Percutaneous implantable Bone Conduction Hearing Aids have been used for decades to treat certain types of hearing losses. These devices can offer improved sound quality, by stimulating the bone directly. However this class of device has a major drawback: a chronic open wound, as vibratory energy is delivered to the skull through an osseointegrated screw directly attached to an external audio processor. To overcome issues related to wound management and infections, two new classes of bone conduction hearing aids have been recently developed: passive, and active, transcutaneous implants. The passive devices transfer mechanical energy through intact skin to the bone. The BONEBRIDGE system represents the first active bone conduction device that addresses the wound issues of percutaneous devices. The system is implanted in the Temporal Bone or in the retrosigmoidal area.

In order to evaluate the surgical risk of exposure /compression of important structures such as the dura and the sigmoid sinus, the BONEBRIDGE can be "virtually implanted" prior to the actual surgery using dedicated software called BB Fast View. The BB Fast View software utilises conventional CT scans (DICOM) and can assist radiological and surgical planning. Important information about the placement of the BONEBRIDGE can be forwarded to the radiologist and surgeon for evaluation. The software has been proven to be a useful tool as a preliminary assessment of the feasibility of BONEBRIDGE implantation.

doi:10.1017/S0022215116006435

ID: 847.2

Coupling of Active Middle Ear Implants to the Ossicles and the Cochlea

Presenting Author: **Joachim Mueller**

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Learning Objectives: In general, the audiological results achieved after tympanoplasty showed postoperatively for 80 % of the patients an improved or equal hearing compared to preoperatively. Thus 20% of the patients are not satisfied with their hearing. Active middle ear implants offer new possibilities for the improvement of hearing. In principle, active middle ear implants can directly drive any vibratory structure of the middle ear. The lecture uses video sequences to describe and discusses the coupling techniques of active devices to the ossicular chain (Incus, Stapes), to partial or total prosthesis, directly to the round or oval window. For some attachments, special elements had been developed. Also accompanying procedures, such as tympanic membrane reconstruction with cartilage are discussed. In cases of a atelectatic middle ear the alternative application of the device directly to the round oval or round window is advantageous. Active middle ear implants enrich the field of reconstructive middle ear surgery and enable a detailed discussion on different ways of reconstruction.

Since the basic principles of tympanoplasty had been developed in the early 50ties, many otologists made additional contributions to our current knowledge of tympanoplasty procedures.

In general, the audiological results achieved after tympanoplasty showed postoperatively for 80 % of the patients an improved or equal hearing compared to preoperatively. Thus 20% of the patients are not satisfied with their hearing.

Active middle ear implants offer new possibilities for the improvement of hearing.

In principle, active middle ear implants can directly drive any vibratory structure of the middle ear. The lecture describes and discusses, based on short videosequences, the coupling techniques to the ossicular chain (Incus, Stapes), to a partial or total prosthesis, or directly to the cochlea, via the round or oval window. For some couplings methods, special elements had been developed.

Also accompanying procedures, such as tympanic membrane reconstruction with cartilage are discussed.

In cases of a atelectatic middle ear some of the above mentioned alternative applications of the active device directly to the round oval or round window is advantageous.

Active middle ear implants enrich the field of reconstructive middle ear surgery and enable a detailed discussion on different ways of reconstruction.

doi:10.1017/S0022215116006332

ID: IP137

Quality of information available via the internet for patients with otological conditions

Presenting Author: **Alistair Mitchell-Innes**

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Learning Objectives:

Objective: Evaluate the type, content and quality of information available via the internet for patients with common otological conditions.

Methods: The Google search engine was used to generate responses for the following search terms: glue ear, otitis media, otosclerosis, Meniere's disease, cholesteatoma and ear perforation. The first 10 websites for each search term were selected for analysis. Websites were evaluated with the validated DISCERN instrument, the LIDA tool, the Flesch Readability Formula, the SMOG (Simple Measure Of Gobbledygook) readability score and against the JAMA criteria. Comparisons were made with a similar study assessing quality of information in non-otological conditions.

Results: Mean SMOG score was 12.19 years of education (range 6.2–22.8). The HON symbol appeared on 15 of 49 websites (30.61%). Pearson's r was used to identify interactions between variables and demonstrated a significant correlation between LIDA score and Google ranking ($R2 = -0.1195$, $p = 0.002$); between university/hospital affiliation and JAMA score ($R2 = -1.7889$, $p = 0.0182$) and commercial affiliation and JAMA score ($R2 = 1.0561$;

https://doi.org/10.1017/S0022215116006332 Published online by Cambridge University Press

p = 0.01). Multivariate linear regression analysis showed LIDA to be the strongest predictor of Google ranking (Page rank decreasing by 0.10572 per LIDA score; p = 0.01).

