PS 1

Middle Ear Pathophysiology and Management Viewed from Pressure-Regulation Function

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It is well known that the middle ear (ME) pressure should be always kept atmospheric in order to maintain its efficient sound conductive function. For this purpose, there are two ME pressure-regulation systems; one is the eustachian tube (ET) and the other is transmucosal gas exchange, mainly in the mastoid. The ET function is known comparatively well, but the gas exchange function is not known so well. In my presentation, I first explain briefly the normal physiology of the gas exchange function, and then what happens to this important function under the condition of various ME diseases such as otitis media with effusion or cholesteatoma, and what happens to this function after ME surgery. Finally, I would like to propose the algorism of appropriate choice of ME surgical procedures according to pathophysiological conditions of the ME as well as to surgical intervention to the mastoid.

PS 2 Otic Capsule Dehiscence Syndrome: Clinical Features, Comparison to Superior Semicircular Canal Dehiscence Syndrome and Longitudinal Cognitive Recovery with Surgery

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Objective: (1) To longitudinally study two patient cohorts with superior semicircular canal dehiscence syndrome (SSCDS): one with radiographically confirmed superior semicircular canal dehiscence (SCD); and the other with no identified otic capsule dehiscence (no-iOCD). (2) Patients with peripheral vestibular dysfunction due to gravitational receptor asymmetries have cognitive dysfunction and assumed neurobehavioral sequelae. Pre- and postoperatively quantitatively measurement in a cohort of patients with superior semicircular canal dehiscence syndrome (SSCDS) symptoms with: superior canal dehiscence (SCD); and otic capsule defects not visualized with imaging and repaired with round window reinforcement (RWR); or both was completed.

Study design: Two prospective patient series.

Setting: Tertiary referral center.

Patients: (1) Eleven adults and one child with SSCDS were identified, surgically managed and followed: six had radiologically confirmed SCD; and six had no-iOCD. Six adult patients with SCD underwent a middle cranial fossa approach with plugging procedures. Five adult patients and one child underwent round window reinforcement (RWR) surgery. One SCD patient developed a no-iOCD 1.5 years after SCD surgery and underwent RWR surgery. (2) There were 13 adult and 4 pediatric patients with superior semicircular canal dehiscence syndrome (SSCDS) who had completion of neuropsychology test batteries pre- and every 3 months postoperatively. Eight had RWR exclusively, 5 had SCD plugging exclusively, and 4 had both.

Interventions: (1) Prospective structured symptomatology interviews, diagnostic studies, 3D high-resolution temporal bone CT data and retrospective case review. (2) Completion of a neuropsychology test battery preoperatively and at 3, 6, 9 and 12 months postoperatively that included: Beck Depression Inventory-II (BDI); Wide Range Intelligence Test (WRIT FSIQ) including average verbal (crystallized intelligence) and visual (fluid intelligence); Wide Range Assessment of Memory and Learning (WRAML), including the four domains of verbal memory, visual memory, attention/concentration and working memory; and Delis-Kaplan Executive Function System (D-KEFS).

Main outcome measures: (1) Patient symptomatology, including video documentation; and results of diagnostic studies. (2) Quantitative and statistical analysis of their cognitive and neurobehavioral function.

Results: (1) The mean age for the SCD group was 41.8, with a range of 29.5 to 54 years at first surgery. The mean age for the no-iOCD group was 32.2, with a range of 13.2 to 51.6 years at first surgery. There were 10 females (83%) and two males (17%). One male was in each group. The symptomatology preoperatively was no different between the groups, other than the character of the migraine headaches. Resolution of the symptoms of SSCDS ultimately occurred in all patients. Both SCD and no-iOCD groups showed highly significant improvement in postural control following treatment (Wilcoxon Signed Rank, $p<0.001$). (2) There was a significant decrease in the BDI for all groups. For the WRAML, there was a statistically significant improvement for visual memory and verbal memory for the RWR only and Both groups, but no mean improvement for the SCD only group. All three groups had improvement in the attention/concentration domain. There was no change in working memory for all groups. The IQ scores were unchanged.

Conclusions: (1) The nomenclature of otic capsule dehiscence syndrome more accurately reflects the clinical syndrome of SSCDS since it includes SCD and no-iOCD, as well as posterior and lateral semicircular canal dehiscence; all of which can manifest as SSCDS. (2) Overall there was a marked improvement in cognitive and neurobehavioral function postoperatively. Variability may result from duration of underlying disease before intervention. The initial decrement or delay in performance improvement measured in several patients may represent brain reorganization. Greater longitudinal data and greater subject numbers are necessary to better understand and optimize cognitive recovery.

PS 3 Our Experience with the World's First Middle Ear Implantable Hearing Aid Developed in Japan

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Implantation of a sound-amplifying device in the middle ear is a fascinating way to overcome some of the disadvantages of conventional hearing aids, such as sound distortion, acoustic feedback, discomfort from wearing an earphone, and cosmetic appearance. In 1983, we developed the world's first implantable hearing aid (IHA), the Rion Ehime (E)-type device. It was a partial implantable type in which the ossicular vibrator element of a piezoelectric ceramic bimorph was coupled directly to the stapes. The vibrator was activated by sound signals that were transmitted through the retroauricular skin using an electromagnetic induction system. The first device was successfully implanted in 1985. Since then, it has been implanted in 53 patients with bilateral deafness at four institutions, in the ears with mixed hearing loss that could not be rehabilitated with routine middle ear surgery. All of the patients were followed for as long as the device continued to function. Although many patients accepted the IHA enthusiastically because of the high quality of sound and easy use, its manufacturer ceased production in 2005 because the company did not profit sufficiently, mainly due to the government regulation of medical products in Japan. Experience with surgery and long-term follow-up studies of the patients prompted us to summarize the IHA project by analyzing the device problems and postoperative difficulties leading to device removal or reimplantation. This presentation focuses on the present status of the patients, device problems, postoperative difficulties, and measures used to counter the problems and difficulties. From the long-term follow-up studies, we learned that:

1. The device can be used to rehabilitate mixed deafness that cannot be rehabilitated satisfactorily with either surgery or a conventional hearing aid. It can function satisfactorily in the ear for up to 23 years.
2. The device provides a natural sound quality without feedback or wearing discomfort. The quality of hearing afforded by the device is very close to that perceived by physiological hearing.
3. No sensorineural hearing loss attributable to long-term use of the device was seen in any of the patients.
4. The implant operation could be repeated safely and the patients found the implant very satisfying.

We hope that a review of the long-term data will help with future planning and the design of more sophisticated hearing devices implantable in the middle ear. Ultimately, we hope that a new device will be developed and introduced.

RT1 Tympanoplasty: Decision Making

Moderator: O. Nuri Ozgirgin, *Turkey*

The surgical techniques for tympanoplasty depends on the disease affecting the middle ear and the mastoid. In case of simple chronic otitis media or non-complicated otitis media with granulation tissue formation it is almost possible performing the intact canal wall technique. Even sometimes the granulation tissue nearby the structures such as facial nerve or oval window can create difficulty this can be managed. Of course it is always preferred performing the surgery after controlling the discharge and active infection.

However in case of cholesteatoma the situation is always challenging. The two main issues to be issued are controlling the residual and recurrent Cholesteatoma. The key points to these are; the surgeon should know the pathogenesis of cholesteatoma and the factors contributing to cholesteatoma formation very well, as well as the anatomic structures of the middle ear and how to access there.

The most crucial parts where the residual cholesteatoma presents itself are the sinus tympani and the attic area. So the drilling and exploring should be directed to these areas. The ventilation pathways and the support to the newly created tympanic membrane is very important to control the recurrences.

As it is inevitable to build-up the technique on endoscopic or microscopic examination of the ear, audiograms and preoperative computed tomography, one can plan the surgical technique and even anticipate the outcome. The location of the disease in regard to the above mentioned factors respective to residual and recurrent cholesteatoma, the most relevant technique should be chosen. These contribute dealing among open and close techniques, reconstruction and obliteration methods following removing the disease and posterior canal wall and using endoscopes.

The topic will be discussed with the distinguished panelists over several cases.

RT2 Imaging in Otology: New Frontiers

Moderator: Thomas Somers, *Belgium*

Today, imaging has become an important cornerstone of the diagnostic work-up in otology. 1/ The advent of the non-EP diffusion weighted sequence in MRI makes it a compulsory tool in the pre-op work-up and post-op follow up of cholesteatoma cases.

2/ Gadolinium enhanced 3-T MR images can document endolymphatic hydrops, thus allowing for the unequivocal diagnosis of patients with a Menièriform syndrome. This technique can also warn the surgeon for a clear contra-indication in stapes surgery patients with vestibular complaints. 3/ Conebeam CT offers a much higher resolution of the interface between bone, air and soft tissue, while the associated irradiation dose is substantially lower, as compared to multi-detector CT scans. As such, CBCT has become very useful for the pre-op work-up of patients with conductive hearing loss.

4/ Real-time simulation pictures of temporal bone lesions can help the surgeon to prepare his approach in cases with a congenital aberrant anatomy, such as in major atresia cases.

The 4 speakers of this RT will highlight the indications, advantages and limitations of these imaging techniques. Questions and discussion from the audience are welcomed.

RT3 Monitoring assisted CPA surgery

Moderator: Hidemi Miyazaki, *Japan*

We are entering an age of functional preservation for CPA surgery especially for benign tumor surgery including acoustic neuroma. Nowadays, close to 50% of the acoustic neuroma patients choose the radiotherapy despite of benign tumor. Because the average of preservation rate of neural function after radiotherapy is much better than the postoperative results. The therapeutic goal of acoustic neuroma surgery is total tumor excision with preservation of hearing and the facial nerve function. However, poor FN functional grade such as House-Brackmann (HB) grade ≥2 and worse Gardner-Robertson grade hearing scale in nearly 50% of patients with large or adhesive acoustic neuroma. Such poor functional preservation after the conventional surgical strategy is related to the various aspects of the nerves, tumors, and the surgeons. Intraoperative monitoring (IOM) of the facial nerve and cochlear nerve is essential to improve hearing preservation after surgery, but conventional methods of monitoring have proved inadequate. Therefore, novel methods of continuous direct neurophysiological monitoring have been introduced to achieve both immediate intraoperative feedback and successful prognostic assessment.

In microvascular decompression (MVD), we usually use IOM to know the effectiveness of the surgery and to preserve surely normal facial nerve function and hearing grade. The most common IOM of MVD for hemifacial spasm is abnormal muscle response monitoring, but it is not enough for determination of efficacy of MVD.

In this RT, the pioneers will show their cutting edge IOM for CPA surgery. As otoneuro surgeon, as functional surgeon, and as otologyst, we'd like to discuss the future of CPA surgery.

RT4 Indication and Decision Making with special impact on Cochlear Implantation of the Elderly

Moderator: Thomas Lenarz, *Germany*

The session on "Indication and Decision Making in Cochlear Implants" covers several recent topics and developments of electrical stimulation to restore hearing with special emphasis on cochlear implantation in the elderly. Indication criteria for cochlear implantation in patients with presbycusis will be discussed. Different hearing situations must be differentiated in respect to the amount of residual hearing, asymmetric hearing, duration and the cause of deafness. Preservation of residual hearing is of utmost importance to allow for electric-acoustic stimulation which will offer enlarged options for hearing rehabilitation. Cochlear implant in single sided deafness and bilateral cochlear implants are important in order to improve hearing for the best communication of the patient. Future trends such as local drug delivery will be discussed.

RT5 Middle Ear Ventilation and Eustachian Tube Dysfunction

Moderator: Sven-Eric Stangerup, *Denmark*

In this round table session we try de dealwith different situations associated with negative middle ear pressure to intractable middle ear effusion. In the presentations Sven-Eric Stangerup starts with the most common cause of negative middle ear pressure; problems during airflight. Next Ian Williamson will report the results of a comprehensive study og OME and autoinflation in children from a GP'view. Then Holger Sudhof and Chrisian Faber will go through the new way to improve Eustachian tube patency in severe OME and introduce a new classification of Eustachian tube patency and finally Per Caye-Thomasen will present the results of different bone anchored sollutions in cases where the ET passage fails.

RT6 Tympanoplasty: Difficult Cases and Complications

Moderator: Takashi Nakagawa, *Japan*

This round table concerns the management of difficult otological cases and the complications of ear surgery. Each speaker will present a number of interesting cases to share experience and discuss the learning points of each case. To make the discussion more interesting, the round table members do not have prior knowledge of the cases. The management of these cases may well be controversial. The aim of the round table is to get a frank and unreserved exchange of opinion from the panelist and the audience. We expect an active participation from the audience.

RT7 Cartilage Tymapanoplasty: Current Methods, Techniques, and Results

Moderator: Kenneth H. Lee, *USA*

Since Banzer performed the first Tympanoplasty in 1640 with pig bladder, many advances and new techniques have been developed. In 1963, Jansen was the first to report the use of cartilage to reconstruct the tympanic membrane. Subsequently, several different modifications of the technique have been described. This roundtable panel presentation will present the evolution of different techniques in cartilage tympanoplasty including variations of the palisade, mosaic, and rooftiles techniques. The most current methods utilizing cartilage rods to repair the tympanic membrane as well as support the ossicular chain will be presented and surgical outcomes of this method discussed. There has been a long debate over the use of cartilage vs. fascia for reconstruction of the tympanic membrane in chronic ear surgery. Data evaluating long-term results of retraction, persistent perforation, cholesteatoma recurrence, and hearing post surgery comparing cartilage palisade vs. fascia techniques in children after cholesteatoma surgery will be presented. In addition, data comparing post-operative hearing results from over 1700 patients who underwent tympanoplasty for chronic suppurative otitis media either with or without cholesteatoma at a single institution will be presented. Lastly, endoscopic ear surgery is an emerging technique that is proving to have great utility with expanding applications. The details of using an endoscope to perform cartilage tympanoplasty will be presented. The closure rates, audiologic outcomes, and complications following endoscopic cartilage graft tympanoplasty in the pediatric population will be discussed.

RT8 Tympanoplasty: Reconstruction of Hearing System

Moderator: Masafumi Sakagami, *Japan*

Tympanoplasty aims to remove infection in the middle ear and restore hearing by ossiculoplasty in patients with chronic otitis media, cholesteatoma, adhesive otitis media, tympanosclerosis, and congenital anomaly of ossicles. It is considered to be a typical functional surgery. There are several factors to influence on hearing outcomes after tympanoplasty.

First, the most important factor which I have thought is to create and maintain aeration in the tympanic cavity which makes an ear drum well movable. Eustachian tube function is deeply involved. As Eustachian tube dysfunction has not been solved by surgery or medication, surgeons has sometimes tried to place a ventilation tube, to make an ear drum with sliced thin cartilage, or to place a silicon plate in the tympanic cavity followed by ossiculoplasty at the second stage operation. Every speaker will refer to this topic.

Second, which material is used for a columella? There have been many reports about columella materials: autologous materials (ossicles, cartilage, and cortical bone), homologous materials, and artificial materials (TORP/PORP, hydroxyapatite, titanium, cement, and so on). Dr. Yamamoto and Dr. Zarowaski will mention topics of the columella which they prefer.

Third, surgeon sometimes have trouble to decide which type ossiculoplasty is suitable for hearing improvement. For example, which is better in a patient with tympanosclerosis, type 1 tympanoplasty after removal of calcification as much as possible or type 3 ossiculoplasty after removing the incus? Which is better in a patient with an intact stapes, type 3 or type 4 ossiculoplasty? Dr. Honnurappa will mention ossiculoplasty in difficult situations.

Fourth, does hearing improvement by a columella continue for a long time? My experience is that postoperative hearing gets worse when hearing after type 3 and type 4 ossiculoplasty is compared between 6 months and 5 years. Dr. Kuo and I will report long-term hearing outcomes after cholesteatoma surgery.

