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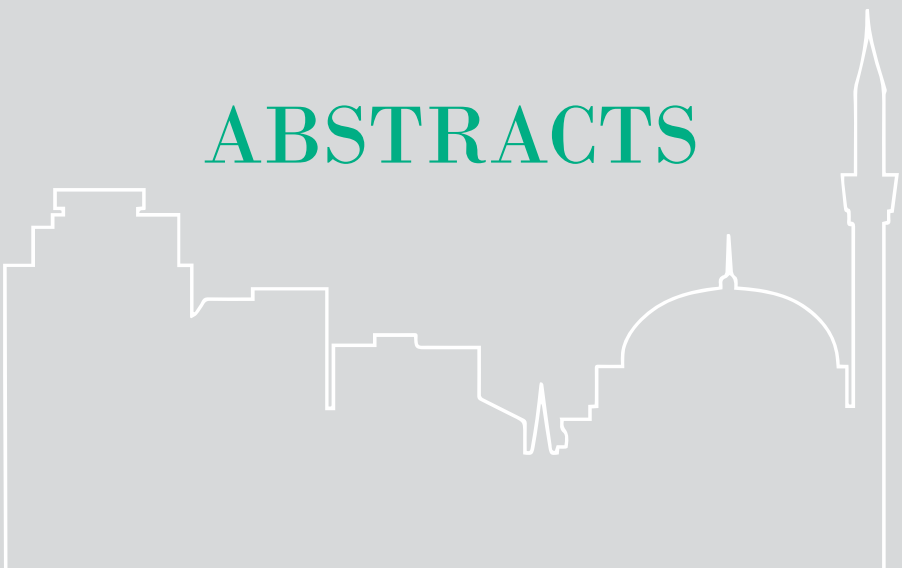
ABSTRACTS



Content

Cochlear implantation and anethesia

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In light of the strong trends toward performing cochlear implantation in infants, it is necessary to consider anesthetic issues. Just as anesthetic risk may play an important role in surgical candidacy in the elderly population, anesthesia is also of special consideration in infants. Even healthy infants are known to be at increased risk for anesthetic complications. For this reason, most elective surgical procedures are not routinely done within the first two years of life.

The advancement in the technology of the cochlear implants has resulted in increasing trend of cochlear implantation in both the children and elderly population. The anesthesiologist is faced with the task of smoothly conducting the surgery without any interference in the stimulation techniques used.[1]

The preoperative evaluation is mainly focused on the presence of any congenital anomalies in these patients which may affect anesthetic technique. The reduction of anxiety of the patient as well as the parents of small children is an important aspect of the preoperative visit. The anesthetic technique chosen should not interfere with the stimulation of the cochlear implant electrode assembly. The postoperative management is mainly focused at prevention of agitation and good analgesia. A close cooperation between the surgeon and the anesthesiologist is essential for a positive outcome in this surgery.

Induction of anesthesia can occur in the standard manner in adults using propofol 2, 5 mg/kg intravenously with the analgesia given by fentanyl 0, 5 - 2 μg/kg intravenously for pediatric patients, and 2 - 20 μg/kg intravenously for adult patients. The induction in children without intravenous access can be achieved by inhalational induction by oxygen and sevoflurane. Tracheal intubation is achieved after neuromuscular blockade with rocuronium 0.5 mg/kg intravenously, with appropriate sized endotracheal tube. Attenuation of hemodynamic response with preoperative remifentanil in a dose of 1 mg/kg not only provides stable hemodynamics during induction and intraoperative period enabling a smoother control to provide a bloodless field during surgery, but also decreases the requirement of anesthetic drugs during perioperative period.[2]

Anesthesia is usually maintained with oxygen, air, and sevoflurane without intermittent doses of rocuronium. Alternatively, a total intravenous technique involving infusion of propofol can be used to maintain anesthesia. However, the choice of anesthetic technique and drugs is solely the priority of the attending anesthesiologist whether to use experience based or evidence based anesthesia based on scientific logical empiricism.[3]

The standard monitoring should include hart rate, five lead electrocardiogram, noninvasive blood pressure, pulse oximetry, capnography, and neuromuscular monitoring. Tissue oxygenation monitoring is an advance monitoring that give us valuable information about tissue oxygenation during hypotensive anesthesia technique that is the most desirable technique for cochlear implantation at pediatric patients, as well as at the adult population.

The surgical duration is usually 3 hours with no significant blood loss with proper use of hypotensive technique. There is no requirement of blood transfusion, however sometimes significant blood loss may occur from large non collapsible mastoid emissary veins. Adequate blood volume is maintained by infusion of crystalloids compensating for fasting and blood losses.

