

31ST WORLD CONGRESS OF AUDIOLOGY, MOSCOW, RUSSIA, 29 APRIL – 3 MAY 2012

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The 31st World Congress of Audiology, together with the biennial congress of the International Society of Audiology, took place in Moscow from 29 April to 3 May 3, 2012. It was organised jointly by the International Society of Audiology and the Russian Society of Audiology, and was the first time that the congress was given the name "World" instead of "International". About 500 participants from around the world attended the conference. The scientific program included 3 symposia, 4 invited lectures, 19 free papers, and 2 poster sessions. The lectures were presented by outstanding specialists and young scientists who focused on different aspects of normal and pathological auditory processing.

The presentations generally concerned the genetic basis for hearing loss, diagnostic methods for hearing and speech, implantation, and hearing aids. The most important issues are summarised below.

Molecular basis of hearing loss

A symposium on "Biological and genetic basis for hearing loss" included interesting talks of scientists from the National Institute of Deafness and Other Communication Disorders in the USA. Prof. T. Friedman presented results on the molecular basis of hereditary deafness. He provided an example of the MYO7A gene mutation, which is associated with Usher syndrome and characterised by congenital profound deafness, progressive loss of vision, and vestibular dysfunction. The major role of appropriate rehabilitation and educational programs, as well as genetic counseling for patients and their families, was highlighted. Prof. T. Friedman recommended cochlear implantation together with intensive auditory training as the most effective method for treating Usher syndrome. Prof. I. Belyantseva focused on molecular mechanisms underlying hair cell stereocilia, which are deflected by sound and head movement. Alterations in their morphology result in hearing loss and balance disorders. Prof. G. Frolenkov showed the results of his recent studies on TRPA1 protein which is an essential part of the pathway protecting the cochlea from acoustic overstimulation. Considering the method of Next generation sequencing (NGS), which is nowadays the standard method for identifying gene mutations in research, Prof. N. Morell highlighted the role this technology plays in identifying the mutated genes that cause hearing loss. NGS may soon become a common method in clinical practice, especially for genetic counselling.

Diagnostic methods for hearing and speech

An interesting lecture on this topic was provided by Prof. R. Harrison from Canada who showed results of an animal

model used to study neural links between the two ears. Our ears do not work independently, and cochlear damage in one ear has important consequences for the other. Prof. R. Harrison talked about his study of anesthetized mice in which ABRs were recorded from both ears. Immediately following unilateral cochlear damage there was a significant elevation in threshold and amplitude of ABRs in the contralateral ear. The results show that changes in activity patterns in one cochlea have contralateral effects which may be important in audiological clinical practice.

Prof. K. Campbell from the USA talked about the protective effects of D-methionine (D-met) in preventing or reducing toxicities induced by aminoglycoside antibiotics, which are commonly prescribed to treat sepsis, meningitis, or respiratory infections. As a result of this treatment patients often suffer hearing loss and kidney problems. Prof. K. Campbell studied guinea pigs treated with daily injections of both the antibiotic and D-met. D-met reduced antibiotic-induced ABR threshold shifts and cochlear hair cell loss. Prof. K. Campbell is continuing her research in this area to prevent noise-induced hearing loss in US military populations and hearing loss in chemotherapy patients treated with cisplatin (an anti-cancer medicine).

Prof. McPherson showed a case study of a 15-year boy with left frontal scalp hematoma as a consequence of head trauma. The patient suffered from vertigo, tinnitus, and depression. Central auditory processing and language tests indicated damage to the left superior temporal gyri. DTI study revealed a reduced number of fibers of the corpus callosum on the left side. Prof. McPherson highlighted the importance of joint behavioural and neuroimaging techniques in aiding diagnosis after brain damage.

A few lectures concerned technical aspects of objective diagnostic methods used in audiology, e.g. transiently evoked otoacoustic emission (TEOAE) as well as the measure of spectrum resolving power (SRP) which may be useful for assessing the effectiveness of hearing aids and cochlear implants.