Fifth, if we have an enough time, we would like to discuss indications of Baha when hearing recovery fails or it is originally impossible.

RT9 Implantable Solutions for Conductive Hearing Loss

Moderator: Rubens de Brito, *Brazil*

The aim is to discuss our experience in restore conductive hearing loss due to both middle ear disease and congenital ear malformations through an active middle ear prosthesis. We will discuss preoperative evaluation, surgery and hearing results.

RT10 Presbycusis: Challenges in Our Aging Population

Moderator: Tatsuya Yamasoba, *Japan*

Age-related hearing loss (AHL), also known as presbycusis, is a universal feature of mammalian aging and is characterized by a decline of auditory function, such as increased hearing thresholds and poor frequency resolution. The primary pathology of AHL includes the hair cells, stria vascularis, and afferent spiral ganglion neurons as well as the central auditory pathways. A growing body of evidence in animal studies has suggested that cumulative effect of oxidative stress could induce damage to macromolecules such as mitochondrial DNA (mtDNA) and that the resulting accumulation of mtDNA mutations/deletions and decline of mitochondrial function play an important role in inducing apoptosis of the cochlear cells, thereby the development of AHL. Epidemiological studies have demonstrated four categories of risk factors of AHL in humans: cochlear aging, environment such as noise exposure, genetic predisposition, and health co-morbidities such as cigarette smoking and atherosclerosis. Genetic investigation has identified several putative associating genes, including those related to antioxidant defense and atherosclerosis. Exposure to noise is known to induce excess generation of reactive oxygen species (ROS) in the cochlea, and cumulative oxidative stress can be enhanced by relatively hypoxic situations resulting from the impaired homeostasis of cochlear blood supply due to atherosclerosis, which could be accelerated by genetic and co-morbidity factors. Antioxidant defense system may also be influenced by genetic backgrounds. These may explain the large variations of the onset and extent of AHL among elderly subjects.

Based upon these backgrounds, the speakers in this panel will present their cutting-edge topics, mainly those related to epidemiology and the influence of genetic factors and environmental factors such as food consumption. I hope such new information will deepen our understanding of the mechanism of the development of AHL.

RT11 Pediatric cholesteatoma

Moderator: Haruo Takahashi, *Japan*

Cholestatoma in children has still been one of the important issues in otology due to its difficulty in early diagnosis particularly in case of congenital one, fast development, high incidence of residual lesion, etc. Points of discussion in pediatric cholesteatoma may be as follows.

Any symptom to make us suspect of hidden mastoid congenital cholesteatoma

CWU, CWD, canal reconstruction or obliteration?

Indication of endoscopic surgery

Early diagnosis of residual cholesteatoma

Revision surgery – is it necessary?

In this round table, Matthew Yung (UK) as Chair and myself as moderator, as well as John Hamilton (UK), Levent Olgun (Turkey), Yasushi Naito (Japan), and Makoto Ito (Japan) as presenters are invited, and their precious experiences will be presented with the aspects of its diagnosis and treatments. Some discussion about cases those I present will also be planned to provide audiences with valuable take-home messages.

RT12 Tumors: Decision Making and Surgical Treatment of Acoustic Schwannona

Moderator: Hao Wu, *China*

RT13 Complicated Surgical Cases for CI

Moderator: Alec Fitzgerald O'Connor, *UK*

This Round Table will be interactive with the speakers discussing their pre operative assessments that make them aware of possible surgical complications. We will also discuss situations where CI may be contraindicated and how to deal with complicated surgical anatomy. Lastly there will be a discussion on the management of both intra-operative and post operative surgical problems. Attendees are welcome to bring their own cases; but must contact the Moderator first (afoc@globalnet.co.uk).

RT14 Facial Nerve Paralysis: Update

Moderator: Naoto Hato, *Japan*

Historically, different strategies are involved in therapeutic approaches in patients suffering from facial nerve paralysis. In this round table, recent topics regarding the factor influencing the facial nerve disorders will be presented by specialists. First paper will be presented by Dr. Akira Inagaki about intratympanic steroid therapy for facial palsy, which is the newly developed method. The steroid administered in the middle ear can permeated into the facial nerve as well as intratymapnic steroid therapy is an alternative method for the inner ear diseases. In Bell's palsy and Hunt syndrome cases, intratympanic treated group showed better recovery rates. The result might indicate an additive effect of the intratympanic steroid therapy in acute viral facial palsy.

Next paper will be presented by Dr. Naohito Hato about facial nerve regeneration surgery using bFGF-gelatin hydrogel in patients with severe Bell's palsy. Basic fibroblast growth factor (bFGF) promotes the regeneration of denervated nerves. Advantages of this regeneration surgery are low risk of the hearing impediment and long effective period after onset of the paralysis. This paper is the first clinical report of the efficacy of bFGF utilizing a new drug delivery system in patients with severe Bell's palsy.

Third paper will be presented by Dr. Javier Gavilán about intraoperative facial nerve management in vestibular schwannoma surgery. His presentation deals with intraoperative maneuvers to improve facial nerve function after surgical removal of vestibular schwannoma. It is well known that best functional results after facial nerve section are achieved with end-to-end anastomosis. A different situation is that of patients with anatomically intact facial nerve but no electrical response at the end of the operation. For these patients by-pass techniques with graft reinforcement have demonstrated good functional long term results. His personal experience with these reconstructive methods will be presented, emphasizing surgical tips and functional results.

Fourth paper will be presented by Dr. Jin Kim about the minimal invasive treatment for acute and chronic facial palsy. In acute phase, an application of botulinum toxin to healthy side for treatment with facial asymmetry who cannot be optimally treated enhance the quality of life during recovery of facial function by improving symmetry. In chronic phase, an attempt has been made to produce a new 'balance' in facial dynamics between a paralysed and a non-paralysed face with reduction of synkinesis, by concomitant injection of botulinum toxin A on both sides in patients with long-lasting facial sequelae. And also develop a new method for maintaining the effect of botulinum toxin treatment for facial sequelae by daily newly developed half-mirror biofeedback rehabilitation for about 2 years from the first injection.

RT15 Decision Making in Cholesteatoma Surgery

Moderator: Manohar Bance, *Canada*

Cholesteatoma can present an enormous number of variables to take into consideration when planning best intervention for optimal results. Some of these are age and health of the patient, stage of the cholesteatoma, aggressiveness of the disease, hearing and balance status of the ear and contralateral ear, availability of specialized instruments such as lasers or endoscopes, stability of the ear (ventilation, scarring propensity) and familiarity with various surgical techniques. Some surgical decisions to consider are extent of removal of bone to expose disease (e.g. canal wall taken down, partly down etc), extent of reconstruction of normal-like anatomy, extent of hearing reconstruction, and whether or not to perform a second stage procedure, either for hearing or for safety purposes.

In this panel, we will discuss

1. The role of imaging in deciding surgical technique preoperatively. What is the value of preoperative CT scanning or MRI, how does it change the surgical approach, in which situations is it mandatory?

2. How does the hearing status of the ear, or contralateral ear change surgical approach, e.g.. how do you change your approach to an only hearing ear, or to a dead ear, or to an ear with near normal hearing.

3. How do you manage revision versus primary surgery?

4. How do you stage cholesteatoma, if at all, and what are the important sites to note that might change surgical approach or technique

5. How do you follow patients post-operatively, and what would make you decide to do a second look.

6. How is your approach different in adults versus children

7. What are your results like personally, if you have data to share

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RT16 The Management of Skull Base Tumours - Improving Patient Outcomes

Moderator: Vincent Cousins, *Australia*

The management of tumours of the lateral skull base has evolved significantly over the last 30 years. Better pre -treatment assessment has been greatly assisted by the development of newer imaging techniques, particularly MRI scanning. Modern intra-vascular imaging and interventional procedures have added extra dimension to diagnosis and treatment. Other modalities including biochemical and genetic markers have provided better understanding of disease processes and pro-active identification of associated syndromes, other tumours and affected family members.

A better acceptance of the natural history of benign conditions has led to more frequent use of observation and of radiation as alternative management strategies. Patient focused quality of life studies comparing all management modalities have guided this significant change of practice.

This Round Table will focus on improved patient outcome in the management of tumours involving the lateral skull base. It will explore the recent advances in management of acoustic schwannomas and the surgical management of facial nerve schwannomas.

Tumours involving the jugular foramen, including paragangliomas and schwannomas present a particular problem where surgery may put the lower cranial nerve nerves, major vessels, the facial nerve and the outer and middle ear at risk. This session will also demonstrate surgical approaches to retrostyloid space and jugular foramen designed to limit functional impairment of these structures.

The scope of extirpative surgery has been assisted by newer reconstructive techniques and the addition of adjuvant oncological therapies for malignant conditions has improved patient survival. Modern management of malignancy involving the lateral skull base will also be discussed.

RT17 Implantable Solutions for Single Side Deafness

Moderator: Joachim Müller, *Germany*

RT18 Otology-Up to date from East Asian Society of Otology

Moderator: Ken Kitamura, *Japan*

The concept of this round table is to address up-to-date as well as innovative information related to otology to all over the world from the East Asian Society of Otology. Speakers who participate in this round table are representative of their otological society in East Asia. Prof. Sakagami from Japan will present "Short-term outcomes of cholesteatoma surgery based on Japanese grading system in 2010". The subjects were two hundred ninety-nine ears with primary cholesteatoma. He will demonstrate surgical methods, postoperative hearing, the rate of postoperative retraction, and the rate of residual cholesteatoma at the time of second-look surgery. Prof. Tong from Hong Kong will present "Otology-Up to date", He will review the development of otology in the past decade. The title of the presentation by Prof. Cho from Korea will be announced at the time of presentation. Prof. Wu from Taiwan will present "Screening for hearing impairment in newborns". He simultaneously performed newborn genetic screening in addition to newborn hearing screening for ~5000 newborns. And he found that newborn genetic screening for common deafness-associated mutations might identify infants with slight/mild or potentially progressive sensorineural hearing impairment, thus compensating for the inherent limitations of the conventional universal newborn hearing impairment. Prof. Wu form China will present "Recent advances in management of jugular paraganglioma". He will review the treatment strategy and surgical techniques of jugular paraganglioma based on his experience in 105 type C jugular paraganglioma patients.

RT19 Approach to Lateral Skull Base

Moderator: Mohamed M.K. Badr-El-Dine, *Egypt*

Until recently skull base surgery was considered "no man's land" because of the highly complex anatomy and even more perplexing morphological organization of the contained neurovascular structures coupled with the plethora of the pathological conditions encountered in this region.

Because of the continuously exciting and promising innovations in skull base surgery, tumors once thought to be one of the most difficult surgically unapproachable ones, are now becoming safely manageable with reasonable morbidity and mortality rates.

However selection of approach has been a great challenge for both neurosurgeons and otologists. Approaches must be individualized and tailored according to the patient's clinical condition, the size of the tumor and the status of patient's audiometry. The surgeon skills and preference are paramount in the final choice of approach. Several different surgical approaches over the years with many modifications and combinations have been devised. The main requirement of any approach is to ensure total tumor removal with the least morbidity. The access must be sufficient to all the surgeon control over any possible bleeding in the posterior fossa but with minimum trauma to the brain and neural structures.

Advanced tumors involve several anatomic zones that are often surgically approached by various specialties. Therefore a multidisciplinary surgical team is needed for optimal execution of these technically difficult surgeries and to afford the lowest possible morbidity and achieve the best results.

Basically, transtemporal approaches to the CPA can be categorized into 3 main classical groups: 1) the middle cranial fossa; 2) the translabyrinthine; and 3) the retrosigmoid/suboccipital approaches. Also the main approaches to the jugular foramen and infratemporal fossa are the Fisch infratemporal approaches type A, B, and C. No one surgical approach satisfies the variety of needs dictated by a given tumor in all cases, therefore multiple combinations and modifications of the basic approaches have been employed.

Professor Hao Wu will describe the refinements to the classic enlarged translabyrinthine approach for removal of vestibular schwannoma (VS) by modifying the bony dissection range of the temporal bone eliminating the middle ear and blind sac technique. His technique provided wider surgical field, well prevention of CSF leakage and higher preservation of FN function.

Professor Hidemi Miyazaki will present his new strategy for functional acoustic neuroma surgery. His newly designed electrodes used for continuous neurophysiological monitoring of both FN and auditory nerve. His results show marked improvement in the preservation of FN and hearing functions and establish new trend in management of CPA surgery.

Professor Livio Presutti will discuss the new endoscopic transcanal corridors to lateral skull base. Three main corridors to the lateral skull base were identified: the transcanal supragenicular corridor, the transcanal transpromontorial corridor, and the transcanal infracochlear corridor. Landmarks, tips, and pitfalls of these new approaches are highlighted. The transcanal endoscopic approaches proved successful for removal of pathology involving the fundus, IAC, cochlea, petrous apex and geniculate ganglion region with lower complications and less invasive procedures compared to traditional microscopic approaches. Endoscopic surgery opens future widespread application to the lateral skull base surgery.

Professor Jacques Magnan will present the key points to access the jugular foramen. Based on his vast experience, he will describe the surgical procedure with its modifications to the jugular foramen highlighting the anatomical landmarks, technical tips and pitfalls.

Finally, illustrative cases will be presented and discussed among panelists aiming to clarify decision-making and establish a road map for management of controversial pathologies.

RT20 Otosclerosis and Stapes Surgery: Difficult Cases

Moderator: Alan G. Micco, *USA*

Stapes surgery for otosclerosis continues to be one of the most difficult otologic surgeries that practitioners perform. During this session, a panel of experts will discuss many aspects of the diagnosis and treatment of otosclerosis. They will derive from their experience to discuss current trends, and how they manage this disorder. This will include discussions of current technique and results. Difficult and complicated issues such as facial nerve dehiscence, floating footplate and far advanced otosclerosis will also be covered.

RT21 Mastoid Obliteration techniques

Moderator: Andrzej Zarowski, *Belgium*

The surgical management of cholesteatoma is changing throughout the world.

The main reasons for this change are:1/ unsatisfactory results obtained by either the CWU conventional technique (high residual and recurrent rate, high re-intervention rate) or the conventional CWD technique (high co-morbidity such as the need for regular cleaning, high rate of intermittent otorrhea, difficult fitting of a hearing aid); 2/ the advent of the non-EP DW MRI sequence, allowing for a non-invasive follow-up and identification of residual disease; 3/ the excellent results of mastoid obliteration techniques regarding both residual and recurrent levels, as well as hygienic outcome.

This RT will address the rationale and results of the various mastoid obliteration techniques.

The 4 speakers, with a long standing experience in mastoid obliteration, will discuss their specific technique and results, while emphasizing how their regional socio-economic environment dictates some of the differences in technique.

Questions and discussion from the audience are welcomed.

RT22 New strategies and controversies in Mastoiditis Treatment

Moderator: Per Caye-Thomasen, *Denmark*

Is the incidence of acute mastoiditis (AM) increasing due to more conservative treatment of acute otitis media or is it decreasing due to the introduction of pneumococcal vaccination? How does the infection spread within the ear and does this correlate to the clinical picture? What is the contemporary microbiology of AM and how does this affect the antibiotic of first choice? Should a CT-scan always be performed when AM is suspected, even though children are more sensitive to radiation? Should mastoidectomy always be performed when the diagnosis is clear? If sinus thrombosis is found on CT, how should this be treated? These are some of the questions to be answered and discussed in this roundtable on the most common complication of acute otitis media - join this session and what is likely to be a heated discussion!

RT23 Genetics of Hearing Impairment

Moderator: Shin-ichi Usami, *Japan*

Deafness is a disorder with high genetic heterogeneity, and over the past two decades a good deal of progress has been made in identifying many different genes responsible for similar phenotypes. To date, approximately one hundred genes are estimated to cause non-syndromic hearing impairment, although a number of these may result in similar phenotypes that entail no symptoms other than hearing loss. The identification of deafness-causing genes has been the most influential factor in the recent extensive advances in our knowledge of the biology of hearing.