An important step during the surgery is preservation of facial nerve which may be identified intraoperative by electrical stimulation thus precluding the use of muscle relaxants. This should be used after the effect of the muscle relaxant used for intubation has weaned off as evidenced by the response on the train of four stimulation and during this process the anesthesia can be maintained by propofol infusion in combination with remifentanil or a combination of remifentanil with sevoflurane.

The two main aspects of electrical stimulation are usually used, that is, the electrically elicited stapedius reflex threshold (ESRT) and electrically elicited compound action potential (ECAP).[4]

ESRT mainly determine the maximum comfort level which is defined as the loudest sound tolerated without pain, while ECAP mainly determines the noise threshold - lowest acoustic stimulus perceived as sound. Anesthesia can affect the ESRT leading to wrong estimate of the maximum comfort level which may produce pain during stimulation. In various studies it has been found that there is a strong correlation between the level of hypnosis and the mean stapedius reflex threshold value.[5]

The use of electroencephalograph has been found to be useful in maintaining the sufficient level of hypnosis. In a prospective study including children, it was found that the ESRT increased with increasing concentration of inhalational agent with minimal effect of propofol and nitrous oxide. The ECAP was not found to be affected by either the inhalational agents or the propofol. Thus, it can be concluded that the use of total intravenous anesthesia using propofol and opioid is beneficial in pediatric cochlear implant surgery.[6]

Sudden coughing and bucking should be avoided at the end of surgery to prevent dislodgment of the electrode array of the implant. Neuromuscular blockade should be reversed and spontaneous respiratory efforts are allowed. The child can be extubated in deeper planes and kept in lateral recovery position to prevent sudden agitation. The child should be nursed in post anesthesia care unit in presence of the parents with proper care of postoperative analgesia.

The major postoperative concern in cochlear implant surgery is the prevention of postoperative nausea and vomiting which is common in ear surgery. The various measures employed are adequate anxiolytics preoperatively, use of total intravenous anesthesia with propofol, avoidance of nitrous oxide, administration of antiemetic's like ondansetron 0.1 mg/kg intravenously at the end of surgery, Postoperative analgesia can be maintained with parent or nurse controlled boluses of intravenous paracetamol. It is effective in reducing doses of opioids and thus helps in prevention of opioid related side effects.[7,8]

The incidence of postoperative shivering can also be reduced to a large extent by use of perioperative dexmedetomidine.[9]

The patient should be monitored in post intensive care unit till the consciousness is regained fully with minimal postoperative nausea and vomiting.

The cochlear implant surgery is considered to be relatively safe and minimal or no anesthesia related complications are reported. The complications are mainly surgical including minor complications like mild flap infection, change in taste, minor balance problems, and transient facial palsy. The major surgical complications include flap necrosis, device failure, device migration, cerebrospinal leak, meningitis, and persistent facial palsy.[10, 11]

Late postoperative complications requiring reimplantation are less frequent and thus these patients should be followed for long term.[12] Other less frequent complications include displaced magnet from the receiver pocket by magnetic toys and silicone allergy.[13]

Conclusion

The anesthetic technique used may have implications on the method of stimulation of the electrodes of the cochlear implant intraoperative. Moreover, most of these patients are children and it is the responsibility of anesthesiologist to prevent any agitation and smooth induction and emergence from anesthesia. A close cooperation between the anesthesiologist and surgeon is essential for a positive outcome.

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Cochlear implantation and vertigo-case presentation

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CI has become a standard of care for the patients with moderate to severe sensorineural hearing loss in the last more than 20 years. In time when the indications for CI are significantly expanded and we have wide use and application of cochlear implant it is already becoming very important to critically analyze and evaluate all the risks and possible side effects of this procedure. Postoperative vertigo it's one of the well - known complications after cochlear implantation which has a considerable impact of patient life. It can be a consequence of many causes and the complaints can appear directly after cochlear implantation surgery or after a period of time. Postoperative vertigo it's more common in adults, especially in one who have a history of preoperative balance disorders and long lasting deafness. Children really suffer from this complication which usually occurs in milder form.

In this case report we present a 9-year-old child, a cochlear implant recipient, with recurrent episodes of vertigo appearing for the first time 6 years after the implantation. Every next episode of vertigo was milder than the previous one and well respond on standard vestibular therapy with Beathistine or Eglonyl.

Exposing patient to the risk of possible balance disorders associated with CI its justified in view of the hearing rehabilitation achieved. In any case it's necessary to inform the patient about possibility and quality of post-operative vertigo symptoms. Implementing a protocol for peri-operative evaluation of the vestibular function of specially designed questionnaires and objective tests for assessment of the vestibular function should be standard procedure for each patient who is candidate for a cochlear implant.

