

# THE 13<sup>TH</sup> HEARING AND STRUCTURE PRESERVATION WORKSHOP

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Some 160 participants converged in Tokyo, Japan, for the Hearing and Structure Preservation Workshop on 2–5 October 2014. This meeting was the 13<sup>th</sup> in the workshop series. The host of this year's Workshop was Prof. Shin-ichi Usami from Shinshu University School of Medicine.

Thirteen has proven to be a fortunate number for Japan: since last year electro-acoustic stimulation (EAS) in children and adults has been approved as a clinical procedure by Japanese health authorities and is now covered by national health insurance. An innovative aspect of Japanese clinical guidelines for EAS is that they refer, among other factors, to the aetiology of hearing loss. A combination of objective hearing tests and genetic testing results in improved assessment and prognosis for hearing, especially in very young children.

As presenters and participants of this workshop agreed, at the present stage of development hearing preservation (HP) still poses a substantial challenge. There are a multitude of factors that have to be taken into consideration to achieve maximum HP, such as electrode design, insertion depth, and surgical procedure; there are also individual characteristics of different groups of candidates, such as age, degree and duration of hearing loss, its progression and aetiology.

Currently, the vast majority of cochlear implantations use three surgical approaches – cochleostomy (C), round window (RW), and extended round window (ERW) – and two electrode types: lateral wall (LW), with several contacts over a long span, and perimodiolar (PM), with many contacts over a short length. For more than a decade the trend in electrode design has been toward ensuring hearing and structure preservation for all insertion depths, while improving the ease of insertion through the RW membrane or cochleostomy, according to Claude Jolly from Med-El.

The correlation between insertion depth and structure preservation (for a similar surgical approach and similar electrode model) is still unproven. What is being demonstrated, however, is that maximum cochlear coverage with the use of EAS, or electric stimulation only, provides greater benefits for patients. Moreover, data from Vanderbilt University presented by Dr George Wanna suggests that RW and ERW approaches and LW electrodes are associated with a higher likelihood of a successful scala tympani placement and confers superior audiological outcomes [1]. Additionally, a RW approach with a soft electrode decreases the risk of damage to vestibular function, as Dr Keita Tsukada from Japan said in his presentation [2].

In the future, HP will be essential, particularly with implantation in children, as underlined in the presentation by Prof. Henryk Skarżyński from the Institute of Physiology and Pathology of Hearing in Poland. During his talk Prof. Skarżyński presented an overview of the first and the largest paediatric program of cochlear implantation, hearing preservation, electric complementation (EC), and electric acoustic stimulation (EAS). This clinically established effort has been described in the literature as Partial Deafness Treatment (PDT) [3]. Clinically and scientifically, three types of PDT in children have been identified: 1) deep, with 31 mm insertion of standard electrodes in cases of non-functional residual hearing; 2) shallower, with 20 mm insertion in cases having only slightly elevated thresholds at low frequencies; 3) deep, with 28 mm insertion in functional residual hearing.

A number of speakers presented results of HP using the new Hearing Preservation Classification system, developed by the HEARRING group led by Prof. Skarżyński and Prof. Van de Heyning from the University of Antwerp [4]. This comprehensive HP classification system is suitable for use with all cochlear implant users who have measurable pre-operative residual hearing. Data presented during the Workshop showed that the new classification system works effectively, and clearly and accurately describes hearing preservation results.

There is sufficient evidence that cochlear implantation results in better hearing benefits if the inner ear structures are preserved, regardless of the type or degree of patient hearing loss. We should therefore aim for structure preservation in all cases. One of the future solutions presented during the Workshop was personalized electrode design and a so-called 'theranostic' electrode enabling specific, individualized therapy for various diseases and combining diagnostic and therapeutic functions. The personalized approach means choosing an electrode length and insertion depth based on an individual's cochlear duct length and residual hearing.

Minimizing invasiveness and insertion-induced trauma, and improving functional outcomes through patient-specific frequency mapping, are the goals of the collaborative project (HEAR-EU) supported by the European Union under the Health Cooperation Work Programme of the 7<sup>th</sup> Framework Programme started in September 2012. The objectives of this project, presented at the Workshop, embrace:

- developing a novel high-resolution, high-energy microCT device to obtain detailed images of the middle and inner ear, even in the presence of metallic implants,

- building a model of the shape variability of the middle and inner ear from high-resolution images, also incorporating functional information,
- building a computer-assisted, patient-specific preoperative planning system, and
- improving the design of cochlear implant (CI) electrode arrays and associated insertion tools using a population-based optimization framework.

Among other topics included in the scientific program of the Workshop were electrode studies, outcome predictions

and improvement, pharmacological approaches in otoprotection, tinnitus, peripheral assessment, functional imaging, personalized medicine, and approaches to tissue engineering. The outstanding extent and depth of topics presented during the Hearing and Structure Preservation Workshops are at the root of their success, coupled with the commitment of organizers and the continued participation of top-level hearing specialists from around the globe. This year's Workshop has set a high benchmark for the next 14<sup>th</sup> meeting that will take place in Nashville, USA.

### References:

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