In terms of clinical applications, the most remarkable aspect of these advances is that ENT clinicians can now make highly accurate molecular diagnoses through the use of genetic testing, enabling a clearer understanding the mechanisms involved, more appropriate and precise treatment selection and greatly improved genetic counseling.

Genetic testing has accordingly become indispensable to the provision of personalized therapeutic intervention for deafness patients.

In this Round Table, the speakers will present their recent advances in the clinical application of genetic testing for hearing loss patients as well as efficient screening strategy. I believe that this Round Table represents an excellent review of recent genetic testing for all ENT clinicians who wish to apply these innovative diagnostic tools.

RT24 Vestibular System: Management for Chronic Dizziness and Vertigo

Moderator: Maurizio Barbara, *Italy*

Chronic vertigo can be represented by several pathological conditions, both central and peripheral in origin. The major causes in both groups are summarized, focusing in particular on the most frequent peripheral diseases.

Vestibular schwannoma is one of the most well-defined vestibular disorders, in which the pathology is well known and can be established on MRI and in many cases confirmed after surgery and histopathology. The effect of the tumor on the vestibular and cochlear nerves can be monitored and correlated with measurements of postural balance and dizziness. In spite of having a similar pathology, vestibular schwannoma patients vary considerably with respect to vertigo symptoms, and vertigo seems to be the most powerful predictor of quality of life in this disorder. So, the correlation between objective parameters such as tumor size, location, growth and measurements of nerve function on the one hand, and the subjective symptoms on the other are likely to be discussed. Symptom severity in vestibular schwannomas will be compared to that of other vestibular disorders.

A definition of chronic vertigo will be discussed with some suggestions for rehabilitation procedures that may include home program, biofeedback program and power program, with a comparison among them.

Possible surgical options are also presented, in particular with a new proposal that addresses the endolymphatic duct, with its mechanical blockage.

The concomitant presence of anxiety disorders up to depression is also envisioned, suggesting to check with appropriate questionnaire eventual comorbidities in these subjects.

RT25 CI: Hearing and Structural Preservation Cochlea Implant Surgery

Moderator: Dan Jiang, *UK*

Electro-acoustic stimulation (EAS) is a concept developed in 1999, which allows patient to use acoustic stimulation at low frequencies and electrical stimulation at high frequencies on the implanted ear. Since then, there have been several studies demonstrating the superiority of EAS over either modality on its own. EAS provides a solution for patients with profound medium-to-high frequency hearing loss but with residual low frequency hearing who have not previously been considered cochlear implant candidates, and only receive very limited benefit from hearing aid alone. Many factors can influence the outcome of hearing preservation cochlear implant. Type of underlying pathologies, age of patients, type of electrode used, access to the cochlea, insertion speed /methods and use of steroid are few to name. In this round table session, the group from Manchester will report their experience on long term outcome of the hearing preservation, the group from Cambridge will discuss the hearing preservation rates following cochlear implantation in standard non-electroacoustic cochlear implant candidates, The group from Shinshu will report the Japanese experience of the EAS trail, and the group from Berlin will discuss the factors affecting the intracochlear pressure during the electrode insertion. The panel discussion will be focused on the surgical techniques used in hearing preservation surgery, and the way to achieve the sustainable hearing preservation result.

RT26 Auditory Neuropathy and Cochlear Nerve Deficiency

Moderator: Kimitaka Kaga, *Japan*

Auditory neuropathy and cochlear nerve deficiency are different in origin and pathophysiology. In 1996 a new type of bilateral hearing disorder was discerned and published almost simultaneously by Kaga et al and Starr et al. Although the pathophysiology of this disorder as reported by each author was essentially identical, Kaga used the term "auditory nerve disease" and Starr used the term "auditory neuropathy".

Auditory neuropathy in adults is an acquired disorder characterized by mild-to moderate pure-tone hearing loss, poor speech discrimination, absence of the auditory brainstem response (ABR) all in the presence of normal cochlear outer hair cell function as indicated by normal distortion product otoacoustic emissions (DPOAEs) and evoked summating potentials (SPs) by electrcochleography (ECoG). A variety of processes and etiologies are thought to be involved in its pathophysiology including mutations of the OTOF and/or OPA1 genes. Most of the reports in the literature discuss the various auditory profiles of patients with AN. Vestibular neuropathy is often complicated with auditory neuropathy or found among patients with balance disorders.

In 2008 the new term of Auditory Neuropathy Spectrum Disorders (ANSD) was proposed by Colorado Children's Hospital group following a considerable study of newborn hearing test results. When both ABR and DPOAE were present in particular cases during newborn screening they were classified as ANSD. However, ANSD shows developmental changes.

Cochlear nerve deficiency is diagnosed in deaf children by temporal bone CT or MRI which reveals decrease in number of cochlear or vestibular nerve. It is difficult to predict outcomes of cochlear implant because it depends on number of cochlear nerve. Acquisition of head control and independent walking are marked by delayed.

In this Round Table, auditory and vestibular function in patients with auditory neuropathy, cochlear nerve deficiency and inner ear malformation and the outcome of cochlear implantation are discussed.

RT27 How to Manage Uncontrollable Otitis Media

Moderator: Yukiko Iino, *Japan*

Acute otitis media (AOM) is one of the most frequent infections in childhood, and otitis media with effusion (OME) frequently follows AOM. They are self-limiting diseases and prone to improve with age. However, there are some children who need special attention and treatment to control both otitis media. Recently, there have been many guidelines for AOM and OME in children worldwide. In Japan, the guideline for the management of AOM in children was first published in 2006, and the third edition was published in 2013. In the third edition, the risk factors and the management for recurrent AOM are included. The guideline for the management of OME in children has also been published in Japan. In this guideline, algorithm of the management of OME is shown, and in addition, special remarks for OME with Down syndrome and cleft palate are included because they are at high risk of persistent and uncontrollable otitis media. Recurrent AOM and persistent OME cause not only hearing loss but also severe eardrum change such as atelectatic eardrum, retraction pocket and adhesion. In case with such a complication and sequelae, surgical intervention is sometimes indicated.

In this round table, I will present several cases with otitis media in children, and ask each speaker how to treat them. The speakers can also present their topics related to the management of uncontrollable otitis media between the case presentation.

RT28 Development of Medical Technology in the Otorhinolaryngology

Moderator: Kazuo Tanishita, *Japan*

Development of Artificial Cochlea Sensory Epithelium Using MEMS Technologies

Satoyuki KAWANO

Graduate School of Engineering Science, Osaka University, Japan

There are two types in hearing loss; the conductive and the sensorineural hearing loss. The conductive one, which is caused by dysfunction of the outer and/or middle ear, is mostly cured by medical and/or surgical treatments. However, it can be said that there is no therapeutic option for the sensorineural hearing loss except implantable auditory devices. Sensorineural hearing loss is mainly caused by the degeneration of the cochlea hair cells, which convert sound vibration into electrical potential in the inner ear, and the mammalian cochlea has no capacity for regeneration.

In our recent research, using MEMS (Micro Electro Mechanical Systems) technologies, the artificial cochlea sensory epithelium was developed to realize both acoustic/electric conversion and frequency recognition without an external energy supply. The novel device composed of a piezoelectric membrane in the shape of trapezoid, where the resonance frequency changed along the longitudinal direction. When the external sound pressure in lymph fluid is exerted on the piezoelectric device implanted on the basilar membrane, the limited part corresponding to the frequency of sound resonates and generates electricity. Assigning electrodes on the rim of trapezoidal membrane stimulate the auditory primary neurons matching to the frequency of acoustic stimuli. We made the animal test using deafened guinea pigs, and confirmed that the device successfully induced the auditory brain-stem responses.

Development of new analytical systems by collaboration with engineers for promoting basic research of inner ear

Hiroshi HIBINO

Department of Molecular Physiology, School of Medicine, Niigata University

Hearing is one of the most important senses in animals including human. Acoustic stimulation vibrates fine structure of the cochlea in the inner ear by only 10 nm at maximum. The mechanical responses are thereafter transduced to electrical signals by highly differentiated sensory cells in the cochlea. Disruption of these elements and processes by noise exposure, ototoxic drugs, or gene mutations causes deafness. In order to elucidate the hearing system as well as to overcome hearing disorders, our group tries to seek how the mechanoelectrical transduction is controlled and how vascularly perfused drugs are distributed in the cochlea of living animals. For such purposes, we are collaborating with engineers and creating two analytical apparatuses equipped with state-of-the-art technologies in the optical and electrochemical fields. To effectively promote interdisciplinary researches, we have also developed a few platforms where engineers, biologists, physicians, speech therapists, pharmacologists can discuss and work together.

Intermittent pressure therapy of intractable Meniere's disease and delayed endolymphatic hydrops using the transtympanic membrane massage device.

Hideo Shojaku, Yukio Watanabe, Michiro Fujisaka, Hiromasa Takakura, Masahito Tsubota, Masatsugu Asai

Department of Otolaryngology, University of Toyama

The effects of the transtympanic membrane massage (TMM) device were evaluated in patients with intractable Meniere's disease (MD) and delayed endolymphatic hydrops (DEH) compared with that of the Meniett device. Twelve ears of 10 patients were treated with the TMM device, while 15 patients were treated with the Meniett device. All of the patients had failed to respond to medical treatment including diuretics prior to each pressure treatment, and were followed up for more than 24 months after treatment. The tympanotomy is necessary before treatment for the Meniett device, not but for TMM device. In both treatment, frequency of vertigo after treatment was significant lesser than that before treatment. The time course of vestibular symptom in the TMM device was not significantly different from that in the Meniett device. No complication was directly attributable to treatment by the TMM device. Middle ear pressure treatment by the TMM device as well as the Meniett device is an effective and minimal invasive option for intractable vertigo in the patients with MD and DEH.

RT29 Practical Management of Tympanic Membrane Retraction in teenagers

Moderator: Adrian James, *Canada*

It is widely recognized that tympanic membrane (TM) retraction can cause permanent conductive hearing loss from ossicular erosion and also progress to form cholesteatoma. These outcomes cannot be readily predicted, as many retractions remain stable for many years while others regress spontaneously. TM retraction often presents during teenage years. This young age provides a unique opportunity for preventative intervention, before the disease process becomes more established in adulthood. However, little reliable evidence is available to guide clinicians on the appropriate time or technique for preventative surgical intervention.

The panelists in this round table will use their wide experience to address this challenging scenario. They will describe and discuss the roles of various surgical interventions, including short term tympanostomy tubes (grommets), long term tubes (subannular T-tube), and excision or lasering of retraction pockets, as well as the place of cartilage tympanoplasty and the more recent vogue for Eustachian balloon tuboplasty. Any available evidence on the efficacy of these techniques will be highlighted.

The practicalities of clinical decision-making will then be illustrated by referring to well-illustrated cases representing different stages of TM retraction. Small changes in details of the clinical presentation will be used to explore their influence on management decisions.

In this manner the round table aims to outline practical strategies for contemporary care of TM retraction in teenagers.

RT30 Current Opinion on Temporal Bone Malignancies

Moderator: Chunfu Dai, *China*

In this session, Dr. Donnelly is going to share the experiences at Cambridge University Hospitals in the treatment of squamous cell carcinoma of the temporal bone during 1982-2012. The data leads to conclude: 1) The need to re-visit the role of neck dissection or TMJ removal as routine practice in early stage disease. 2) To ensure post-operative radiotherapy is delivered for all patients where no contra-indication exists. 3) Accept curative intervention may not be possible for all patients. Then Dr. Dai will give lecture on surgical management of adenoid cystic carcinoma in the external auditory canal, he will present 43 cases of ACC in the EAC, this is the largest series of ACC in the EAC. It concludes that ACC in EAC is associated high rate of recurrence. It frequently invades the parotid gland, parotidectomy should be always considered while removal of the tumor. Dr. Nevoux is followed by the topic of management of endolymphatic sac tumor. His study showed the tumor occurs in isolated cases or is associated with von Hippel-Lindau disease. He aimed to define the indications for resection, to preoperatively predict surgical difficulties, and to define the postoperative treatment. Finally, Dr. Llorente will present the reconstruction after temporal bone resection. He implied skin grafts, locoregional flaps, or tissue expanders are very useful. However, free tissue flaps are particularly useful, and commonly necessary in lateral temporal bone reconstruction.

RT31 Decision Making: Implantable vs. non-implantable Hearing Aid

Moderator: Hiroshi Hosoi, *Japan*

Although air-conduction (AC) hearing aids are effective in most hearing impaired subjects, some patients cannot use AC hearing aids, for instance, patients with continuous otorrhea or aural atresia. Bone-conduction (BC) hearing aids are usually applied as an alternative to AC hearing aids. However, the BC transducer must be pushed tightly against the head and continued use causes skin induration and discomfort.
New ideas and devices have been introduced to solve these problems. One is implantable and the other is non-implantable hearing aids. The advantages and disadvantages of the both hearing aids will be shown in this round table.

1) Implantable hearing aids
Though many types of implantable hearing aids are on the market or on the experimental stage, I would like to focus on the patients who cannot use AC hearing aids because of severe otorrhea or atresia of the external auditory canal.
Dr. Olgun will explain outline of implantable hearing devices, including bone-anchored hearing aids, implantable middle ear devices.
Dr. Stalfors will focus on bone-anchored hearing aids.

2) Non-implantable hearing aids
Non-implantable hearing devices include AC, BC and cartilage conduction (CC) hearing aids for the slight to moderate hearing-impaired and ultrasound hearing aids for the profoundly hearing-impaired. I would like to focus on the newly developed CC hearing aid.
I will explain the new sound conduction pathway, i.e., cartilage conduction and its applications.
Dr. Nishimura will present his paper about new hearing aids, i.e., cartilage conduction hearing aids.

【Cartilage conduction - New sound conduction pathway】
Two sound conduction pathways, i.e., air- and bone- conductions are widely known through the ages. I found the third sound conduction pathway in 2004 and named "cartilage conduction". This new sound conduction pathway can introduce new types of hearing aids, earphones for general purposes and cell-phones.
J.Acoust.Soc.Am. 2014; 135(4):1959-1966.
Laryngoscope 2014; 124:1214-1219.

RT32 Revision Stapes Surgery

Moderator: O. Nuri Ozgirgin, *Turkey*

Stapes surgery is a “one go procedure” since it is well know that revision surgery does not achieve the same outcomes of primary intervention. However, subsequent conductive hearing loss or dizziness/vertigo could necessitate revision surgery. The present round table will illustrate tips and tricks to avoid revision surgery and pitfalls that can lead to an unsatisfactory result in primary surgery.

Since revision surgery is known to be associated with a higher risk of sensorineural hearing loss the ideal patient for revision stapes surgery is one who benefits from the initial surgery but complained of conductive hearing loss.

The major complication in stapes surgery requiring a revision are represented by problems related to prosthesis size, fibrotic bands, adhesions, incus necrosis, perilymphatic fistula, intact footplate, incus-malleus fixation, and reobliteration.

Details regarding revision surgery techniques and results will be presented and discussed.

RT33 Endoscopic Ear Surgery

Moderator: Livio Presutti, *Italy*

The recent introduction of the endoscope in ear surgery is based on certain anatomical and pathophysiological principles. Moreover, the technological development and, in particular, the introduction of high definition cameras has allowed to make more feasable a surgical technique that seemed impossible just a few years ago.

-Principles.