Cochlear implantation in case of relapsing polychondritis

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Key words: cochlear implant, relapsing polychondritis, autoimmune disorders

16 years old patient was first hospitalized in 2013 with complaints of vertigo and reduced hearing in the right side. Investigation showed conductive hearing loss, serous otitis media and peripheral vestibular syndrome. After 10 months he started to develop recurrent stridorous breathing attacks combined with episodes of vertigo. In one year hearing is worsening and he becomes practically deaf. Magnetic resonance imaging shows partial destruction of laryngeal cartilages and the diagnosis of relapsing polychondritis is made. In 14 months shortness of breath becomes an indication for a tracheostomy. The patient is receiving immunosuppressive therapy which causes secondary Cushing's syndrome with vertebral compression fractures.

In 2016 MED-EL CONCERTO FLEX^{28} electrode cochlear implantation on the left side was performed. Post-operative CT checkup showed all electrodes inserted in the cochlea. The initial fitting of speech processor OPUS 2 was performed 1 month later and subjectively test results were excellent. Free field audiometry after 5 months shows hearing with left ear 15-25 dB.

Relapsing polychondritis is a rare autoimmune connective tissue disease. Inner ear disorders are seen in only 40-50% of patients, but profound sensorineural hearing loss is uncommon. In these situations, cochlear implantation should be considered as a treatment option.

Cochlear implantation in the ossified cochlea

Rouev P., Dimitrov T.

Ossification of the cochlea in candidates for cochlear implantation is often. During the last 5 years we have three cases with ossified cochlea. We present our surgical experience in that cases with cochlear ossification. Two of them were successful and one of them was impossible because of total cochlear ossification. Case reports demonstrating that results is often similar to those expected for implantation of the nonossified cochlea when the insertion itself is possible.

Concurrent genetic and standard screening test for hearing reduction

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Objective: Reduction of hearing is the most common sensory impairment among newborns with an incidence of 1–3 per 1000 births. Introduction of an Auditory Newborn screening program allows early identification of hearing impairment. Mainly, congenital hearing loss in early childhood is a result of genetic changes. Due to high frequency of *GJB2* pathogenic variants, its molecular characterization among NSHL cases is already conducted as a routine analysis in many countries.

Aims: To determine whether genetic screening along with the standard hearing screening in newborns is justified. Here we present our experience.

Methods: Otoacoustic emission (OAE) method was conducted in 223 newborns at risk of hearing impairment. Among them 7 did not pass the test in both ears while 9 exhibited one-sided hearing loss. In all 7 children with indication of profound bilateral deafness, the diagnosis was confirmed using auditory brainstem response. Genetic screening of GJB2 gene was performed in six of them.

Results: Genetic analysis of *GJB2* revealed homozygous state of the most common pathogenic variant 35delG in three (50%) of the analyzed infants. In the remaining three no pathogenic variant was determined.

Conclusion: The results indicate that performing auditory OAE together with genetic screening is justified. In newborns who have not passed the hearing screening test and have profound hearing loss, without other syndrome traits, screening for mutations of *GJB2* gene should be conducted. Genetic screening enables establishment of early definite diagnosis for deafness and helps in conducting adequate therapy providing timely rehabilitation and social inclusion of deaf child.

Key words: hearing loss, genetic screening, auditory screening, *GJB2* gene

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Criteria for determining hearing aids in children in Montenegro

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According to world statistics per 1,000 live births 1-3 have hearing problems. Montenegro according to Wilkipedia has 622,373 inhabitants according to the 2017 census. The number of children (0-17 years old) in Montenegro in the middle of 2017 years is 137,419 or 22.1% of the total population, which means that 137-412 children have hearing problems in the Montenegrin population. Percentage expressed 0.022-0.066%. Of those, cochlear-impaired children are currently 53. By CI, 41 MEDEL, 10 Cochlear and 2 ADVANCED BIONICS. Until 2 years ago, cochlear implants were covered by the Health Fund at the expense of the Health Fund until the age of 18, and now this limit has been moved to 26 years. The lower limit is set at 18 months and a person with bilateral hearing loss equal to or greater than 90 dB is eligible for a cochlear implant in the area of speech frequencies.

Also, an insured person up to 26 years of age with congenital ear malformation or other inability to wear aids is allowed a digital bone conduction device - the Vibrant system. The exact difference between boys and girls is not known, but there are more hearing impaired boys compared to girls.

