

Results: Bone conduction thresholds showed no significant change over all in the implanted group. In few patients with mobile footplate some loss of bone conduction was observed. The mean free field thresholds were 43 \pm 7 dB (0.5–4 kHz) and the monosyllabic word score was 67 % at 65 dB presentation level compared to conventional hearing aids with 24 %. Speech intelligibility in noise was 2.1 dB SNR in the OLSA Matrix test (S0N0) three month after activation.

Conclusion: Codacs provides an effective treatment for patients with MHL.

doi:10.1017/S0022215116001900

Emerging Technologies (1) (R641)

ID: 641.2

Fully Implantable Hearing Aids

Presenting Author: **Philippe Lefebvre**

Philippe Lefebvre, Sébastien Barriat

University of Liège

Learning Objectives: 30% of the population over 65 years of age is hearing impaired, corresponding to 7% of the general population. At the present time, this frequent handicap can only be reduced by the use of hearing aids allowing to deliver higher sound energy to the inner ear. These prostheses have undergone tremendous improvement over the last few years in particular on the electronic and aesthetic aspects. In this presentation, we will review the progresses which have been made on implantable hearing devices transmitting the sound energy directly to the ossicular chain in the middle ear.

Semi implantable devices are composed of an external part containing the microphone, the battery and the electronic transferring the information transcutaneously to the internal receiver which activates the transducer attached to the ossicular chain.

In the fully Implantable Hearing Device, the subcutaneous microphone picks up ambient sounds, converts them into an electrical signal, amplifies the signal according to the wearer's needs, and sends it to an electro-mechanical transducer. The transducer tip is mounted in a laser-drilled hole in the body of the incus and translates the electrical signal into a mechanical motion that directly stimulates the ossicles and enables the wearer to perceive sound. The implanted battery is recharged daily via an external charger and the wearer can turn the implant on and off with a hand held remote control.

doi:10.1017/S0022215116001912

Emerging Technologies (1) (R641)

ID: 641.3

Implants in chronic ear disease – new advances

Presenting Author: **James Ramsden**

James Ramsden

University of Oxford

Learning Objectives: Chronic ear disease poses a challenge to hearing restoration. There is often a tension between

controlling the disease and restoring hearing. Outcomes of CSOM surgery in the long run have mixed hearing results and patients often must be phlegmatic about their hearing deficits. New technologies in hearing and vestibular devices can alleviate the deficits but are sometimes difficult to apply to patients with disordered anatomy from chronic ear disease. Hearing aids, BAHA and middle ear implants are the mainstay of hearing rehabilitation, but new options include totally implantable middle ear implants, active stapedectomy devices (CODACS) and vestibular implants. In this session I will discuss where the newer devices fit in to the treatment options, and Prof Lenarz, Prof Lefebvre and Mr Donnolly will outline in more detail specific emerging technologies.

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doi:10.1017/S0022215116001924

Emerging Technologies (1) (R641)

ID: 641.4

Surgical aspects of vestibular implantation

Presenting Author: **Neil Donnelly**

Neil Donnelly¹, James Johnston¹, James Tysome¹, Patrick Axon¹, Yu Chuen Tam¹, Richard Knight¹, Ross Deas²

¹Cambridge University Hospitals, ²Med-El

Learning Objectives: Implantable vestibular prostheses are currently being developed in order to restore balance to patients with severe bilateral vestibular hypofunction. This presentation will examine the key research findings to date and examine on going challenges.

Implantable vestibular prostheses are being developed with a view to restoring balance to patients with severe bilateral vestibular impairment that are not responsive to currently available treatments. Electrical stimulation of nerve fibres in the vestibular system in animal and human experiments has been shown to evoke eye movements which mimic the vestibular ocular reflex (VOR).

An important technical issue faced in implanting a vestibular prosthesis is ensuring optimal positioning to provide electrical stimulation to the nerve fibres. The ideal test of this would be performed intra-operatively at the time of implantation to allow precise placement, and adjustment if required.

The aims of this clinical trial were to systematically record both the ECAPs and electrically evoked eye movements obtained by electrical stimulation of the semicircular canals in

patients under a general anaesthetic for translabyrinthine resection of vestibular schwannoma. This was to ascertain whether the ECAPs and eye movements are reproducible, reliable and correlated, and to allow characterisation of the ECAPs. A new implant array and surgical approach to vestibular implantation were developed. Auditory Brainstem Responses were also recorded to try and confirm preservation of hearing post. Patients were selected if they had recordable balance function and hearing in the tumour ear prior to surgery. Six patients were studied.