The first anatomical and physiological important element to consider is the mastoid. Most of microsurgical interventions to middle ear start with mastoidectomy even when the mastoid itself is not involved by the disease. The mastoid is used in many cases as a way to access to the attic and the tympanic cavity, or it is used to search for fundamental landmarks such as those necessary for the posterior tympanotomy. Today, however, it is hypothised that the mastoid could have some functions and its removal can lead to functional limitations and future surgical failures. The main functions of the mastoid are gas exchange and the buffer effect; the air cells system of the mastoid is made by an epithelium with a single cell layer, which favors the exchange of gases similarly to what happens in the pulmonary alveoli. In fact, this epithelium is different from that present in the tympanic cleft, which is pseudostratified, more devoted to clearance.

-Anatomical basis

As well known most middle ear areas are not explorable by the direct light of microscope and therefore are "blind spots" that can become very important if they locate a disease and in particular a cholesteatoma. The main “blind areas are the epitympanum, protympanum and retrotympanum. The retrotimpanum is divided into an upper portion and a lower portion;

The upper portion is made by the sinus tympani, which in turn is further divided by ponticulus in posterior tymoanic sinus. The lower limit of the sinus tympani is represented by the subiculum. The lower portion of retrotympanum, called sub tympanic sinus, is bounded laterally by the styloid process and medially from the round window with its anterior and posterior pillars. The lower limit is given by a thin bony crest that from the bottom edge of the promontory leads to the jugular bulb region of the jugular, called finiculus. Near the finiculus is often present a recess which in some cases is very developed and that can reach the apex of the petrous and whose name is sub-tympanic canaliculus. All these areas are explored very easily by the endoscope

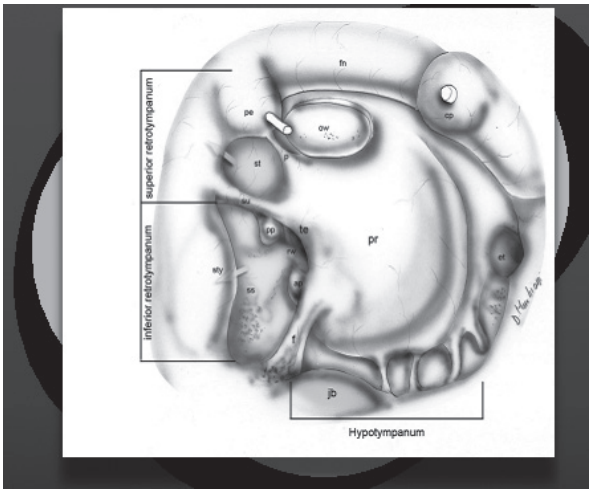

Fig 1 retroympanum st sinus tympani, p ponticulus, su subiculum, pe pyramidal eminence, pr promontory, sty styloid process, f finiculus, ss subtympanic sinus

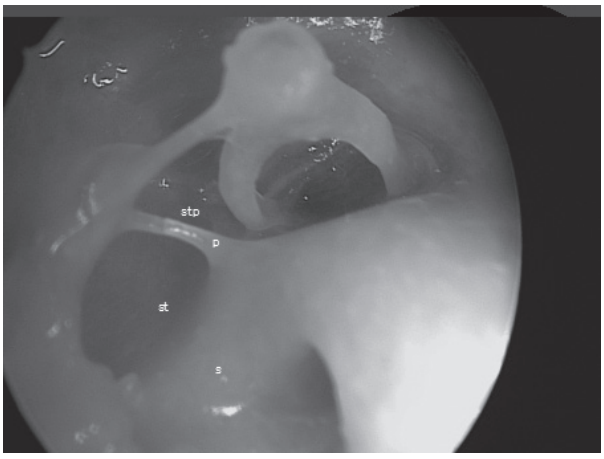

Fig. 2 sinus tympani: st, p ponticulus, s subiculum stp posterior tympanic sinus

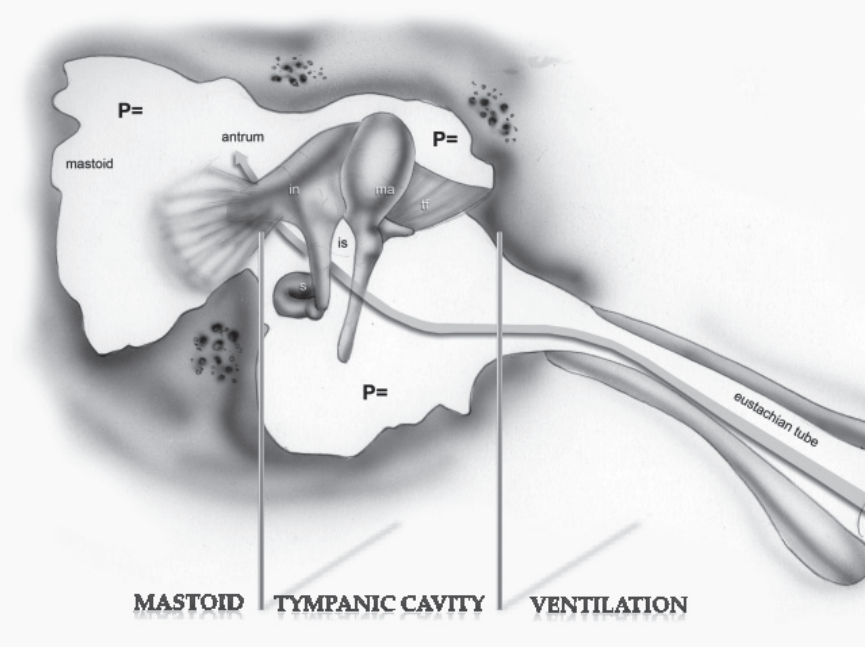

fig 3 ventilation routes: is tympanic histmus, tf tensor fold

-Ventilation middle ear.

The ventilation routes of middle ear, already well described by the work of Palva, must be reconsidered from the endoscopic technique viewpoint, since it allowed us to see what we could previously only imagine. In particular, certain diseases such as epitympanic cholesteatoma are in the authors' view a result of a lack of ventilation. In fact, the air from the Eustachian tube can fail to reach the mastoid cavity for a block of the isthmus, creating an epitympanic dysventilation. A lot of attention is then made at the end of the surgical procedure for restoring the correct routes of ventilation, and those steps are easily accomplished by endoscopic surgery.

Therefore, at present we can say that most diseases affecting the tympanic cavity can be treated with endoscopic surgery exclusively, while if there is a mastoid involvement a combined approach must be used.

-Surgical principles

Endoscopes used are those with 4mm or 3 mm of diameter, 15 cm length and an angle of 0° and 45°. Dedicated angled instruments for endoscopic surgery and 3CCD cameras and high-definition screens are needed. A lot of attention should be paid to the control of hemostasis, especially at the beginning when the meatal flap is raised; this must be done for a few minutes before incision by infiltration of local anesthetics and vasoconstrictors and then by the use of cotonoids soaked in adrenaline during surgery. The tympanomeatal flap is similar to that used for microscopic surgery; the atticotomy can be performed by a curette, drill or piezosurgery and it is smaller compared to those performed by microscope. The graft material for the reconstruction of the tympanic membrane is the same as used classically (perichondrium, fascia or cartilage). The use of powered instruments, such as Sonopet, chisels, and curved drills can guarantee the optimization of surgical results.

Of course, the postoperative course is very short and less pain is guaranteed. Present authors recommend the use of general anesthesia anyway for patients and surgeons convenience.

It obvious that by this technique the old contrast between the open technique and the closed technique is overcome, because to each patient a case by case operation is provided, and almost only the pathologic tissues are removed.

-Conclusions

Endoscopic surgery of the ear is to be considered a functional surgery in the sense that it preserves the uninvolved mucosa and leads to anatomical and functional results with the best recovery. It can be also can used exclusively or in combination with the microscope for exploration of blined areas. The new frontier of endoscopic surgery of the ear is represented by the extension of the application to the inner ear, the petrous apex and the cerebellar pontine angle. The first experiences dating back some years ago look very promising.

RT34 Perilymph Fistula: Fifty Years of Controversy

Moderator: Tetsuo Ikezono, *Japan*

Perilymphatic fistula (PLF) has been a controversial issue in otolaryngology now for fifty years. It became an almost emotional issue in Otolaryngology with "believers" and "nonbelievers." Unlike other causes of sensorineural hearing loss and dizziness, PLF is surgically correctable by sealing the fistula. Appropriate recognition and treatment of PLF can improve hearing and balance hence the quality of life of the afflicted patients. Therefore, PLF is an especially important disease for otologist.

In this Round Table, key controversial aspects are discussed, suggestions for progress are offered.

Terminology: PLF was first recognized in the early days of stapedectomy as causing disequilibrium and balance problems before sealing of the stapedectomy with natural tissue became routine. It then became apparent that head trauma and barotraumatic trauma from flying or diving could be a cause of PLF. Descriptions of "spontaneous" PLF with no trauma history followed. This entity has been the target for criticism. Most "spontaneous" PLFs are attributable to a traumatic event which the patient has sometimes forgotten. Although the term "spontaneous" has been extensively used, a more appropriate term would be *idiopathic*.

We have classified PLF into 4 categories and asked each speakers to use this categorization. Category 1 linked to trauma, middle and inner ear diseases, 2 linked to barotrauma caused by antecedent events of external origin (such as flying, diving), 3 linked to barotrauma caused by antecedent events of internal origin (such as straining, sneezing, coughing), 4 has no apparent antecedent event (idiopathic).

Diagnostic Test: The main criticisms is a lack of reliable diagnostic tests. The conventional definitive diagnosis of PLF depends on the direct visualization of the perilymphatic leak, but this is both difficult and highly subjective. The difficulty of making a definitive diagnosis of PLF has caused a long standing debate regarding its prevalence, natural history, management, and even its very existence. Previously tested candidate markers such as beta-2 transferrin, Beta-trace protein or intrathecal fluorescein, are markers of CSF leakage. A Novel biomarker for PLF diagnosis, CTP (Cochlin-tomoprotein), was selectively detected in the perilymph. ELISA based CTP detection test has been widely available for 2 years nationwide in Japan.

Symptoms: The literature often states that the symptoms of PLF are sudden onset and/or progressive hearing loss with episodic attacks of vertigo. However, some reports have suggested it to be putatively involved in a broad spectrum of hearing loss symptoms and balance disorders. In some cases, vestibular symptoms are the chief complaints. We will discuss the key symptoms and history to suspect PLF.

Japanese Diagnostic Criteria: Unlike other countries, PLF has been one of the main targets for research of otology in Japan. The 1st diagnostic criteria was made in 1983, and recently it has been revised.

1. Definite cases
   1) Visual identification of fistula(s) between the middle and inner ear by microscope or endoscope.
   2) Biochemical detection of perilymph specific protein, such as Cochlin-tomoprotein (CTP).

2. Suspected cases
   Cochlear and/or Vestibular symptoms were observed due to known causes or after preceding events (Trauma, Middle and inner ear diseases, Middle and/or inner ear surgeries. Barotrauma caused by antecedent events of external or internal origin)

3. Comments
   1) Idiopathic cases have been identified by the biochemical test (CTP detection test).
   2) Following symptoms and test results may be observed.

      a. Tinnitus like running water sound.
      b. Popping sound in the ears.
      c. Nystagmus and/or vertigo induced by pressure application to the middle ear (Hennebert's phenomenon, fistula sign).
      d. Imaging study may show fistula or pneumolabyrinth.
      e. Symptoms may be acute, progressive, fluctuate, or recurrent. Vestibular symptoms may be the chief complaint of patients.

Ref)
(1) Hornibrook J. Perilymph fistula: fifty years of controversy. ISRN Otolaryngol. 2012:281248
(2) Ikezono T et al: The performance of Cochoin-tomoprotein detection test in the diagnosis of perilymphatic fistula. Audiol Neurootol 15(3): 168-174, 2010.

IC1-1 Central Auditory Anatomy and Function

Seung-Ha Oh, *Republic of Korea*

Hearing is very important for the communication in human being. In contrast to animal, human requires hearing to learn the language and communicate with others for social interaction. The importance of hearing ability throughout the whole life span cannot be over empathized. Human brain is not completely developed when they are born. In contrast, the human brain should be developed for the first few years and continuously adapted afterward. Adequate speech information, not just environmental sound, is very essential for the development of human auditory system and related area.

Speech sound conveys to the ear drum and middle ear as an acoustic energy and converted into the electrical signal at the cochlear, more precisely at haircells. These electric signal travels to the brain via central auditory system. The central auditory system consists of cochlear nucleus, superior olivary complex, lateral lemniscus, inferior colliculus, medial geniculate body, and auditory cortex.

In this instruction course, we will learn about the central auditory anatomy and functional connectivity up to the level of auditory cortex. Additionally the pathologic disturbance of central auditory pathway will be discussed. Central auditory processing disorder (CAPD) is a spectrum of disease between cochlear and auditory cortex. Diagnostic evaluation and management of CAPD will be summarized.

IC1-2 Pathophysiology of tinnitus and its central management

Kaoru Ogawa, *Japan*

Japan faces the super-aged society ahead of the world and hearing impaired aged persons are remarkably increasing. The hearing impairment of elderly people in particular produces the social isolation of elderly people, which could result in senile depression or the dementia. In other words, it may indicate that we have to cope such various mental problems behind hearing impairment.

Tinnitus is one of the most common symptoms associated with auditory disorders. Tinnitus is defined as "receiving a sound while the sound stimulation from external environment lacked" or "the abnormal hearing phenomenon that some kind of sensation of sound occurs in though there is not a sound source any place other than the physical inside". Tinnitus is one of the most common symptoms associated with auditory disorders. The epidemiological surveys about tinnitus reported that about 15~20% of the population experienced tinnitus, and 20% of them had severe tinnitus. From these data, about 3~4 million patients are estimated to have severe tinnitus with annoyance in Japan.

Both the auditory and non-auditory pathways in the brain may be involved in the pathophysiology of tinnitus, and therefore both must be targets for evaluation and treatment of tinnitus. In our hypothesis of generating tinnitus, hearing loss reduces the cochlear nerve activity and the neural activity with the affected central auditory pathway, which down-regulates the inhibitory cortical processes, leading to hyper-excitability with the central auditory structure including the primary auditory cortex. On the other hand, the non-auditory brain activities related to tinnitus may cause tinnitus annoyance, which result in depression, anxiety and sleep disturbance. This hypothesis suggests that tinnitus can be a great distress when aberrant neuronal activity in the primary auditory cortex is connected to the cortical distress network involving the cingulate cortex, the dorsolateral prefrontal cortex, the amygdala and the hippocampus.

In the present study, we examined clinical features of tinnitus in Japan, and the novel evaluation methods and therapeutic strategies especially from the view point of both the auditory and non-auditory pathways in the brain as the central mechanisms of tinnitus.

IC3-2 Topical IGF1 therapy as salvage treatment for sudden deafness

Takayuki Nakagawa, *Japan*

Background: There is no established therapeutic option for sudden deafness refractory to systemic corticosteroids. This study aimed to examine the efficacy and safety of topical IGF1 therapy using gelatin hydrogels in comparison to intratympanic corticosteroid therapy.

Methods: We randomly assigned patients with sudden deafness refractory to systemic corticosteroids to receive gelatin hydrogels impregnated with IGF1 into the middle ear (62 patients) or to receive 4 doses of intratympanic injection with dexamethasone (Dex) (58 patients). The primary outcome was the proportion of patients showing hearing improvement. The secondary outcomes included the change in puretone average hearing thresholds over time and the incidence of adverse events. In addition, multiple regression analysis was performed to explore determinants of hearing recovery in puretone audiometry at 8, 12 and 16 weeks after treatment.

Results: Baseline characteristics including hearing level at the diagnosis, age, time from the onset to test treatments were comparable between the two treatment groups. No significant difference in the proportion of patients showing hearing improvement was found, but the difference in changes in puretone average hearing levels over time between the two treatments was statistically significant. Multiple regression analysis revealed that hearing level at the diagnosis, age, time from the onset to test treatments and treatment group were significant variables influencing changes in puretone average hearing levels overtime. Tympanic membrane perforation persisted in no patient in the IGF1 group, but persisted in 15.5% of Dex group patients. The difference in the incidence of tympanic membrane perforation was statistically significant.