An interesting talk was provided by Prof. Attias from Israel who showed experimental evidence of an association between auditory neuropathy and dietary thiamine deficiency. The results in infants fed a thiamine-deficient formula for 3 months proved that thiamine is crucial for normal auditory development and its deficiency may be considered as a cause of neuropathy of the auditory system in infants.

M. Lewandowska from the Institute of Physiology and Pathology of Hearing, Poland, presented an innovative

method of simultaneous EEG and fMRI registration which may be applied for investigating the neural correlates of central auditory processes in children and neurological patients.

Several major issues were discussed during a session on speech perception. Prof. Coninx talked about a *multi-Frequency Animal Sound Test* (mFAST) in which animal sounds (cow, dog, cat, bird) with different spectral properties are used to estimate audiometric thresholds. The results of the mFAST validation study indicate that it may be applied as an alternative to pure tone audiometry to screen young children for hearing loss. Another lecture by V. Peter from Australia focused on the role of cognition in understanding degraded speech. Using EEG methods the authors found specific changes in brain activation in response to speech sound modifications. A. Vermeulen from the University of Cologne showed basic principles of the HEARD program. The general purpose of this project is to expand an international database of speech perception tests performed by children with different hearing problems. The HEARD program introduces a common measure of speech recognition ability, the Equivalent Hearing Loss (EHL) value. So far, 19 audiological, educational, and medical centres and clinics in some European countries, including Poland, have participated in this project.

Implants and hearing aids

Auditory implants and hearing aids were widely discussed at the conference. The first symposium on this topic was moderated by Prof. R. Cowan and included a panel of Prof. R. Laszig, Prof. T. Nikolopoulos, Dr P. Skarzynski, and Prof. G. Tavartkiladze. Discussion focused on available forms of treatment for patients with asymmetric and single-sided hearing loss. The panel questioned whether it is better to implant only the ear with more profound hearing loss or both affected ears. The effectiveness of using different hearing aids in asymmetric hearing loss treatment was also considered. Participants of the panel discussion emphasised that brain plasticity played a major role in recovering from hearing loss. A remaining open question is how well predictions obtained from adults can be carried across to children. Prof. R. Laszig noted that the best choice is to provide cochlear implantation to children as early as possible. He also believed that robotic surgery was in an early stage, and is still very expensive.

Concerning innovations that may be implemented in surgery in the future, participants of the panel discussion raised issues about the simplification of the fitting procedures, miniaturisation of the implanted electrodes, and modernisation of the educational system for surgeons. Gene therapy was considered a promising way of treating deafness.

Prof. R. Laszig talked about his experiences with implantation of asymmetric hearing loss patients. He highlighted the major problems of this clinical group: impaired speech recognition and sound source localization ability. In addition, these patients often suffer from tinnitus. Prof. R. Laszig presented the results of his ongoing project concerning the effectiveness of asymmetric hearing loss treatment. So far, 53 adult patients with at least a 10-year history

of hearing deficits have been recruited. Performance on speech recognition and sound source localisation tests of patients with auditory implants have been compared with those who used hearing aids in one ear (these patients had normal hearing or mild hearing loss in the other ear). In general, the most satisfactory outcomes were obtained in implanted patients. The duration of hearing loss and its aetiology turned out to be important predictors of speech recognition and sound source localisation ability. Prof. Laszig also strongly recommended using implants in cases of prelingual deafness.

Prof. T. Nikolopoulos focused on methods of temporal bone imaging which is necessary prior to implantation. The most common techniques are high-resolution computerised tomography (HRCT) and magnetic resonance imaging (MRI).

Dr P. Skarzynski showed different approaches to hearing protection after studying 3756 cochlear implant patients in the course of 20 years, out of which 1512 were treated for partial deafness. He also presented Prof. H. Skarzynski's classification scheme for Partial Deafness Treatment.