According to the regulations of the Health Fund issued in 2016, children up to the age of 18 are entitled to two IV channel hearing aids, which can be changed up to 7 years once every two years, and then every three years, until the age of 18. The criteria are bilateral sensorineural hearing loss greater than 25 dB at 500, 1000, 2000 and 4000 Hz, one hearing aid is assigned. An insured person up to 18 years of age with bilateral permanent hearing impairment exceeding 45 dB in at least two speech frequencies (1000-4000Hz) is entitled to two hearing aids if successful hearing rehabilitation and speech development are thus enabled.

Hearing aids are prescribed by the "Hearing Aid Consilium", which is held once a week at RH "Danilo I", Cetinje. There are an average of 1-2 hearing aids per week for children up to the age of 18, which means that 80 to 104 patients receive these aids a year.

According to the manufacturers, the devices that are at the expense of the Health Fund are:

1. Audifon (Arriva and Vico)
2. Audio BM (Inizia 11 cpx Bernafon)
3. Rexton (Targa S 5, Targa P5 and Targa HP 5)

Waiting lists for the allocation of hearing aids in our country do not exist because children will be assigned to the devices within a week, while cochlear implants are a somewhat different situation, so it sometimes takes up to 8 months for paperwork.

For the first time in Montenegro, neonatal screening has been started in all hospitals and we expect timely diagnosis and early detection of hearing impairment, which will result in the earliest possible start of speech rehabilitation and inclusion of our youngest patients in equal life with their peers.

EEG before cochlear implantation

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Objective: 44 hearing-impaired children have been examined at the neurological-developmental clinic at the Pediatric Disease Clinic for the past 7 years. These children underwent the procedure prior to cochlear implant placement.

Methods: Neurological examination, EEG, Magnetic resonance imaging and evaluation of psychomotor development have been performed in these children.

Results: Children were middle aged at 32.5 months, Sub-coefficient in mental capacity was 90%, Sub-coefficient in Speech was 33%. An analysis of the EEG findings was made. Focal changes have been found in the temporal region

Key words: cochlear implant, EEG hearing impairment

Different VIBRANT SOUNDBRIDGE coupling techniques – our experience and results

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The VIBRANT SOUNDBRIDGE (VSB) active middle ear implant was originally designed for purely sensorineural hearing loss. Due to the technical developments in the recent years, the scale of possibilities has been significantly broadened and VSB became a widely utilized, reliable solution also for patients with conductive or mixed hearing loss.

Between 2011 and 2019, 24 patients were implanted at the Department of Otolaryngology, University of Pécs. Incus long and short process vibroplasty were performed for 11 and 5 patients, respectively, as well as round window vibroplasty for 2 patients. For 6 advanced otosclerotic patients, VSB incus vibroplasty was combined with stapedotomy ("power stapes" technique).

Comparing the different coupling techniques, patients with RW vibroplasty achieved the best postoperative functional gain as well as the best improvement in Speech Reception Threshold (SRT) and Word Reception Score (WRS) results. With the combined "power stapes" technique, we found remarkable improvement especially in the WRS results.

Flaws and obstacles in neonatal hearing screening program

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Early hearing detection and intervention (EHDI) is based on neonatal hearing screening (NHS), which is supposed to be well organized and smoothly ongoing. It is not always so.

Central database is required in order to monitor the NHS program (number of babies screened, lost to follow up, etc.)

Even the highest percentage of screened babies followed by low follow up decrease the outcome of NHS, like in USA.

Continuous financial support is necessary for maintaining NHS program. The cost per baby screened is 5-8 USD, but 7000 USD per a single baby identified with permanent hearing loss. It is not enough to provide one screener per maternity ward and consider that the problem is solved. One screener per 1000 births is necessary with several back-up devices in case of dysfunction. In hospitals with NICU and preterm babies AABR screener should be provided as well, because OAE screening is insufficient for this population of babies.

Education of staff performing NHS is not a guarantee that everyone will do it correctly.. The tracking system should be provided in order to intervene if high refer rates keep coming from a certain screening center. The central database is essential for quality control.

Two-step screening with OAE is the most effective way of selecting the babies who will need further attention and diagnostic procedure in audiology department. Organizing the second OAE screening is sometimes difficult because the babies are leaving maternity ward 2–5 days after birth. Providing screeners for pediatric clinics should be considered. Sending babies to audiology department for second OAE screening is not practical for both financial and organizational reasons.

The outcome of early identified hearing loss is promising if the well organized, financially stable and continuously monitored NHS is established.

Genetic testing of hearing loss at RCGEB using next-generation sequencing approachs

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Hearing loss is the most prevalent sensory deficit, with an incidence of 1-2/1000 newborns worldwide, with at least half of cases due to genetic factors. Hereditary hearing loss is one of the most genetically heterogeneous conditions with more than 1000 pathogenic variants identified in more than 80 genes. Despite the extreme genetic heterogeneity pathogenic variants in only one gene, *GJB2*, encoding connexin 26, a gap junction protein responsible for potassium transport and ion homeostasis, is the predominant cause of an autosomal recessive non-syndromic hearing loss. Pathogenic variants determined in other deafness causing genes are more rare and are only seen in either a single or a very few families.