Conclusions: The positive effect of topical IGF1 application on hearing levels and its favorable safety profile suggest utility for topical IGF1 therapy in patients with sudden deafness.

IC4-1 Clinical features and treatment outcomes of otitis media with ANCA-associated vasculitis (OMAAV)

Yasuaki Harabuchi, *Japan*

Antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis often initially involves middle ear and presents otological symptoms. Such ear disease is recently called otitis media with ANCA-associated vasculitis (OMAAV) in Japan. Recently, the OMAAV working group of Japan Otological Society performed nationwide survey. A total of 297 patients (86 males and 211 females with age ranged from 13 to 89 years), who were diagnosed OMAAV at 65 departments of otolaryngology, were registered in this survey. They were characterized as follows: 1) appearing as intractable otitis media with effusion or granulation, which does not respond to antibiotics, accompanied by sudden progressive hearing loss over less than 2 months; 2) predominantly occurring in female (71%) of elder age (median: 67 years); 3) predominantly being MPO-ANCA-positive (56%), and sequentially being PR3-ANCA-positive (22%) and both-ANCAs-negative (17%); 4) frequently sequencing facial palsy (32%) and hypertrophic pachymeningitis (24%); 5) often involving lung (38%) and kidney (26%) lesions; 6) the occurrence of hypertrophic pachymeningitis showed relation with that of facial palsy ($p<0.01$), but did inverse relation with those of lung ($p<0.01$) and kidney ($p<0.05$) involvements. OMAAV has three risk factors for an unfavorable clinical course, threatening life: hypertrophic pachymeningitis, both-ANCAs-negative phenotype, and non-administration of immunosuppressant. For the occurrence of hypertrophic pachymeningitis, headache (OR=5.108, $p<0.0001$) was the riskiest symptom and both-ANCA-negative phenotype (OR=2.565, $p=0.029$) was also the independent risk factor. The administration of steroid together with immunosuppressant showed the only independent predicting factor for a non-disease relapse (OR=2.061, $p=0.008$) and for an improvement of hearing loss (OR=2.2, $p<0.0001$). As described above, OMAAV has clinical features much different from the other AAVs. Therefore, we propose that OMAAV should be categorized in a new entity as 'otologic-limited AAV'.

IC4-2 Clinical features and hearing outcome of Otitis media with ANCA associated vasculitis

Naohiro Yoshida, *Japan*

Objective: Antineutrophil cytoplasmic antibody (ANCA) associated vasculitis (AAV) presents the otologic symptom as an initial symptom. In most cases, rapid progressive hearing loss is observed as localized AAV. In this study, audiological features and hearing outcome after immunosuppression therapy were evaluated.

Methods: A total 284 cases 480 ears audiologically evaluated at preandposttreatment in the nationwide surveys were enrolled in this study.

Hearing outcomes were compared among the following factors: 1. hearing loss type (conductive, sensorineural or mixed), 2. otitis media type (secretion, granulation or others), 3. ANCA subtype (PR3ANCA positive, MPOANCA positive, PR3, MPOANCA double positive, PR3, MPOANCA double negative) 4. another organ involvements (nose, lung, facial palsy, hypertrophic pachymeningitis), 5. immunosuppressive therapy; prednisolone (PSL) only or / PSL and cyclophosphamide(CPA).

Results: The overall hearing outcome was as follows: complete recovery in 30%, partial recovery (<10dB) in 30%, no change orworse in 40%. The completely deaf could not be recovered. The hearing outcome of ANCA negative group showed worse than that of another group. No significant difference of hearing recovery among nose, lung involvement. On the other hand, the patients combined with facial palsy showed significantly worse hearing outcome compared with no facial palsy patients. Patients treated by the immunosuppressive therapy with both PSL and CPA showed significantly better hearing outcome compared with PSL only (odds ratio 2.30).

Conclusions: This study showed the effectiveness of immunosuppressive therapy for hearing loss at an early stage. The combination of facial palsy and hypertrophic pachymeningitis influenced on the hearing outcome.

IC5-1 Aetiology and management of temporal bone CSF leaks

Neil Donnelly, *UK*

Temporal bone CSF leaks may arise as a result of congenital abnormality or be acquired later in life. The various aetiologies will be explored with focus being placed on the association of spontaneous temporal CSF leak with superior semicircular canal dehiscence and pulsatile tinnitus, resulting from raised intracranial pressure. A protocol developed in our unit for the investigation and management of raised intracranial pressure will be explored.

The management of temporal bone CSF leaks varies according to the underlying aetiology. Focus will be on the various surgical strategies that are utilized, with case vignettes and intra-operative video being used to demonstrate the rationales and techniques of the strategies undertaken.

IC5-2 Management of cholesteatoma in the petrous apex

Shizuo Komune, *Japan*

Lesions in the petrous apex are very rare and cholesteatoma and cholesterol granuloma are representative diseases in this region. Problems in the petrous apex lesions are, firstly that this area is very narrow in working space at the surgery, and secondarily, surrounded by important organs, injury of which is sometimes life-threatening. Therefore, approaches to this lesions are very narrow and limited in the space. Consequently, it is very difficult to eradicate the petrous apex lesions without decreasing QOL of each patient, namely, facial palsy, severe hearing loss, CSF leak, meningitis, brain damage. Another problem is a high possibility of recurrence, especially in cholesteatoma.

I would like to show anatomical importance of the petrous apex, approaches to this region reported so far, and to focus on how to manage the operated lesion, especially in the case of cholesteatoma.

IC6-1 What should general ENT practitioner know about cochlear implants

Angel Ramos-Macias, *Spain*

Cochlear implants are the most outstanding technological development in the restoration of sensorineural hearing loss. As with any technological development, it is subjected to rapid and constant changes that push the medical practice forward. In this talk, innovations and changes in the diagnosis, indications, treatment and results in cochlear implants that are essential to the general practitioner ORL will be discussed with the aim of updating their knowledge in the field.

IC6-2 The Effect of Brain Plasticity on the Results of Cochlear Implantation

Seung-Ha Oh, *Republic of Korea*

Cochlear implantation is an effective and only method available for the auditory rehabilitation of profoundly deaf patients. The extracted characteristics of speech sounds were sent to stimulate the spiral ganglion via electrodes. Unfortunately, current technology of speech coding strategy is not close enough to the natural one and there are huge variable outcomes after cochlear implantation. The results of cochlear implantation are determined by the factors that are associated with the anatomical and neurophysiological status of the auditory system. Such factors of central auditory associated system are essentially related with 'age at deafness', 'age at operation', 'cause of deafness', and 'mode of communication prior to surgery'.

Sensory maps within somatosensory, visual, and auditory systems in the brain are altered when associated peripheral sensory organs are damaged. For example, cortical structures deprived of their normal auditory sensory inputs can become responsive to the stimulation of other sensory modalities. This reorganization of cortical functions across different sensory systems, which is called cross-modal plasticity, has been demonstrated for activation of the auditory cortex via visual stimulation, such as lip reading and sign language.

Brain research in deaf subjects would help provide a better understanding of the changes of brain function consequent to auditory deprivation. Cochlear implantation affords a unique opportunity to restore sensory input in the profoundly deaf. Furthermore, research on brain functions associated with hearing deprivation and restoration can provide valuable information on cross-modal plasticity. Analyses of brain cortical function in the pre-implantation deaf and of functional changes following cochlear implantation are required in order to understand outcome variability. It is also likely that an improved understanding of this issue would facilitate the customized rehabilitation of patients following cochlear implantation.

Brain function can be investigated by numerous methods such as neuropsychologic analysis, electrophysiologic tests, and neuroimaging techniques. Functional imaging techniques are developed to visualize the anatomical area of brain related with specific function like speech sound. Several techniques such as fMRI (functional MRI), diffusion tensor imaging, positron emission tomography (PET), and magnetoencephalography (MEG) have been used frequently in the field of brain science.

A series of studies have demonstrated that cross-plasticity in the auditory cortices of deaf patients plays an important role in the recovery of auditory language after cochlear implantation. The study of FDG-PET showed that the children with good postoperative auditory language performance had high levels of glucose metabolism in the dorsal visual pathway, indicating a higher visual spatial function. An improvement in speech perception has been found to be significantly correlated with increase of glucose metabolism at the occipito-temporal junction, which emphasizes the significance of comprehensive collaboration and subsequent mutual plasticity between the visual and auditory cortices. However, the PET studies conducted to date only provide indirect evidence of plasticity based on measures of resting state glucose metabolism. Further studies focused on the functional connectivity of audio-visual cross-modal plasticity have been conducted using DTI and H215O-PET.

In this instruction course, the various functional neuroimaging study in an effort to identify the factors affecting postoperative development of auditory language will be introduced.

IC7-1 The new technology: canal wall up tympanoplasty with transplantation of tissue-engineered cell sheets

Hiromi Kojima, *Japan*

Objectives: The likelihood of recurrent retraction and adhesion of newly formed tympanic membrane is high when normal middle ear mucosa is extensively lost during intractable middle surgery. If rapid postoperative regeneration of the mucosa on the exposed bone surface can be achieved, prevention of recurrent tympanic membrane adhesion and cholesteatoma formation can be expected. The aim of this study was to develop a new method to transplant autologous cell-sheets to promote postoperative regeneration of the middle ear mucosa.

Methods: We harvested 10-by-10-mm specimens of inferior turbinate mucosal tissue from the patient with aquired middle ear cholesteaoma. Tissue-engineeed epithelial-cell sheets were fabricated ex vivo by culturing harvested cells for three weeks on temperature-responsive culture dishes in a cell-processing center (CPC) according to good manufacturing practice guidelines. After canal wall up tympanoplasty with mastoidectomy had been performed, sheets of cultured autologous cells that had been harvested with a simple reduced-temperature treatment were transplanted directly into the exposed bone surface of middle ear cavity from which normal mucosa had been defect.

Results: Autologous cell sheets were successfully transplanted to human middle ear. Postoperative tympanic membrane findings showed that there was no retraction of tympanic membrane. Furthermore postoperative CT findings showed that aeration were seen in attic and mastoid cavity where the cell sheet were transplanted. No recurrence of choleateatomas were seen.

Conclusion: This is the first clinical study approved from the Ministry of Health, Labour and Welfare in Japan. Furthermore this is a first-in-man study in the world that the cultured cells were transplanted to the human ear. This novel technology of transplantation might be an effective alternative to the surgical operation on intractable otitis media in the near future.

IC7-2 Tissue engineered mastoid air cells' regeneration for intractable otitis media

Shin-ichi Kanemaru, *Japan*

Aim: Most chronic otitis media (OMC) are observed poor development of mastoid air cells (MACs) and poor function of Eustachian tube. In order to a complete recovery from intractable otitis media, regeneration of the MACs' gas exchange functions is thought to be need. In this study, we implanted autologous bone fragments as a scaffold and gelatin sponge soaked in basic-fibroblast growth factor (b-FGF) as a regulatory factor to the newly opened mastoid cavity and assessed whether these promote regeneration of MACs or not.

Material and Method: In this study, 10 cases with severe chronic otitis media (n=3), cholesteatoma (n=5), and adhesive otitis media (n=2) were selected. At the 1st stage of operation, before mastoidectomy, cortex bone lid was harvested. Harvested autologous bone fragments with gelatin sponge soaked in b-FGF were implanted into the newly opened mastoid cavity and they were fixed by fibrin glue. Cortex bone lid was returned to the original position and was fixed by autologous bone pate.

By the images of high resolution computed tomography (HRCT), whether MACs were regenerated or not were estimated. The Eustachian tube function were measured before and 9 to 12 months after the 1st stage operation.

Results: Regeneration of MACs was observed 7 out of 10 cases (70%). In 6 out of 7 cases (86%) in the successful cases of regeneration of MACs in both group, Eustachian tube functions were improved. On the other hand, in the failure cases of regeneration of MACs, Eustachian tube functions were not improved.

Conclusions: Implanted autologous bone fragments and gelatin sponge soaked in b-FGF to the newly opened mastoid cavity contribute to regeneration of MACs in both HRCT images and gas exchange function.

PP-1 Politzer Prize Nominee
The mechanism underlying the potassium transport of the lateral wall in the cochlea

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The endocochlear potential (EP) is an essential property for hearing and critically controlled by the unidirectional K^+ transport across the lateral cochlear wall. The lateral wall, which is a complex of the stria vascularis and the spiral ligament, functionally consists of two epithelial layers; the strial marginal cells and the syncytium. The syncytial layer comprises the strial intermediate and basal cells, and the fibrocytes of the spiral ligament. The intrastrial space (IS), an extracellular compartment between the two layers, exhibits low $[K^+]$ and a highly positive potential similar to the EP. This IS potential (ISP) is the major component of the EP and primarily depends on the large K^+ gradient across the apical surface of the syncytial layer. The K^+ gradient is regulated by the unidirectional K^+ transport driven by Na^+, K^+-ATPases and Na^+, K^+, $2Cl^-$-cotransporters (NKCCs) on the basolateral surface of the marginal-cells' layer. Since Na^+, K^+-ATPases and NKCCs also occur in the fibrocytes of the spiral ligament, which provide the basolateral surface of the syncytial layer, it has been proposed that they are involved in the K^+ transport and the EP. To test this hypothesis, we examined the electrochemical properties of the lateral cochlear wall of guinea pigs during perilymphatic perfusion of ouabain or bumetanide, specific blockers of Na^+, K^+-ATPases and NKCCs, respectively. Since the fibrocytes of the spiral ligament are bathed in the perilymph, these perturbations presumably affect the K^+ transport of the fibrocytes.

When ouabain was perfused into the perilymph, $[K^+]$ within the syncytium was decreased whereas that of the IS was unaffected, reducing the K^+ gradient across the apical surface of the syncytial layer, and consequently the ISP and the EP were declined. These findings indicate that the fibrocytes' Na^+, K^+-ATPases virtually uptake K^+ and significantly contributes to the EP, as suggested previously.

It is known that the EP is also declined by perilymphatic perfusion of bumetanide. We found that, unexpectedly, this perturbation affected neither of the intracellular potential nor $[K^+]$ of the syncytium, implying that the fibrocytes' NKCCs negligibly contribute to the physiological K^+ uptake. On the other hand, bumetanide caused $[K^+]$ of the IS to elevate and the ISP and EP to decline. These observations demonstrated that bumetanide applied to the perilymph blocked the NKCCs of the marginal cells but not those of the fibrocytes. These phenotypes resemble those when the bumetanide was intravascularly perfused to directly inhibit the marginal-cells' NKCCs. Altogether, to drive the unidirectional K^+ transport that regulates the EP, it is plausible that, whereas both the Na^+, K^+-ATPases and NKCCs are involved in the marginal cells, only Na^+, K^+-ATPases provide significant contribution in the basolateral surface of the syncytial layer.

PP-2 Politzer Prize Nominee
Implantable bioelectrical system for restoration of blinking

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Different implantable electrical neuro- and myostimulators, and EMG recording systems are used in clinical practice and experimental investigations. Symmetrical innervation of mimic facial muscles provides clinicians with a natural trigger for an implantable mimic muscle microstimulator in patients with facial palsy.

The goal of our investigation is to define the ability to use implantable bioelectrical systems for restoration of complete and synchrone blinking in case with unilateral facial injury. Moreover, our goal is to define optimal stimulation parameters and type of implantable stimulating electrodes, which will allow obtaining the state of complete short- and longtime eye-lid closure.

