanic membrane (MB), the influence of tension and position on the function of ossicular replacement prostheses (TZ), the significance of a solid contact in ossicular reconstruction in acoustic and non-acoustic pressure environments (K-BH), and the coupling of sound to the ossicular chain by the normal tympanic membrane (JJR).

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Bio-mechanics of the middle ear (R736)

ID: 736.4

The Significance of a Solid Contact in Ossicular Reconstruction in acoustic and non-acoustic pressure environment

Presenting Author: **Karl Hüttenbrink**

Karl Hüttenbrink
HNO-Klinik der Universität zu Köln

Learning Objectives: TBC

The reconstruction of the ossicular chain has the goal to connect the vibrating tympanic membrane with the inner ear via the stapes. Two aspects have to be considered: Firstly the Hi-Fi sound transport. For this purpose, the prosthesis has to be anchored tightly to the vibrating structures in order to avoid a loose contact. Any soft tissue in the gap between the prosthesis and the vibrating structures will reduce the energy transmission due to its damping effect. Secondly, the prosthesis has to be stabilized against a displacement by static forces, like atmospheric pressure variations, scar tissue traction, tympanic membrane retraction etc. Simple water-adhesion is not solid enough for the stabilization of the prosthesis against these forces. Therefore, new designs for a more stable attachment are necessary. They must not only guarantee a stable positioning, but, especially in cases of cholesteatoma surgery with its high risk of rezidives, an easy removing must be possible, to reduce the risk of a stapes' luxation.

doi:10.1017/S0022215116003091

Big Cholesteatoma: How I do it (2) (V737)

ID: 737.1

Large Cholesteatoma

Presenting Author: **Levent Olgun**

LEVENT Olgun
Izmirbozyaka Teaching Hospital

Learning Objectives:

Introduction: Large cholesteatomas are generally congenital origin and by the years reach considerable sizes. Most of the cases may be indolent for years and first detected only after development of complications.

Method: Between 2010–2016 34 large cholesteatomas were operated on at Izmir Bozyaka Teaching and Research Hospital ENT Clinic. Eighteen of them seeked attention because of intratemporal complications, intracranial complications led to surgery in 4 other cases. In this presentation short clips of operative videos of some of these cases would be shown and important points would be stressed.

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Big Cholesteatoma: How I do it (2) (V737)

ID: 737.2

Intra-op warning signs to look for in implant surgery

Presenting Author: **Mohan Kameswaran**

Mohan Kameswaran
Madras ENT Research Foundation (P) LTD

Learning Objectives: The otologist very often has to deal with extensive cholesteatoma in the Indian population. This video presentation will focus on extensive cholesteatoma and its management.

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Mastoid Obliteration (R741)

ID: 741.1

Why consider obliterating the mastoid in cholesteatoma surgery anyway? Lessons learnt from changing treatment strategy, preliminary results and future perspectives

Presenting Author: **Robert Jan Pauw**

Robert Jan Pauw, Mick Metselaar, Anne van Linge, Laura Veder, Bas Pullens, Marc van der Schroeff
Erasmus MC

Learning Objectives: To demonstrate the advantages of mastoid obliteration in cholesteatoma surgery. To emphasize the importance of structured follow-up after cholesteatoma surgery in order to assess both medical and patient reported outcome measures.

Mastoid obliteration in cholesteatoma surgery can decrease the cholesteatoma recurrence rate.

In the Erasmus Medical Center we have implemented canal wall up tympanoplasty with bony obliteration of the mastoid as the treatment strategy of choice for primary or recurrent cholesteatoma. Preliminary results of this treatment strategy will be shown and compared to our previous results with cholesteatoma recurrence and residual rate as primary outcome measures.

Currently, all patients are included in a prospective database that includes not only medical outcome measures like cholesteatome recurrence and residual rate, complication rate and hearing results, but also patient reported outcome measures using general and disease specific questionnaires. An overview of the current standardized follow-up regimen and the outline of the database will be given. A concept version of an interactive cholesteatoma dashboard that allows real time insights in different outcome measures will be demonstrated.

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Mastoid Obliteration (R741)

ID: 741.2

Mastoid obliteration 6 years follow up results. European trend, local peculiarities

Presenting Author: **Sergey Kosyakov**