Molecular characterization of inherited hearing loss in Republic of Macedonia has started in 2006 by direct Sanger sequencing of the *GJB2* gene. More than 180 unrelated cases with hearing loss were analyzed and members of their families. These studies indicate that *GJB2* pathogenic variants are responsible for hearing loss in 36.5% of analyzed cases, with 35delG as the most frequent pathogenic variant found in 66.9% of mutated chromosomes, followed by W24X (21.8%), showing specific ethnic distribution.

Recently, a new approach in molecular characterization of inherited deafness was applied. A simultaneously targeted screening of more than 70 deafness genes using TruSight One Sequencing panel covering 4800 genes on MiSeq, Illumina platform was performed in a family with two brothers affected with progressive hearing loss. They were prescreened for mutations in *GJB2* gene, and both were negative. Compound heterozygosity of NM_006383.3:c.[451A>G];[196C>T] was identified in *CIB2* gene. The *CIB2* gene, located on chromosome 15 encodes a protein belonging to a family of calcium- and integrin-binding proteins and has conserved role in calcium homeostasis. Both variants were novel, classified as pathogenic according to ACMG criteria. Their parents were confirmed as carriers. An early molecular diagnosis of hearing loss should may benefit with earlier medical intervention and cochlear implantation.

NGS approach was applied also in *GJB2* negative, two year old boy with bilateral sensoryneural hearing loss. NGS analysis did not reveal any pathogenic variant in deafness genes that could contribute to the condition.

In addition, in an other cases primarily sent for NGS due to other clinical conditions and deafness as a second clinical feature, *GJB2* gene pathogenic variants were also identified. A homozygosity of 35delG in *GJB2* gene, and a compound heterozygosity of 35delG andLeu90Pro were identified as an independent cause of deafness.

Due to high incidence among our population of deaf persons, Sanger sequencing of *GJB2* gene, remains the first line recommended molecular diagnostic approach. But possible defects in other deafness causing genes are not covered.

Next-generation sequencing (NGS) technologies become a powerful tool for geneticists in identification of the causative DNA variants in hereditary deafness following Mendelian pattern of inheritance. Due to extremely genetic heterogeneity in deafness, NGS involving a subset of panel with deafness-relevant genes allows sequencing of hundreds of genes in parallel and is the second diagnostic approach in families with hereditary form of deafness. NGS has an obvious advantage over classical polymerase chain reaction based Sanger sequencing, achieving faster results and appropriate cost effectiveness concerning the number of genes analyzed.

Implantable Hearing Devices in KBC Osijek

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Otorhinolaryngology Department of KBC Osijek was founded on the 23th May 1928. The founder and the first head of Department was Professor Ivo Herlinger, a student of Vienna. He was already very interested for deafness, ear surgery, diagnostics and treatment otogenic complications. Last year, we celebrated our 90th anniversary. The most important year was 2009 when Department become a University Department at Faculty of Medicine, Josip Juraj Strossmayer University of Osijek.Therefore, on 25th October 2019 we are celebrating 10 years since becoming University Department. In Croatia, deafness is treated by cochelear implantation since June 1996. Unfortunately, although professor Herlinger showed interest for treating deafness before 90 years, this interest in Osijek did not retained. The situation changes significantly in 2017, when the first cochlear implant was performed in KBC Osijek, thanks to the interest of some doctors and with help of Zagreb colleagues. Since then, cochlear implantation has been performed on children and adults in KBC Osijek which have indications. All operated patients have been successfully operated and rehabilitated.

Since 5th May 2017 in Croatia we have five centers for cochlear implantation: two Zagreb centers (KBC Sestre milosrdnice, KBC Rebro), KBC Osijek , KBC Rijeka and KBC Split.

We plan to establish a Center for cochlear implantation in the near future. KBC Osijek will then become a place for implantation and rehabilitation of cochlear implanted patients.

Individual Solutions in Cochlear Implantation; one step closer

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Introduction
In order to quickly estimate an individual's cochlear duct length (CDL), a research software application was developed. Clinicians can use this information to select the cochlear electrode array size that is individually suited to each cochlear implant (CI) recipient. Furthermore, the research software application allows to post-operatively determining the percentage of cochlear coverage, the insertion depth and the insertion angle of individual electrode contacts.