Materials and Methods: Experimental part was performed in adult rabbits, which have undergone full transection of main trunk of facial nerve, implantation EMG recording electrodes into healthy OOM, and stimulating electrodes in paralyzed side. This system consists of EMG recording electrodes which implanted in healthy orbicularis oculi muscle, EMG amplifier, DAC, microcontroller, which detects EMG pattern and triggers the microstimulator with electrodes which evoke contraction orbicularis oculi muscle in paralyzed side. The bioelectrical system of blinking was implanted in the back of animals under the skin. The device was activated.

There was established complete synchronous eye closure in all of animals, after tuning the parameters of stimulation.

We performed comparison of different stimulation's parameters: mono- and biphasic impulses, single and serial impulses with different frequencies and amplitudes. We estimated the influence of mono-, two-, and multichannel electrode stimulation of OOM.

Results: Using biphasic serial impulses for stimulation with frequency 40-50 Hz, amplitude 1-3 mA, and impulse duration 2 ms allowed complete synchronous eye closure in all the animals.

Conclusion:
1. Proposed implantable bioelectrical system allows reaching complete closure of the eye by direct stimulation of denervated orbicular occuli muscle, which is triggered from healthy side.
2. Optimal pattern for stimulation is a series of biphasic impulses with frequency of 40-50 Hz, amplitude of 2mA, and impulse duration of 2 ms.
3. The software for proposed system allows detecting blinking in healthy side in more than 80% cases, that permits sufficiently synchronize detection and stimulation in bioelectric system of blinking.

PP-3 Politzer Prize Nominee
Prediction and demonstration of tinnitus improvement after CI for single-sided deafness using qEEG

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Background: Notwithstanding successful reduction of tinnitus after cochlear implantation (CI) in patients with single-sided deafness (SSD) in recent studies, neither the exact mechanism of suppression nor the predictors of the amount of improvement are fully understood yet. In this regard, we aimed at predicting and demonstrating improvement of tinnitus after CI in patients with SSD using pre-and postoperative resting-state quantitative electroencephalography (qEEG).

Methods: QEEG data were collected from nine SSD patients who underwent CI for tinnitus management pre- and postoperatively. By correlating the degree of improvement in tinnitus intensity and tinnitus-related distress with preoperative source-localized qEEG findings and comparing qEEG findings of patients with marked improvement after CI with those with relatively slight improvement with regard to source-localized activity complimented by connectivity analysis, we attempted to find preoperative predictors of tinnitus improvement. Also, by contrasting pre- and postoperative qEEGs, we sought to reveal neural substrates that are related to tinnitus improvement.

Results: Our results showed increased activities of the auditory cortex (AC), posterior cingulate cortex (PCC) and increased functional connectivity between the AC and PCC as negative prognostic factors for the reduction of tinnitus intensity after CI in patients with SSD. Also, relatively increased activity of the right dorsolateral prefrontal cortex and decreased connectivity between distress-related areas such as the orbitofrontal cortex/parahippocampus (PHC) and sensory-perception areas such as the AC/precuneus were found in patients with relatively slight improvement in tinnitus-related distress as compared with those with marked improvement. Also, as compared with preoperative qEEGs, post-CI qEEGs showed significantly decreased activities in the bilateral middle and inferior frontal cortices, pregenual anterior cingulate cortex, and PHC.

Conclusion: The current study suggests that pre- and postoperative qEEGs can be applied to predict post-CI tinnitus reduction and demonstrate changes in cortical oscillations after CI in patients with SSD.

PP-4 Politzer Prize Nominee
Treatment Outcome of Auditory Frontal Dual-site rTMS in Tinnitus Patients and Changes in Functional Connectivity after rTMS: Double-Blind Randomized Controlled Trial

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Objectives: Repetitive Transcranial Magnetic Stimulation (rTMS) have been proposed as a treatment option of tinnitus. Traditionally, single-site stimulation on the auditory cortex (AC) was mostly studied. Recently, dual-site (AC+frontal cortex (FC)) rTMS has been introduced to be a better option compared to the single-site AC stimulation. But it has never been studied if combined AC+FC stimulation is better than single-site FC stimulation. In this study, we aimed to compare the treatment outcome between 1) dual-site AC+FC, 2) single-site FC, and 3) sham stimulation groups. We also aimed to find changes in resting state cortical connectivity in good responders of the dual-site AC+FC stimulation.

Materials: Thirty-six patients with chronic tinnitus were recruited for this study. rTMS was administered at a frequency of 1 Hz using a MagPro system with a Figure-eight coil. AC and FC target were determined using the 10-20 EEG method. Regardless of groups, 3000 pulses at 110% RMT were delivered on each day for four days. We compared the treatment outcome between dual-site AC+FC group (group 1, n=23) and single-site FC group (group 2, n=8), and sham treatment group (group 3, n=6). The outcomes were assessed with pre and post-treatment THI and VAS at 1, 2 and 4 weeks after treatment. Also, secondary outcomes were STAI-X1, STAI-X2, BDI and PSQI scores at baseline and 4 weeks after treatment. In six good responders of group 1, pre-treatment and post-treatment resting state magnetoencephalography was recorded. The functional connectivry between 5 nodes (Rt FC, Lt FC, Rt AC, Lt AC, visual cortex) were analzyed in theta, alpha, beta, and gamma bands.

Results: Only group 1 resulted in significantly better THI and VAS scores as compared to baseline at 2 and 4 wks. Treatment outcome was significantly better in group 2 (preTHI:52.0±18.0, 4 wkTHI:38.6±19.9), when compared to that of group 2 (preTHI:44.9±17.7, 4 wkTHI:47.0±25.5) and group 3 (preTHI:50.3±21.7, 4 wkTHI:48.0±25.1). Also, a improvements in STAI-X1 (pre:42.7±9.7, 4wk:36.9±10.6), STAI-X2 (pre:42.5±10.0, 4wk:40.3±10.2), BDI (pre:9.5±6.4, 4wk:8.4±6.9) and PSQI (pre: 8.0±4.3, 4wk:6.2±3.4) were observed in group 1 but not in group 2 and 3. The strengh of coherence between nodes were different between pre-rTMS and post-rTMS in group 1.

Conclusions: A beneficial effect of rTMS on tinnitus suppression was found in the dual-site AC+FC group, while no treatment effect was found in single-site FC and sham treatment group. The changes in functional connectivity between AC and FC seems to be the bases of tinnitus suppression. Dual-site AC+FC stimulation may be preferable than single-site stimulation in modifying the patholgic functional connectivity and controlling tinnitus.

PP-5 Politzer Prize Nominee
Bony cochlear nerve canal and internal auditory meatus and their effect on the cochlear nerve

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Objectve: To find out bony labyrinth anomalies and cochler nerve anomalies which accompany bony cochlear nerve canal (BCNC) stenosis and atresia.
Introduction: The bony cochlear nerve canal (BCNC), in other words cochlear aperture is the bony canal space between the fundus of the internal auditory canal and the base of the cochlear modiolus that carries cochlear nerve fibers.There is a subgroup of inner ear anomalies which makes cochlear implantation (CI) is not possible.This may be due to the absence of the anatomical structures such as Michel deformity or discontinuity between the inner ear and brainstem like cochlear nerve aplasia.n narrow IAC with absent cochlear nerve and BCNC atresia, CI is contraindicated.
To predict the situation of the cochlear nerve (CN), some criterias are necessary in temporal bone computerized tomography (CT) scan. Generally, CN aplasia or hypoplasia accompanies the BCNC stenosis and atresia.
Material and Method: Cases in our inner ear malformations database were reviewed retrospectively and both CT and MRI data were investigated.High resolution computerized tomography (HRCT) images with 0.5 mm thickness and MRI views were evaluated by a neuroradiologist and two otolaryngologist.
38 patients with 59 ears which has BCNC diamater less than 1.5 mm were included in the study.BCNC and IAC diameters, cochlear malformation type and accompanying vestibular anomalies were investigated. Situation of the CN was determined. All patient charts were also evaluated with regard to OAE, ABR and audiologic results were noted. The width of the BCNC at the fundus of IAC were measured in milimeters based on the axial view of the HRCT. The width at the mid-portion level and the length of the IAC were also measured in axial sections.
Results and Discussion: Recent developments in imaging technologies provide increased anatomical detail.HRCT and MRI are performed to evaluate the etiology of the hearing loss especially for CI candidates. The BCNC can be stenotic (less than 1.5 mm) or atretic.In the study group 21 ears have atretic, 38 ears have stenotic BCNC. The most commonly seen cochlear abnormalities together with BCNC stenosis is the cochlear hypoplasia and incomplete partition type 1.If the BCNC is atretic, cochlea is hypoplasic in %90.5 of the ears. In %27.1 of the BCNC stenotic ears have also stenotic IAC (less than 2 mm width). Semisircular canal anomalies can also exist in BCNC stenosis or atresia.
If the BCNC is atretic, CN is either hypoplastic or aplastic. If the BCNC is stenotic %84.2 of the ears have hypoplastic or aplastic CN. Systemic abnormalities such as Goldenhar syndrome and CHARGE association can be seen together with BCNC and IAC stenosis.
If the BCNC width is less than 1.5 mm together with IAC stenosis(<2mm), all of the cochlear nerves is either aplastic or hypoplastic.In other words, if BCNC stenosis or atresia accompanies IAC stenosis, the CN can not be normal.
Conclusion: If an individual has a cochlea without a cochlear nerve, OAE responses can be obtained but they do not have ABR. ABR together with OAE should be added to the neonatal hearing screening protocol. In cochlear anomalies and stenotic BCNC and IAC, MRI must be taken into account to evaluate the status of the cochlear nerve. In bilateral cochlear nerve aplasia Auditory Brainstem Implant (ABI) is the first treatment of choice instead of CI.
BCNC diameter together with IAC diameter is a strong indicator of a cochlear nerve abnormality.These type of patients requires advanced imaging techniques and electrophysiological studies which may lead the clinician to ABI.

PP-6 Politzer Prize Nominee
A new classification of congenital ossicular malformations

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In this study, we propose a new classification of congenital ossicular malformation based on the latest basic embryological research and apply this new classification to our clinical case series.

A basic embryological research (Le Douarin, 1993) revealed that the skeletal components of the middle ear are derived from the neural crest. Neural crest is a vertebrate-specific embryonic structure that has the ability tocan differentiate into various tissues; it is said to be "the fourth blastoderm," following endoderm, mesoderm, and ectoderm. After condensation centers constructed by neural crest cells form a primordium, each ossicle is formed from endochondral or membranous ossification in the following sequence: first, simultaneous formation of the head of malleus and body of incus; stapedial footplate; simultaneous formation of the tympanic ring and manubrium of malleus; stapes superstructure; the neck of malleus; and finally, the long process of incus (Mallo, 1997).

The classification by Funasaka (Funasaka, 1979) and that by Teunissen and Cremers (1993) are known as the conventional fractionation of ossicular malformation. The classification by Funasaka focuses on the development of ossicles from each branchial arch and classifies them accordingly into 3 groups. Although it has been widely used for more than 30 years in Japan, there are some issues such as the unclear differentiation of abnormal stapes superstructure and non-inclusion of newly discovered diseases such as malleus bar. The classification by Teunissen and Cremers, which focuses on stapedial footplate fixation that is frequently observed particularly in Europe and the United States, classifies the ossicular malformations into 4 groups. However, it is difficult to understand the link between the groups and the locations of ossicular anomalies, and basic embryological information is not included in the classification. Moreover, neither classification considers the concept of auditory ossicles being derived from the neural crest. Therefore, it is necessary to update the classification of ossicular anomalies based on recent embryological evidence.

We hereby propose a classification that is based on the concept of ossicle development from neural crest cells. We classify ossicular malformations in the following 6 groups: group 1, abnormality of the manubrium, neck of malleus, or tympanic ring; group 2, abnormality of the head of malleus or body of incus; group 3, abnormal ossification surrounding ossicles in the attic; group 4, abnormality of the long process of incus; group 5, abnormality of stapes superstructure; and group 6, fixation of stapedial footplate or abnormality of vestibular or round window. The order of the groups is anatomically decided with group 1 indicating abnormality close to the external surface.

Using our novel classification, we classified 65 patients (77 ears), who were diagnosed with congenital ossicular malformation over past 13 years during their first operation in our hospital. We found that group 4 (abnormality of the long process of incus) showed the highest frequency (42/77, 54.5%). Groups 1, 2, and 3 were significantly associated with the abnormality of the external ear, including external auditory canal stenosis or anomaly of the pinna. We concluded that the new classification based on embryological information also has clinical implications, because this study applies advances in basic research to clinical medicine.

FP1-1 Dissociation between caloric test and video head impulse test

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Purpose: The caloric test has been the best method to recognize the loss of peripheral vestibular function. The video head impulse test (vHIT) is also very simple method to detect the peripheral vestibular loss by observing the corrective saccade as well as by measuring the gain of vestibule-ocular reflex. But the results between these two tests can be different, depending on the functional status of clinical entity of dizziness, probably due to the different range of test frequency in vestibulo-ocular reflex (VOR). In this study, cases with different results between two tests were categorized to find out the further diagnostic value of these two tests.

Methods: 211 ears from 201 patients who visited Soree Ear Clinic due to dizziness, and both bithermal caloric test and vHIT were performed, were included. vHIT was performed using ICS impulse (GN Otometrics, Denmark) on horizontal plane and was repeated about 20 times in each direction randomly. Peak head velocity was controlled as 150-200 degree/second by monitoring the recording of head velocity during the test. Canal paresis (CP) more than 25% in caloric test and the presence of corrective saccade with low gain (less than 0.8) in vHIT were decided as abnormal. Clinical findings of the patients with different results between caloric test and vHIT were reviewed and categorized according to the causes of dizziness.

Result: The results between caloric test and vHIT were opposite in 32.2% (68/211 ears) which were normal vHIT with canal paresis ("vHIT- & CP+") in 92.6% (63 ears) and abnormal vHIT without canal paresis ("vHIT+ & CP-") in 7.4% (5 ears). 63 ears of "vHIT- & CP+" included Meniere's disease (32 ears, 50.8%), benign recurrent vertigo (12 ears, 19%), positional vertigo of unknown cause (9 ears, 14.3%) and other causes of dizziness (10 ears, 15.9%). In case of 55 ears of Meniere's disease included in this study, the results were opposite in 32 ears (58.2%) which all of them were "vHIT- & CP+". "vHIT+ & CP-" were only 5 ears, which were acute vertigo syndrome in 2 ears, opposite ears of unilateral vestibular loss in 2 ears, and unknown cause of dizziness in 1 ear.

Conclusion: In 32.2% of dizzy patients, the loss of VOR depends on the frequency range of VOR, and "vHIT- & CP+" is the most common pattern. The most common clinical entity of "vHIT- & CP+" is Meniere's disease, but the frequency selective loss of VOR occurs in variety of causes of dizziness.

FP1-2 Low frequency BC vibration oVEMPs at the vertex and the forehead: a test-retest study

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Background: Dizziness is a common complaint in the population and diseases in the balance organs can be great contributors to such problems. Ocular Vestibular Evoked Myogenic Potentials (oVEMPs) is a method to investigate the otoliths, preferably the utricle. By using BC Vibration in the midline of the skull, both balance organs are synchronously activated and signals are mediated by the crossed vestibular ocular reflex to extra ocular muscles and measured as an evoked response from underneath each eye. The BC device should keep a frequency around 100 Hz, as this is in compliance with the resonance in the utricle. Also the utricular haircells activated in this frequency area, is less resistant to normal ageing processes compared to higher frequencies. From the evoked potentials from each side, an asymmetry ratio (AR) from either the baseline to peak amplitude or peak to peak amplitude is calculated to evaluate if there is pathology present or not. We have investigated two possible useful activation sites, the vertex (top of the skull) and the forehead, and describe each site's reliability in in a test- retest study.

