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Middle ear inflammation, mucin gene expression and hearing loss: bench to bedside (K655)

ID: 655.1

Middle ear inflammation, mucin gene expression and hearing loss: bench to bedside

Presenting Author: **Joseph Kerschner**

Joseph Kerschner

Medical College of Wisconsin

Otitis media (OM) remains one of the most important and common diseases of childhood. With decreased effectiveness of antimicrobial therapy our laboratory has spent the past 2 decades elucidating the mechanisms surrounding the pathophysiology of OM in hopes of identifying novel methods of intervention. Through this work, substantive advances in the understanding of the pathogenesis, management and treatment of OM continue to develop. This presentation will highlight the most substantive of these developments in the areas of middle ear inflammation, mucin gene expression, biofilm formation and hearing loss associated with OM. It will provide the clinician and researcher with a platform to: 1) facilitate discussion of new concepts with patients and colleagues, 2) allow for incorporation of new modalities into their practice and 3) remain up-to-date regarding clinical and research developments that have the potential to provide new technologies and treatment possibilities.

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Emerging Technologies (2) (R661)

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Stereotactic robotic system for ear surgery

Presenting Author: **Thomas Lenarz**

Thomas Lenarz[1], Omid Majdani[1], Samuel John[2]

[1]*Medical University Hannover,* [2]*HörSys GmbH*

Learning Objectives: Robot assited cochlear implantation.

Background: Cochlear implantation has become the treatment of choice for patients with severe to profound sensory hearing loss. An increasing percentage of patients show up with residual hearing which should be preserved during and after surgery. In order to improve the precision of electrode insertion with respect to individual cochlear anatomy and existing hearing loss, an advanced concept of robot assisted cochlear implantation has been developed.

Method: The stereotactic frame robotic system has been developed to allow for minimal invasive high precision cochlear implantation. Using preoperative CT data and a tripod stereotactic frame it is possible to calculate precisely the optimal trajectory from the surface of the mastoid to the inner ear. This path can then be drilled with help of a disposable drilling jig that , which has been individualized to the planned trajectory with an intraoperative robotic assistance system and it has been validated in temporal bone and surgeon studies prior to planned first in man applications.

Results: The overall accuracy is better than 0.5 millimeter. Injuries to facial nerve and scala tympani can be avoided with high probability. The exact placement of the electrode in the scala tympani was achieved.

Conclusion: Robot assisted ear surgery, especially cochlear implantation is both feasible and possible. Introducing such a system would decrease the time needed for implantation by half. The system is easy to use with minimal requirements in terms of technology. It can be adapted for a wide range of auditory implants.

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Emerging Technologies (2) (R661)

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Microsurgical robot for direct cochlea access

Presenting Author: **Marco Caversaccio**

Caversaccio M[1,2], Williamson T[3], Gavaghan K[2], Gerber N[2], Wimmer W[1,2], Anso J[3], Rathgeb C[2] , Wagner F, Weber S[2]

[1]*Department of ENT, Head and Neck Surgery, University Hospital, Bern, Switzerland* [2]*ARTORG Center, Bern, Switzerland*

Learning Objectives:

Objectives: Over the last decade significant research efforts have been invested towards the application of surgical robotics for cochlear implant surgery. To this end, a high accuracy image guided robotic manipulator was developed at the University of Bern, allowing minimally invasive access to the cochlea. This work aims to evaluate the accuracy and usability of the developed system in a study on human temporal specimens.

Methods: A complete surgical workflow for robotic assisted minimally invasive cochlear implantation, including fiducial screw insertion, pre-operative imaging, semi-automatic trajectory planning, patient-to-image registration, tunnel drilling, and electrode array insertion was developed. The proposed workflow, the accuracy of the robotic system, and the effectiveness of the integrated safety features were evaluated in a total of 22 human temporal bone specimens.

Results: In all cases, access to the cochlea was successfully obtained. A drilling accuracy of 0.15 ± 0.07 mm was observed at the round window of cochlea as determined from post-operative image data. The additional mechanisms provide a means to monitor the safety of the approach during the surgery. The system is approved by the Swissmedic regulatory and the Swiss Ethical Committee has given permission for a first in man clinical trial.