The objective was to evaluate the usefulness and reliability of the research software application for the estimation of an individual's CDL as a basis for electrode selection.

Methods
Before surgery, the maximum basal turn diameter (value"A") was measured on a coronal section of high-resolution computed tomography (HRCT) of the temporal bone. Based on "A", the research software application calculated the CDL, and either the longest or a shorter electrode was chosen for implantation. After implantation, the results of 21 consecutive patients (23 ears) obtained using the research software applications were compared to their postoperative X-ray measurements and to the surgeon's intraoperative notes.

Results
The application was used in 21 consecutive patients 19 children, 2 adults). The A distance measured on CT scans varied from 7.8mm to 9.7mm with a mean value of 9.14mm; SD = 0.415 The measured "A" distances correspond to CDLs varying from 28.5mm to 36.4mm. The mean CDL was 34.05mm; SD= 1.72. Full insertion was achieved in all but 2 cases but there were no electrodes outside the cochlea. There was no electrode fold over detected on imaging. In all but 4 cases, the electrode was chosen based on the research software application's indication. We inserted the electrode mostly through the round window (18/23). For 17 long electrode arrays, the software application suggested an insertion depth of 30.7mm and it was 29.4 mm (mean value) according to measurements on the X-ray. For 5 shorter electrode arrays, the predicted insertion depth using the software application was 27.4 mm and it was 26.6 mm (mean value) according to measurements on the X-ray. In one case we used an even shorter electrode.

Conclusion
The results suggest a good correlation between the insertion depths predicted preoperatively using the software application and calculated postoperatively using the X-ray. The insertion length predicted by software was always longer than that calculated on X ray.

Key Words: research software application, cochlear duct length, high-resolution computed tomography

Newborn hearing screening and genetic testing – National concepts, where we are/what do we need?

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In some countries NHS has become widespread, but in other countries is not avaliable or is considered to be too costly or of questioned value. Not only equipment, but capacity, required infrastructure, services and support are main issues. Quality control, screening metods, follow-up and cost effectiveness need to be discussed. Before any NHS implementation we need to take into account that newborn hearing screening without corresponding diagnostic, therapy, intervention, rehabilitation and apropriate sevices could be uselles and unethical. In many countries this program has not been implemented due to lack of evidence-based local guidance, financial or human resources, and absence of political will.

In RS we started with NHS in 2004, first in UKC Banja Luka and then in 8 Delivery unit in our entity. Using TEOAE and AABR through II stage protocol as hospital based precudure, we screened more then 50 000 newborns. Cochlear implantation was performed in 55 cases due to bilateral, profound, congenital hearing loss. The youngest candidate was child with one year of age at the implantation time. Follow up rate increased over the time, and age at the itervention time significantly decreased.

Implementation of NHS in our country was made without financial or any other support from government. Donations, personal enthusiasm, and good relationship between ENT i pediatricians have been the key of our success. Now it is recommended, not mandatory, and paid by Healt insurance found. Difficulties with equipment and staff still exist in some hospitals. Now, when we achieved our goal and have very young children with known hearing status, the question is could we offer apropriate treatment and better services then before?

Newborn hearing screening by OAEs – our experience

Tanja Todevska Cvijetik, Marina Davcheva Chakar, Valentina Ivanovska, Elena Bogeska, Irena Duma Vasovska

Aim: The OAEs method enables detection of hearing impairment in a very short time, immediately after birth. The aim of this study was to present our experience in newborn hearing screening by OAEs.

Methods: A total of 165 newborns were examined, including premature born ones and full-term newborns and they were examined between 01.03.2019 and 01.09.2019.

Results: According to the hearing screening test results , the percentage of newborns who did not pass the test and who are suspected of hearing loss is 8,4%. Retesting was done after one month and the percentage od babies who did not pass the re-examination test is 2,4%.

Conclusion: The OAEs method is efficient in testing hearing function in newborns, because it is rapid,objective and non-invasive. All newborns should be screened, because early detection of hearing loss in newborns is important for early treatment.

Key words: newborn hearing screening, OAEs, hearing loss

ONE SCREW FIXATION OF BONEBRIDGE HEARING IMPLANT – implantation of vibrating hearing implant in patient with conductive hearing loss

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This is a case of a 17-year-old patient with total atresia of left external meatus, microtia and consequential conductive hearing loss of 60 decibels. Until his high school he did not have any problems with his asymmetric hearing, but choice of profession dictated normal hearing. Considering great bone conduction and intact temporal bone we decided to implant Bonebridge vibratory hearing device. Thin corticalis and extended pneumatisation of temporal bone caused insufficient fixation of the second screw. Thus we were forced to fixate Bonebridge device with only one screw. We covered the unfixed screw with thin cortical lamella, which has proven to be effective. First postoperative evaluation of hearing with Bonebridge showed very good sound perception on the operated side. With the implantation of hearing device, we improved our patient's hearing so he matched the criteria required by his future profession. His aesthetic goals will be met with plastic reconstruction of auricle which will follow implantation of hearing device.