Conclusion: As websites with better Google ranking were only weakly associated with higher quality rankings patients would benefit from being directed to reliable websites by clinicians. There is currently a gap in the available resources repository of otological information aimed at patients.

doi:10.1017/S0022215116004667

Stem cell and their potential for hearing preservation (K853)

ID: 853.1

Stem cells and their potential for the restoration of hearing

Presenting Author: **Marcelo Rivolta**

Marcelo Rivolta
University of Sheffield

Learning Objectives: To present the current advances produced in our laboratory of the application of human pluripotent stem cells in the treatment of hearing loss.

The manipulation of human embryonic stem cells has open new horizons for regenerative medicine, especially for incurable conditions like deafness. Hopes have been fuelled further by the potential to generate patient-specific, induced-pluripotent stem cells (iPSCs).

Pluripotent stem cells need to be driven into the desired cell lineages. In our laboratory, we initially tackled this problem by isolating stem cells from the human fetal cochlea, and used them to unravel the basic signals involved in producing sensory cells. We then developed a method to generate otic cells from human embryonic stem cells (hESCs) using molecules that induce the formation of the ear *in vivo*. In this way we generated otic progenitors that can produce sensory hair cell-like cells and auditory neurons. When hESC-derived otic progenitors were transplanted into an animal model of auditory neuropathy, they survived, engrafted and differentiated into neurons. Moreover, they connected with the hair cells and the brain and, more remarkably, they elicited a functional recovery represented by improved ABR thresholds. We are now exploring if hESC-derived auditory neurons could interact with experimental cochlear implants. We have also developed iPSC lines using different techniques and we are adapting the methods developed for hESC for their use with iPSCs.

The field is still at an early stage, but the progress already achieved is substantial. Although the use of stem cells for hearing loss is likely to be initially limited to some conditions, this will probably change with the development of more efficient ways of producing sensory cells and with the improvement of delivery and grafting techniques. In summary, the presentation will revise the recent advances produced by our laboratory and the impact that this new technology could have in the future ways we treat this condition.

doi:10.1017/S0022215116004679

Cholesteatoma imaging: current value and possibilities (K855)

ID: 855.1

Cholesteatoma: Pre- & Postoperative imaging

Presenting Author: **Jan Casselman**
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[1]AZ Sint Jan Brugge-Oostende AV, [2]AZ Sint Augustinus Wilrijk

Learning Objectives: - Know the value of CT (CBCT) and non-EPI DWI in the diagnosis of cholesteatoma - Be familiar with the cholesteatoma mimickers and know how to avoid false positive and negative results - Be aware of the strenght of MR in the post-operative follow-up.

For many years CT was the only available technique. Its accuracy was however low as it failed to visualise new and residual lesions in partially or completely non-aerated middle ears and post-operative cavities.

Characterization of lesions in the middle ear with MR became possible in well-, partially- and non-aerated middle ears. Cholesteatomas do not enhance, scar tissue and/or granulation tissue in postoperative cavities sometimes enhances only after 30 to 40 minutes. Therefore scar tissue can only be distinguished on contrast-enhanced T1W images made 45 minutes after contrast injection. However this technique is time consuming and requires gadolinium injection and false positive and negative results were reported.

Cholesteatomas have a very characteristic high signal intensity on non-EPI DWI images. High resolution non-EPI DWI is able to detect lesions down to 2 mm. False negatives are rare and are due to movement or metal artefacts, auto-evacuation etc.

Studies showed that non-EPI DWI is the only sequence needed, making cholesteatoma screening very short (< 8 min.) and obviating the need for contrast materials.

After CWU surgery, the bony walls of the EAC are still intact and therefore post-operative clinical inspection is limited. Hence the need for imaging to detect residual cholesteatoma.

The value of this technique is even more crucial in patients who were treated with a "bone obliteration technique" or "mastoid/middle ear/external auditory canal exclusion technique". Post-operative inspection or second look surgery is not a real option in these patients. The accuracy of pre- and post-op non-EPI DWI is high is therefore replacing CT and second look surgery throughout the world. Finally today excellent software is available which allows matching of non-EPI DWI and Cone Beam CT images. These images provide the surgeon with all necessary information in one

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