Method: 20 healthy subjects were enrolled and tested with a Minishaker at 125 Hz BCV at the vertex and the forehead. The evoked myogenic responses were recorded from electrodes underneath each eye. We investigated differences in the evoked oVEMP response in two situations. First, two tests were performed under identical set up with the subject not leaving the examining room and with no change of the electrodes. Second, the third test was performed to assimilate a more clinically relevant situation, the subject had to leave the examining room and new electrodes were mounted between the two tests. The third more "clinically relevant" situation was compared with the first situation; this made us able to describe the bias caused by changing electrodes itself.

Results: The evoked oVEMP response it selves was not affected by site nor by changing electrodes. The AR was higher (60%) and had greater spread when vertex was used compared to the forehead (40%). The spread and the repeatability Coefficient was lower for the forehead. The ICCs were reasonable equal for the two sites with wide, overlapping 95% confidence intervals.

Discussion: Low frequency BCV oVEMPs were evoked from both sites. Most analyses in our study suggest the forehead as more favorable than vertex. The average median AR was lower at the forehead with less spread in the AR, which is favorable when a subject returns to the clinic for a new test. The ICC had results similar to those reported by other studies, however it has a rough scale; good, fair to good and excellent, and looking into our data the ICC gives very broad confidence intervals and was to unspecific to add value to our study.

The forehead seems to be the preferable midline site and should be used for low frequency BC Vibration oVEMPs.

Significance: The study is relevant for developing more optimal clinical oVEMP procedures.

FP1-3 Endolymphatic Hydrops Detected by 3-Dimensional Fluid-Attenuated Inversion Recovery MRI following Intratympanic Injection of Gadolinium in the Asymptomatic Contralateral Ears of Patients with Unilateral Meniere's Disease

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Objective: To identify the incidence of endolymphatic hydrops using three-dimensional fluid-attenuated inversion recovery (3D-FLAIR) magnetic resonance imaging (MRI) in the contralateral ear in patients with unilateral Mnire's disease (MD).

Methods: This study was a prospective study. 3D-FLAIR MRI was performed with a 3 Tesla (3 T) unit 24 h after the intratympanic administration of gadolinium (Gd) in 30 unilateral MD patients with an asymptomatic contralateral ear. The incidence of contralateral involvement in unilateral MD patients and the potential correlations between the affected and contralateral ears were analyzed.

Results: Endolymphatic hydrops was observed in 7 of the 30 (23.3%) asymptomatic ears. The mean PTA of the asymptomatic ears in the contralateral hydrops patients (33.0±6.1 dB) was significantly higher compared with the non-hydrops patients (17.8±5.7 dB). The patients with observed contralateral hydrops exhibited a significantly longer duration of the disease compared with the non-hydrops patients (6.7±6.3 vs. 2.9±3.1 years, respectively). Furthermore, the patients with contralateral hydrops had a worse hearing level in the affected ears compared with the non-hydrops patients (70.3±7.4 vs. 52.5±3.8 dB, respectively).

Conclusion: Endolymphatic hydrops is closely related to hearing loss, but they do not necessarily result in Mnire's symptoms. Patients with a long history of MD and severe hearing loss in the affected ear are more likely to exhibit endolymphatic hydrops in the asymptomatic contralateral ear. Adequate attention should focus on unilateral MD patients with contralateral ear hydrops because of the potential to develop bilateral MD.

FP1-4 Withdrawal

FP1-5 CTP detection test for diagnosing PLF in 10 suspected cases

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Perilymphatic fistula (PLF) is a condition in which an abnormal communication is present between the perilymphatic space of the inner ear and the outer system, including the middle ear or other places in the temporal bone. The vagueness of symptoms caused by PLF and the overlapping symptoms of other disease processes make diagnoses elusive.

We report 10 patients (median age 51.2±13.9) suspected to have PLF who underwent the CTP (cochlin-tomoprotein) detection test between 2012 and 2015. Detection of CTP existing only in the perilymph has been one of the diagnostic methods for PLF widely available in Japan. The symptoms are vertigo, dizziness, progressive or changeable sensorineural hearing loss, and tinnitus. In 6 cases, triggers preceding events included clearing of the ears, an accident, playing the clarinet, and hypoplasia of the lateral semicircular canals, and in the other 4 cases there were no triggers. We performed exploratory tympanotomy in 6 cases and myringotomy in 4 cases for diagnosis. The CTP detection tests were conducted one month to 120 months from onset. Among 10 cases, 6 had positive (above 0.8mg/ml) and 2 had intermediate (0.8-0.4ng/ml) results. These results suggest that there may be more cases of PLF among patients suffering from dizziness, vertigo, or sensorineural hearing loss with or without any apparent triggers. We used Spongel with fibrin glue to patch the fistulas.

FP1-6 New scoring system of interview for diagnosis of benign paroxysmal positional vertigo

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Objective: To develop a new scoring system of an interview for the diagnosis of benign paroxysmal positional vertigo (BPPV).

Study Design: Retrospective diagnostic study.

Setting: University hospital and affiliated hospitals.

Patients: Two hundred and six outpatients complaining of dizziness and/or vertigo (D/V).
Main outcome measures: The sensitivity and specificity of diagnosis of BPPV by a scoring system, corresponding to the answers in an interview, which we established in this study.

Methods: We analyzed the results of questions on D/V and found two significant differences between the patients with and without BPPV.

Results: We established an intensive questionnaire with a new scoring system. It consists of the following three closed questions.
1. Is your D/V triggered when you roll your head over in a supine position?
2. Does your D/V disappear within five minutes?
3. Have you ever had hearing loss in one ear, or did you experience a cochlear symptom during vertigo?
One point each was given to an answer of 'yes' to questions 1 and 2. On the other hand, one point was subtracted upon an answer of 'yes' to question 3. When the total score was greater than one point, the patient was diagnosed with BPPV. The sensitivity of the diagnosis of BPPV by this scoring system was 81% and the specificity was 66%.

Conclusion: We have investigated a novel instrument to diagnose BPPV.

FP1-7 SKULL VIBRATION-INDUCED NYSTAGMUS TEST IS A CRITERIA FOR SUPERIOR SEMICIRCULAR CANAL DEHISCENCE DIAGNOSIS

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Background: vibrations at 100Hz stimulate globally vestibular structures. Superior semicircular canal dehiscence (SSCD) syndrome is a clinical condition with a variety of auditory and vestibular symptoms resulting from a mobile third window into the inner ear. The Vibration induced Nystagmus (VIN) obtained in SSCD has been previously commonly attributed to the sole stimulation of the superior semicircular dehiscent canal. In SSCD bone conduction (BC) is facilitated toward the lesion side.

Objective: to determine the lateralization and 3D components of the VIN in SSCD. The standard radiologic evaluation was a 0.5 mm collimated multi slice computed tomography (MSCT) scan with projections in the plane of the superior canal and orthogonal to it. All our SSCD patients included in this this study had an apparent radiological dehiscence larger than 3 mm.

The study design was a non-randomized comparative study between SSCD, otosclerosis (OS) patients and normal subjects.

Methods: 12 normal subjects, 38 unilateral non operated OS, 21 unilateral non operated SSCD were recorded under 3D Videonystagmography (VNG). The VIN slow phase velocities of the torsional, horizontal and vertical components were recorded using stimulations (60, 100Hz) applied on the vertex and each mastoid. The caloric test, head shaking test, and cervical vestibular evoked myogenic potentials (cVEMP) were performed for statistical comparative analysis purposes (Fisher test).

Results: A VIN was found in 82 % of SSCD with a primarily torsional and horizontal component beating toward the lesion side in 40 and 30 %, respectively ($p<0.05$). A primarily vertical component was observed in 30 % of cases with an up beating nystagmus in 83% of cases. The vertex stimulation was the most efficient ($p<0.002$). The cVEMP were positive in 69 % of cases.

In OS, VIN was sparse with low amplitude and was not lateralized to a specific side. In SSCD the sensitivity of VIN and cVEMP was not significantly different ($p=0.25$).

Conclusions: In unilateral SSCD, the VIN vertical component was most often superior suggesting a stimulation of other structures than the sole superior semicircular canal, i.e. a global vestibular stimulation of all the semicircular canals and otolithic organs. In unilateral SSCD, the lateralization of the VIN acts as a vestibular Weber. The absence of bone in a superior semicircular canal creates a third mobile window resulting in abnormal movements of the endolymph, making the vestibular system sensitive to sound or pressure stimuli. As a result, bone conducted vibrations are more efficient in vertex stimulation than mastoid stimulation possibly related to a mechanical direct contact between the endolymph and the cerebrospinal fluids.

The VIN and cVEMP sensitivity are similar to reveal SSCD, suggesting that the VIN should be included as a diagnosis criteria.

FP2-1 The effect of Atg7 on auditory cell death and cellular senescence under oxidative stress

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The main purposes of our study were to consider the effect of Atg7 on auditory cells under oxidative stress. We exposed auditory cell line (HEI-OC1) on H_2O_2 in two different conditions. First, auditory cells were incubated with various concentrations of H_2O_2 (1-5mM) at 33C for 6, 12, and 24h. Next, auditory cells were incubated with 5 mM H_2O_2 for 1h that induces a senescent phenotype. The first was defined as high dose of H_2O_2, and the latter as low dose of H_2O_2. After treatment with H_2O_2, cell viability and population doubling were counted. The proportion of SA-β-gal-positive cells was significantly increased in low dose H_2O_2-treated cells. We detected the expression of autophagy related proteins (Atg7, p62, LC3-II and Lamp2), mTOR related genes (Akt, P70S6 and 4EBP1) and Nrf2/Keap1 cascade with western blotting. Senescence-associated βgalactosidase (SA-β-gal) staining was performed for detecting cellular senescence. High dose of H_2O_2 lead to necrosis in auditory cell, while low dose of H_2O_2 lead to cellular senescence. Meanwhile, autophagy was also induced in these two conditions. The expression of LC3-II was induced after 30 min of high dose of H_2O_2 treatment. The expressions of p62, Keap1 and Nrf2 were increased in high dose of H_2O_2-treated cells. The expression levels of LC3-II were elevated with its peak at 6 h, followed by activation of Lamp2 with its peak at 24 h in low dose of H_2O_2. Then, the expression of these proteins were reduced at 48 h. Phosphorylation of Akt and P70S6 showed pronounced reduction after treatment of H_2O_2, while there was a significant phosphorylation of 4EBP1 at 48 h after treatment of H_2O_2. We found that auditory cell fate determination under oxidative stress depends on the balance among necrosis, cellular senescence and autophagy, and autophagy plays a cytoprotective function against oxidative stress. We confirmed oxidative stress-induced premature senescence was induced with impaired autophagy function through 4EBP1 phosphorylation in our auditory cellular premature senescence model. Our data clearly suggested that autophagy was a cell survival mechanism under oxidative stress, based on the observation that suppression of autophagy by knockdown of Atg7 sensitized, whereas activation of autophagy by rapamycin protected against H_2O_2-induced cell death and cellular senescence. Autophagy impaired by Atg7 knockdown degrades Keap1 in a p62-dependent manner, whereas Nrf2 is activated. As a result, the cell death induced by H_2O_2 was promoted in auditory cells. Taken together, these results suggested that the autophagy pathway maintained signaling cross talk with the Keap1-Nrf2 system through p62 in auditory cells under oxidative stress.

FP2-2 Characterization of Gap Junction Networks in the Human Cochlea

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The cochlea contains two principally different types of gap junction (GJ) networks. One epithelial network is located between epithelial cells in the organ of Corti while two connective tissue networks are situated in the lateral wall and spiral limbus. We analyzed GJs and connexin-26/30 (Cx26, Cx30) expression in the human GJ epithelial network including the spiral prominence (SP) using transmission electron microscopy (TEM) and confocal laser immunohistochemistry. GJs were residential between all types of neighbouring epithelial cells, except between sensory and supporting cells, above the whole length of the basilar membrane, including the inner and outer sulcus epithelial cells, as well as spiral prominence epithelial cells that sit above the lateral anchoring part of the basilar membrane. Few GJs were found in the inter-dental cells. Epithelial GJs were mostly solitarily expressed Cx30 or Cx26, the former dominating. However, possibly there are a few heteromeric/heterotypic GJs between Deiter cells. Outer pillars were coupled through Cx30 expressing GJs. There were no expressions in hair cells or nerve elements. Basal plasma membrane, facing the basilar membrane, showed focal electron-densities and horizontal GJ Cx30 plaques that were believed to represent hemi-channels. The epithelial GJ networks congregated at the SP with root cells projecting into the sub-epithelial space. The findings may suggest that K+-recycling from the basal poles of the hair cells may involve both cellular and extra-cellular routes in man.

FP2-3 Mouse otocysts as an experimental target

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Introduction: Mouse otocysts are an attractive experimental target to investigate treatment modalities for inner ear diseases and to study the inner ear development. Herein, we demonstrate the feasibility of transferring proteins, genes, and pluripotent stem (m-ips) cells in otocysts *in vivo*.

Methods: We used wild type pregnant CD-1 mice. Pregnant mice were anesthetized on embryonic day 11.5 (E11.5) and their uterus was removed after low midline laparotomy. The Uteri were illuminated from beneath with a fiber-optic beam to identify the location of the otocysts. Subsequently, injections were performed.

Protein transduction: Arginine-rich cell-penetrating peptides (CPPs) were utilized for protein transfection into the otocysts. Enhanced green fluorescent protein (EGFP) fused to nine-arginine (9R) peptides as CPPs was injected into unilateral mouse otocysts. The treated embryos were harvested at 3, 6, 12, 18, and 24 h after treatment. Frozen sections were obtained and EGFP fluorescence was examined using a fluorescence microscopy.

Gene transfer: Electroporation-mediated transuterine gene transfer into otocysts (EUGO) was utilized to transfer genes into the otocysts. Briefly, EGFP plasmid vectors with 1% fast green as a tracking dye were injected into the otocysts. Plasmid-filled otocysts were then electroporated with NEPA21 (super-electroporator, NEPAGENE) under various voltage conditions. The treated embryos were extracted at E13.5 and E18.5 and EGFP expression was examined.

Cell transplantation: We utilized m-ips cells (RIKEN, Japan), which express EGFP with Nanog as a promoter. M-ips cells were injected into mouse otocysts at E11.5. To examine the injected cell kinetics, the embryos were removed and evaluated at E13.5, E15.5, and E18.5.

Results: Protein transduction: EGFP was strongly detected in the lining cells of treated otocysts; it was also detected in the cell vicinity at 6 and 12 h and weakly detected at 3 and 18 h after treatment. The transduced protein disappeared within 24 h.

Gene transfer: The overall survival rate of the pregnant mice and embryos after treatment was 100% and 60.4%, respectively. Overall, EGFP expression rate per survived embryo that was subjected to otocystic injection, was 48%. The embryo survival rate in conditions of poring pulses (25V) and transfer pulse (15V) was the highest (88.9%). In the conditions, the expression rate of the treated otocysts per survived embryo was relatively high (66.7%). EGFP expression was detected in the entire inner ear epithelium at E13.5 and E18.5 after treatment.

Cell transplantation: Injected m-ips cells were detected within a space in the treated inner ear at E13.5 and E15.5 (2 days and 4 days after treatment). At E15.5, the cells were attached to lining cells of the inner ear, but no injected cell migrated into the intracellular space of the lining cells in the inner ear. At E18.5, the injected cells were not detectable in the entire inner ear.

Conclusion: Protein transduction using CPPs and gene transfection using electroporation methods were feasible. However, transfection of m-ips cells into the ear was not successful. Further investigations are warranted to explore this issue.