Key words: Bonebridge, one screw fixation, atresia of external meatus, conductive hearing loss.

OTOPLAN

Thomas Ringhofer
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For a surgeon it's always important to know exactly what has to be expected during a surgery, especially in the field of ENT where you have a lot of delicate structures that have to be preserved. To achieve that, MED-EL and the Swiss company CAScination developed the novel software OTOPLAN to provide a tool to easily examine and visualize CT and MRI data preoperatively. In addition it's possible to estimate the cochlear duct length (CDL) and choose the right electrode in case of CI surgeries. Based on the feedback of users OTOPLAN gets constantly updated to bring new features and improvements. In the latest version a new algorithm for the calculation of the CDL and the support for virtual surgery planning was implemented.

Рехабилитациски третман кај лица со кохлеарен имплант во „Завод за рехабилитација на слух, говор и глас – Скопје“

Весна Лазаровска, Билјана Ѓорѓеска

Cochlear implant is an individual hearing aid of the newest generation. It is different from a hearing aid because it is surgically placed in the inner ear. The invention of cochlear implant is considered the turning point in implant technology since it may solve problems with hearing disability. It is recommended in individuals who have no significant sound increase or have small benefit from individual amplifying hearing aids, as well as in individuals with hearing impairment over 90db on 500, 1000, 2000 and 4000 Hz.

The aim of our presentation was to evaluate the speech in individuals with pre-lingual hearing impairment with cochlear implant and to assess the benefit from the implant.

Quality of Life and Cost Effectiveness research in Cochlear Implants

Jone Gerdvilaite ,Vjolca Kjerimi Rushaj

Constantly rising health care costs in the past years have put an emphasis on the effectiveness of treatments, especially in surgical procedures such as cochlear implantation. Quality of Life (QoL) is a crucial outcome in hearing loss research, directly showing benefits for the patient. Quality of Life data not only supports patient counseling and raising awareness, the evidence obtained from QoL studies are used directly in cost effectiveness analysis.

Review of last ten years QoL publications in Cochlear Implantation have revealed lack of unified set of questionnaires used in the studies, many of the measures having variations in their sensitivity regarding to hearing loss. Two types of QoL measures are recommended to be used in a study for comprehensive results: Generic quality of life measure (e.g. HUI, AQoL8D) together with Disease specific quality of life measure (e.g. NCIQ) which have been proven to be both sensitive and reliable in reporting quality of life changes when measured before and after cochlear implantation.

Utility values from quality of life studies published internationally are the gold standard to be used in local cost effectiveness models. Since 2009, pediatric bilateral cochlear implantation has been proving to be cost-effective when adapted to local resource usage in many countries. Moreover, it is now estimated, that benefits from cochlear implantation, both unilateral and bilateral, have been underestimated due to poor selection of QoL measures choices. Regular usage of QoL measures in routine clinical practice has the possibility to inform not only clinical decisions makers, but also serve as evidence based decision aid to insurances and governmental bodies when confronted with funding selection and expansion of indications.

Reduced cochlear patency in cochlear implantation. What if?

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Cochlear implant is a widely accepted, safe procedure for patients with severe to profound hearing loss. There are different cochlear implant procedures described with similar success rate. The emphasis is given on hearing preservation surgery, therefore surgery with as little trauma as possible.

Preoperative radiological computer tomography (CT) provides insight of cochlear patency. Sometimes, even with normal CT findings and meticulous surgical technique it is difficult and even impossible to fully insert cochlear electrode due to unforeseen fibrosis.

A case of successful management of difficult electrode placement is presented and the literature is reviewed.

RONDO 2

Trifon Kiratzidis

MED-EL has always been the pioneer of miniaturization starting already in 1991 with CONFORT the first in the world BTE speech processor for the analog system.

In 1999 with the TEMPO +, the first in the world BTE speech processor for the multi channel digital system, with exactly the same specifications and capabilities as the body worn speech processor.

In 2023 came the RONDO, the first in the world cordless, button like speech processor. This was fully backwards compatible and fully functional with all capabilities as any other speech processor, without any compromise regarding specifications.

Then in 2010 the RONDO 2 came. It is a miracle of technology. State of the art regarding functionality and esthetic design.

I have the privilege to present it along with the interesting history hidden behind it about the initiation stimulus for the company and the first development and research.