It was possible to demonstrate that the amplitude growth and nerve recovery functions were very similar to those observed in cochlear ECAPs but that the latency between stimulation and response was longer confirming that these are vestibular responses. Evoked eye movements under general anaesthesia were observed three out of six test cases and from more than one SCC: these eye movements are not affected by the level of anaesthesia. To date it has not been possible to demonstrate hearing preservation.

doi:10.1017/S0022215116001936

Free Papers (F642)

ID: 642.1

Long-term effects of Eustachian tube balloon dilatation on patient symptoms and satisfaction

Saku Sinkkonen¹, Veera Luukkainen¹, Matej Vnencak², Antti Aarnisalo¹, Jussi Jero¹

¹Helsinki University Hospital, ²Turku University Hospital

Learning Objectives: Long-term effects of Eustachian tube dilatation

Eustachian tube balloon dilation (BET) has been proven to be safe and effective in short-term but more information on its long-term effects are needed. We studied the long-term effects of BET on Eustachian tube dysfunction with a symptom questionnaire (modified ETDQ-7) in 46 consecutive patients (71 ears) treated in our department from 2011 to 2013. 34 (74 %) patients responded to the survey with a mean follow-up of 3.14 years (range 1.83–4.58 years). 77 % of the responders felt that their overall ear symptoms had improved compared to the preoperative situation, and the remaining symptoms were usually mild. Anyhow, the effect varied depending on the symptom. The most common preoperative symptoms were feeling that ears were “clogged”, muffled hearing, ear symptoms during a cold, crackling or popping sounds in the ears, and feeling of pressure in the ears. BET clearly alleviated these symptoms as at least 70 % of the affected patients reported improvement after long-term follow-up. On the other hand, ringing in the ears and the ability to release pressure in the ears by swallowing were improved only in about 40 % of the symptomatic patients. Overall patient satisfaction on BET was good and 79 % of the patients would choose to undergo BET again if their ear symptoms returned to the preoperative level. These results show that BET has significant subjective long-term benefits to the patients.

doi:10.1017/S0022215116001948

Free Papers (F642)

ID: 642.2

Tests of Eustachian Tube Function: The effects of different patient manoeuvres when testing healthy ears

Presenting Author: **Matthew E. Smith**

Matthew E. Smith, James R. Tysome
Cambridge University Hospitals NHS
Foundation Trust

Learning Objectives: To better understand the available tests of Eustachian tube function, and how to optimise the techniques for clinical use.

Introduction: Obstructive Eustachian tube dysfunction is a common disorder for which there is no validated or well-characterised clinical test. To identify opening of the Eustachian tube, numerous tests have been developed which require a patient to perform a Valsalva, Toynbee or sniff manoeuvre, or to swallow on demand. These measures have not previously been compared, or technically refined in healthy individuals.

Methods: We compared six tests of Eustachian tube function in 75 ears from 42 participants, determining the most effective patient manoeuvre for each, and our own normative data.

Results: The highest detected opening rates in normal ears were: Patient reported opening 79%; Observed tympanic membrane movement 78%; Tubo-tympano-aerodynamic-graphy (TTAG) 76%; Continuous impedance 88%; Sonotubometry 94%; nine-step test inflation/deflation 93/94%. Valsalva manoeuvres were most effective at opening the Eustachian tube. Toynbee manoeuvres were most effective when the swallow was performed without water. For Valsalva and sniff manoeuvres, there was a significant correlation between the peak nasopharyngeal pressure generated and Eustachian tube opening.

Conclusions: A number of clinical tests are able to record Eustachian tube opening. The choice of patient manoeuvre applied within each test has a significant effect on detected Eustachian tube opening rates, and our results facilitate refinement of the evolving testing techniques. Further studies are required to explore the association between the test technique and results in ears with Eustachian tube dysfunction.

doi:10.1017/S002221511600195X

Free Papers (F642)

ID: 642.3

Open MET surgery in Children: still an option?

Presenting Author: **Tatiana Matos**
Tatiana Matos, Christoph Schlegel, Thomas Linder
Luzerner Kantonsspital