Prof. G. Tavartkiladze concentrated on objective methods for diagnosis of the auditory pathway in patients before and after implantation. Stapedius reflex measurements should be made during an operation and afterwards during the sound processor fitting. The most common objective measurement method in use is Neural Response Telemetry (NRT).

During the Cochlear Satellite Symposium, Prof. R. Cowan noted that electrical stimulation delivered to the brain areas involved in processing of high sound frequencies, in combination with the acoustic stimulation applied to the regions responsible for low frequencies, was an especially effective solution for speech and music perception. He highlighted the 'usable residual hearing' principle, i.e. the improvement of hearing should be transferred into daily activities. Prof. R. Laszig showed better speech recognition and sound source localisation abilities in adult patients with single-sided deafness after the BAHA implant insertion. An additional effect of the implantation was inhibition of tinnitus. Dr P. Skarzynski presented possible applications of telemedicine for medical consulting, fitting, and rehabilitation.

During the symposium experts from Cochlear Ltd, which offers various hearing solutions in many different countries, talked about new noise reduction technologies available for cochlear implant users. The new BAHA 3 system was described in detail. A second technical symposium by Advanced Bionics provided a brief description of different types of commonly used cochlear implants. The advantages and disadvantages of the HiRes90K implant as well as a waterproof sound processor called Neptune were presented.

During the free paper sessions on auditory implants, Prof. Cowan showed technical possibilities, advantages, and limitations of a prototype implant developed in the HEARing CRC. The conclusion was that the microphone used was a key issue because of the need to avoid body noise. Prof. Cowan also presented new technologies and processes

for improving the transmission of electrical signals. He provided reasons behind the effectiveness of the Nucleus Slim Straight electrode. This new electrode is specifically designed to preserve residual hearing, and the first results are very promising. S. Haumann from the University of Hannover found that on the basis of speech understanding tests on 148 patients conducted prior to the implantation it was possible to predict the success of cochlear implantation. E. Leongard from Moscow emphasised the importance of psychological and pedagogical rehabilitation of hearing impaired children. The presentation provided by C. Rocca from the UK showed the positive effects of music rehabilitation program in children with cochlear implants.

During the conference there were 3 paper sessions on hearing aids. Interesting talks were provided by speakers from Australia: G. Keidser (National Acoustic Laboratories and the Hearing CRC), who described factors that affected the effectiveness of using a directional microphone, and A. Fuente (University of Queensland) who showed that cognitive capacities are good predictors of the effectiveness of hearing aids in older people.

The invited lectures deserve special attention. Prof. J. Eggermont talked about electrophysiological studies on the tonotopy of the auditory cortex in cats. The results have important implications for human research on the effects of long-term noise exposure. Prof. G. Cianfrone from the University of Rome presented strategies for early detection of

psychological comorbidity in tinnitus patients. On the basis of the scores achieved in the Tinnitus Handicap Inventory (THI) questionnaire it was possible to decide whether a particular patient needed either audiological or psychiatric consultation. Prof. G. Paludetti provided experimental data concerning protection against inner ear damage.

An outstanding presenter was Prof. D. Kemp, the discoverer of otoacoustic emissions (OAEs). He emphasised how long it takes from inventing something to its practical application. He considered what turns a discovery into an invention. He noted that application can be handicapped by the lack of a common standard. He illustrated this phenomenon with the example of steam power, which finally enabled the industrial revolution; in audiology the same problem arises for establishing normal thresholds. Prof. D. Kemp recommended the book *“What fire is in mine ears: Progress in auditory biomechanics”*, published by Springer Verlag in 2011. The vast majority of sensory hearing loss involves outer hair cell dysfunction, but this is not true for all hearing dysfunction. Prof. D. Kemp stated his view that OAEs are a leakage of energy out of the functioning cochlea, and so they are only a by-product. The functional homeostasis of the cochlea is shown by its reaction to loud sound.

In the closing of the congress Prof. R. Cowan was elected the new President and Prof. G. Tavartkiladze the new General Secretary of the International Society of Audiology.