Simultaneous translabyrinthine vestibular schwannoma resection and cochlear implantation with intraoperative E-ABR

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Introduction
Vestibular schwannomas are detected more frequently and at smaller stages nowadays. Long-time hearing preservation in sporadic vestibular schwannoma patients is below 50% independent of treatment modality. Cochlear implants are MRI safe and have improved magnets resulting in minimal artifacts. Therefore, cochlear implants in vestibular schwannoma patients are of increasing interest. Sparing the cochlear nerve and determining nerve function after tumor removal is one of the most crucial steps.

Methods/Material
Patients with sporadic vestibular schwannoma and functional deafness were included in the study. Preoperatively MRI and CT scans, audiometric testing as well as an electric brain stem response audiometry with a promontory stimulation electrode were carried. All patients were operated via translabyrinthine approach. Intraoperatively electric brain stem response audiometry (E-ABR)was performed with an intracochlear test electrode before, during and after tumor removal.

Results
Complete tumor removal was achieved in all six patients. MRI scans 6 months after surgery showed sufficient visualization of the internal auditory canal without magnet removal, no residual or recurrent tumor. Preliminary results show promising predictive value of E-ABR measurements.

Conclusion
Simultaneous resection of vestibular schwannoma and cochlear implantation is a good option for patients with functional deafness. Evaluation of sufficient nerve conduction remains the next challenge. Intraoperative electric brain stem response audiometry measurements show promising results.

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Vestibular disorders in cochlear implant users

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Goal of the Presentation
Due to the close relationship between cochlea and vestibular receptors, some patients may present vestibular and postural balance changes concomitantly after cochlear implant surgery. Electrical stimulation by CI can cause pathological changes in the inner ear with subsequent dysfunction of the structures, resulting in vestibular alterations, mainly, in the moments before and after surgery. The incidence of patients with vestibular problems related to the cochlear implant, who developed a benign postural vertigo after the surgery is 159/100,000 per year, being its frequency greater than in the general population (ratio of 64/100,000 per year). The occurrence of changes in body balance, including all the pathologies in the postoperative period to the cochlear implant can vary from 21 to 76%. It is believed that there is a greater occurrence of vestibular alteration, clinically significant in patients with bilateral CI, because those with unilateral implantation are more able to compensate for the vestibular alteration at the injured side. The goal of the presentation is to assess vestibular disorders in adult cochlear implant users, implanted in University Clinical Hospital Center Sestre milosrdnice Zagreb, Croatia.

Methodology and type of study
Unilateral cochlear implantation was made on 41 adult patients. Pre-CI and post-CI all patients underwent to videonistagmography (VNG) and video head impulse test (vHIT) to assessed vestibular function. The data were reviewed retrospectively.

Results and significance
A study examined the vestibular disorder before and after the CI in 41 adult patients. Dizziness was reported by 19.2% pre-CI patients, while 80.8% did not present the complaint. Post-CI we found the presence of clinic dizziness in 26.8%; acute in 12.2%, continuous in 2.4% and delay of 6-18 months in 12.2%. In the caloric test 11.1% of the vestibular organs showed hypofunction ($p=0.16$). 37.5% patients with clinic dizziness after cochlear implant surgery showed vestibular hypofunction ($p=0.08$). In therapy we performed vestibular rehabilitation.

Conclusion
The authors concluded that postoperative dizziness and vestibular hypofunction did occur more frequently in patients with pre-operative vestibular hypofunction than in patients with normal results. Therefore, pre-operative vestibular function tests (VNG, vHIT) results may be an indicator for the frequency of dizziness after CI, and the therapy is vestibular rehabilitation.

Vibrant Soundbridge middle ear implant: pre-operative considerations

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The Vibrant Soundbridge is used internationally for the treatment of conductive and mixed hearing losses and this device is an effective and safe alternative for the treatment of sensorineural hearing loss as well. As demonstrated in the literature, the VSB as an active device offers an effective alternative for patients with various middle ear pathologies, particularly with mixed hearing loss when classical ossiculoplasty could not provide enough functional gain, as well for the patients with aural atresia and middle ear malformations.

VSB technology may provide very good functional effect and may ensure most natural quality of sound due to direct drive stimulation. However, more implantable alternatives for bone conduction devices does exist. Pre-operative considerations must be analyzed with the high responsibility, especially for the patients with aural atresia and chronic otitis, as surgery is more complicated and may be more dangerous for patient. Radiological, audiological, social and clinical considerations must be estimated. Individual expectations of the patients must be evaluated realistically. For patients with aural atresia detailed evaluation of high resolution computer tomography is essential deciding which device is optional for the patients. Clinical data, examples of CT scans, long term follow-up results will be presented in details.