FP2-4 Contribution of active hair-bundle motility to nonlinear amplification in the mammalian cochlea

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The cochlea's high sensitivity stems from the active process of outer hair cells, which possess two force-generating mechanisms: active hair-bundle motility elicited by Ca2+ influx and somatic motility mediated by the voltage-sensitive protein prestin. Although interference with prestin has demonstrated a role for somatic motility in the active process, it remains unclear whether hair-bundle motility contributes in vivo. We selectively perturbed the two mechanisms by infusing substances into the endolymph or perilymph of the chinchilla's cochlea and then used scanning laser interferometry to measure vibrations of the basilar membrane. Blocking somatic motility, damaging the tip links of hair bundles, or depolarizing hair cells eliminated amplification. While reducing amplification to a lesser degree, pharmacological perturbation of active hair-bundle motility diminished or eliminated the nonlinear compression underlying the broad dynamic range associated with normal hearing. The results suggest that active hair-bundle motility plays a significant role in the amplification and compressive nonlinearity of the cochlea.

FP2-5 Intracranial pressure regulation revisited - the Petro-Sigmoid Reticulum - a new intravascular receptor for intracranial pressure

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Introduction: The Monro-Kellie hypothesis dictates that in an incompressible cranium, the blood, CSF, and brain tissue exist in a state of volume equilibrium. In order to maintain a constant blood perfusion, the brain utilizes "cerebral autoregulation". The molecular regulation of blood pressure is poorly understood and specific receptors for homeostasis equal to the carotid glomus and sinus have not yet been identified. However, indications of an unspecific receptor function in the cerebellopontine angle do exist. Although the receptor has remained unidentified, surgical stimulation in this area elicits a "cerebral natriuretic response". The proper stimulus however may be increased intracranial sodium.

In conjunction with the new discovery of the regional situated human endolymphatic sac as a novel intracranial natriuretic gland, we set out to explore and examine the tissue surrounding the human ES and sigmoid sinus in order to identify a possible anatomical well defined receptor for intracranial homeostasis.

Study Design: Using fresh human endolymphatic sacs, a coordinate design for studying both standard and ultrastructural morphology as well as molecular biology was utilized. Standard light microscopy and transmission electron microscopy was used for morphological analysis and both DNA micro-arrays and immuno-histochemistry for molecular biology.

Methods: A total of 30 tissue samples from the human endolymphatic sac were obtained during translabyrinthine surgery for vestibular schwannoma. 18 were prepared for light microscopy using standard methods and for TEM using an oxygenated fluorocarbon fixative before standard preparations for TEM. Microarray technology was utilized on the remaining twelve tissue samples to investigate tissue sample gene expression, using adjacent dura mater as control. The expression of genes specific for the neuronal transmission was determined and results for selected key molecules verified by immuno-histochemistry.

Results: Both light microscopy and in particular the TEM revealed a morphological picture consistent with the occurrence of intravascular situated cells, who's cell-bodies penetrated the endothelial wall. Two cells types are described, and both have the morphological appearance of neuroendocrine cells or indeed nerve terminals. This was strongly supported by the DNA analysis, which was additionally confirmed by the immuno-histochemistry. From the molecular biology analysis we confirmed the intravascular occurrence of cell bodies which expressed the dopamine receptor DRD2 and DRD5, as well as all enzymes responsible the rate limiting steps in the dopamine synthesis, release and re-uptake: Tyrosine hydroxylase (TH), DOPA decarboxylase (DDC), Vesicular Monoamine Transporter 2 (VMAT2), Plasma membrane monoamine transporter (PMAT) and Dopamine Transporter (DAT).

Conclusion: From the combined morphological and molecular biology analysis we hypothesize that the capillary network interposed between the human endolymphatic sac and sigmoid sinus likely hosts a dopamine dependent intravascular receptor, which we suspect reacts to changes in intracranial pressure and/or plasma sodium concentration. The receptor is tentatively named The Petro-Sigmoid Reticulum due to its anatomical location. Further analyzes are currently being conducted to verify this hypothesis and to determine the nature of the natriuretic capability.

FP2-6 Animal model for inner ear conductive hearing loss

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Background: A number of disparate clinical disorders and especially those affecting the vestibular apparatus of labyrinth can produce conductive hearing loss (ICHL) of inner ear origin by acting as a pathologic third window (TW). Theoretically, presenting a cochlear implant electrode into the scala tympani may also induce ICHL through changing of inner ear mechanics to acoustic stimuli.

The aim of these series of animal model studies was to clarify the mechanism of the ICHL, to examine the differences of TW on cochlear or vestibular apparatus and to investigate if CI produces ICHL.

Methods: Total of 57 ears in 30 adult size fat sand rats were operated. In 40 ears, a window was drilled in the bony labyrinth while preserving the membranous labyrinth over the scala vestibule, scala tympani, over the posterior semicircular canal and finally, over the superior semicircular canal. Additional group of 17 ears underwent cochlear implantation. Auditory brain stem responses to low and high frequency acoustic stimuli delivered by air and bone conduction were recorded before and after fenestration or CI.

Results: The largest Air bone gap (ABG) (37 dB) was induced by fenestration of the SSCC followed by PSSCC (14 dB). Similarly, fenestration of the scala vesibuli resulted in about 41 dB ABG where on scala tympani about 10 dB ABG. Cochlear implantation induced ABG of 32 dB which increased to 42 dB after 1 week.

Conclusion: Different surgical manipulations over the cochlear or the vestibular bony labyrinth caused significant ABG that closely mimics the CHL of middle ear origin. Both decrease in acoustic resistance (TW) and increase in acoustic resistance (CI) were demonstrated. Third-window lesions should be considered in the differential diagnosis of CHL in patients with an intact tympanic membrane and an aerated, otherwise healthy, middle ear.

FP2-7 Auditory measures of inner ear conductive hearing loss in Fat Sand Rats

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Background: The presence of conductive hearing loss (CHL) does not imply a particular etiology. Usually, it is associated with dysfunction located in the outer and /or middle ear, which result in reduced auditory levels to the inner ear. However, others may have inner ear ICHL due to labyrinth disorders resulting in acoustic transmission loss to the cochlea by mechanical shunting of stapes vibrations or increasing acoustic impedance due to presence of cochlear implant in scala tympani.

The aim of current animal study was to surgically simulate well known middle or inner ear clinical conditions and to examine differences in various auditory measures

Methods: Total of 30 ears of 15 adult size fat sand rats were operated. Four types of surgical simulations were performed including: 1. Dislocation of malleus from incus 2. Cochlear's window Fixation 3. Superior Canal Dehiscence. 4. Cochlear Implantation.

Auditory brain stem thresholds to low and high frequency stimuli presented by air and bone conduction, wide-band tympanometry (WBT) and Distortion products otoacoustic emissions (DPOAE) were performed before operation, after bullotomy and following the surgical manipulation.

Results: Of the tested measures, the WBT was the best to discriminate between the surgical simulations of CHL. Unexpectedly, in sub-luxation, DPOAE could be still reliably measured. No difference was found between the severity of the ABGs.

Conclusion: Wide band tympanometry appears to be a promising clinical tool for differentiating between different etiologies to conductive hearing loss.

FP3-1 Questionnaire Survey on Eating Habits and a Feeling of Coldness in Patients with Dizziness

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Introduction: Based on our experience, many patients with dizziness feel cold. To investigate this, we conducted a questionnaire survey to investigate eating habits and a feeling of coldness.

Subjects and Methods: The subjects were 128 patients with dizziness (23 males, 105 females, mean age: 58.7; range: 13-88). Controls were 128 patients without dizziness matched by sex and age. The subjects were divided into two groups: with cold group (WC) and without cold group (WOC). The questionnaire items were body height, body weight, body mass index (BMI), feeling of coldness, fair complexion, food and beverage preferences (sweet foods, milk, fruits, confectionery, beer, smoking, and coffee), and habit of exercise.

Results: The following items were significantly more prevalent in patients with dizziness compared to controls: preferences for sweet foods (patients: 61.7%, controls: 41.4%, p=0.002) and confectionary (patients: 52.3%, controls: 32.8%, p=0.011). In only females under 45 years old (N=28), significance was noted for a feeling of coldness (patients: 92.3%, controls: 67.9%, p=0.044). In patients with dizziness, a preference for sweet foods was significantly more prevalent in WC (N=82) compared to WOC (N=46) (WC: 69.5%, WOC: 47.8%, p=0.026).

Discussion: In Kampo Medicine, it is thought that white sugar cools the body. This survey revealed that dizziness is related to a preference for sweet foods. For it was suggested that sweet foods may be one of the causes of dizziness.

FP3-2 A 10 year Review of Management Outcomes of Peripheral Vestibular Disorders in Abuja, Nigeria

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Background: Vertigo is a universal symptom characterized by hallucination of motion, either rotatory or translational and is commonly from peripheral vestibular disorders. Most sufferers report dizziness as presenting symptoms and the challenge facing otolaryngologists is primarily to determine what "dizziness" is vertigo, and what etiological factor is responsible. Beyond that, the major issue facing patients is what treatment options to adopt and the prognosis of such treatment option. Published report on management outcomes of peripheral vestibular disorders among Africans is scanty.

Settings: Tertiary Care urban Otological referral centers in a developing economy.

Methodology: Charts review of patients managed with vertigo as the presenting symptoms at 2 tertiary care otological centers - Balance & Dizziness Clinics of National Hospital Abuja (2005 - 2014), and CSR Otologics Specialist Clinics (2010 - 2014), Abuja were selected for study. Inclusion criteria was followup for at least 12 months. Selected cases were analyzed for age, sex, duration of vertigo, otological and vestibular findings, cold caloric testing outcomes, audiometric assessment, treatment offered and treatment outcomes.

Result: A total of 575 cases were seen during the study period. 14 patients were excluded due to involvement of the supra labyrinthine areas (CPA tumors, abnormal CT brain), and the rest 561 cases had peripheral vestibular vertigo. There were 290 females and 271 males. Mean age was 44.7 years. Symptom was acute (<12 weeks) in 279/561 cases and chronic (>12 weeks in 282/561 cases. Diagnosis was BPPV (200/561), Meniere's disease (189/561), Cervicogenic Vertigo (35/561), Labyrinthitis (32/561), Migraine-associated vertigo (32/561), Climacteric Vertigo (8/561), Perilymph fistula (10/561) and others (55/561). BPPV was bilateral in 76/200, and Meniere's disease was bilateral in 88/189. Case with Migraine associated vertigo and Perilymph fistula reported highest score on Dizziness Handicap Inventory Scoring. Diagnostic investigations ordered include C-spine x-ray (165/561, abnormal in 50/561), ECG (75/561, normal in 60/561), Pure Tone Audiometry (315/561, abnormal in 212), MRI of Brain (50/561, abnormal in 8/561), E/U/Cr (25/561, abnormal in 15/561), Thyroid Function Test (15/561, abnormal in 10/561), and CT Brain (10/561, abnormal in 5/561). Treatment administered include vestibular suppressant medications (285/561, vertigo remission in 195 cases), Particle repositioning maneuvers (200/561, vertigo remission in 138), Chemical labyrinthectomy (13/561, vertigo remission in 7), Tympanomastoidectomy for cholesteatoma (25/561, vertigo remission in 25), NSAID + Physiotherapy (35/561, vertigo remission in 32), reassurance (8/561, vertigo improvement in 8), surgical labyrinthectomy (2/561, vertigo remission in 2) and vestibular exercises (168/561, improvement in 132).

Conclusion: A significant large percentage of vertigo seen in Africa are of peripheral vestibular origin, and could be best managed in a dedicated vertigo clinic.

FP3-3 Autoimmune inner ear disease presenting as Menière's Disease

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Background: Autoimmune inner ear disease (AIED) is a rare cause of sensorineural hearing loss, accounting for less than 1% of all cases. However, it is also one of the few forms of sensorineural deafness that can potentially be treated. It can be associated with a number of autoimmune diseases such as Ankylosing Spondylitis, Systemic Lupus Erythematosus and Inflammatory Bowel Disease. The diagnosis of AIED may be missed for several years as it often mimics the symptoms of other inner ear pathologies such as Menire's disease (MD), with up to 50% of patients meeting the criteria for MD.

Case Description: We present a 52-year-old man, previously diagnosed with MD, manifesting the classical symptoms sensorineural deafness, tinnitus, aural fullness and episodic vertigo. 4 years after the onset of MD symptoms, he was discovered to have autoimmune-associated conditions, namely psoriatis, joint pains and anterior uveitis. Some of his symptoms, especially his joint pains had been longstanding. Given the patient's autoimmune-related diseases, we suspected the diagnosis of AIED and started him on a therapeutic trial of steroids. He responded favorably to the therapy, and was subsequently switched to a steroid-sparing immunomodulator treatment. On these treatments, his vestibular symptoms were abolished and there was also significant sustained improvement in his hearing tests, demonstrating an autoimmune cause for his audiovestibular symptoms.

Discussion: Our case report illustrates the difficulty in differentiating the idiopathic MD from AIED. As the history was typical of MD, it was easy to have concurred with the initial diagnosis. However, this patient had features of autoimmune diseases that raised our suspicion of AIED. The response to immunosuppressant therapy confirmed an autoimmune etiology for his symptoms.

Conclusion: With no diagnostic tests to confirm AIED available, clinicians must maintain a high index of suspicion when treating patients with symptoms of MD who have one or more autoimmune conditions, bilateral symptoms, or a rapid progression of disease. Starting the patient on a trial of treatment with steroids and monitoring his response closely can often be a simple way of confirming the diagnosis.

FP3-4 Surgical aspects of an implantable vestibular prosthesis

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Background: Implantable vestibular prostheses are currently being developed in order to restore balance to patients with severe bilateral vestibular hypofunction. Certain technical issues remain to be resolved when implanting a vestibular prosthetic device to ensure that they are positioned to provide optimal electrical stimulation to ampullary nerve fibres. The ideal test would be performed intra-operatively at implantation to allow precise placement, and adjustment if required. Other issues that require clarification include identifying the optimal surgical approach and confirming that hearing can be preserved. We present our initial investigation of these surgical aspects of vestibular implantation.

Method: Participants were recruited from patients requiring a translabyrinthine resection of vestibular schwannoma. Pre-operatively each patient was tested to confirm the presence of measurable balance function. During surgery the semicircular canals were skeletonised. Electrodes were then inserted via a mid-semicircular canal fenestration to reach the ampulla. Electrical stimulation was applied and ECAPs and evoked eye movements measured. The patients' levels of sedation were measured by using a Bispectral Index.

Results: Recordable and repeatable ECAPs were obtained in all cases. Evoked eye movements were obtained by adjustment of the frequency of stimulation. The Bispectral Index showed that the magnitude of eye response was not dependent on the level of anaesthesia.

Conclusion: Electrically evoked compound action potentials and electrically evoked eye movements both offer the potential to ensure optimal placement of a vestibular implant electrode array without any monitoring of the patient level of sedation. Insertion of the electrode via a mid-canal fenestration is viable and this technique would ensure secure electrode placement. Work is on going to confirm hearing preservation.

FP3-5 Walking with a Vestibular Implant Prototype: Normalization of Dynamic Visual Acuity in Patients with a Bilateral Vestibular Loss

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Introduction: Patients with a bilateral vestibular loss (BVL) lack a properly functioning vestibulo-ocular reflex (VOR), which impairs gaze stabilization abilities. This results in an abnormal loss of visual acuity (VA) in dynamic situations. For instance, while walking, BVL patients' ability to read signs or recognize faces is severely limited. Nowadays it is still not possible to treat efficiently this handicapping condition which imposes a significant social and economic burden on affected patients and society. Promisingly, our group has previously demonstrated that the VOR can be artificially restored using our Vestibular Implant prototype. This study was designed to investigate whether this restoration results in an improvement of dynamic VA.

Methods: Five BVL patients, unilaterally or bilaterally deaf, were fitted with our vestibular implant prototype, which consists of a) motion sensors fixed to the head, b) a regular cochlear implant processor which is fed with motion information using a transformation unit, c) a regular cochlear implant transmitter and d) a modified cochlear implant receiver and stimulator (MED-EL, Innsbruck, Austria) with extracochlear electrodes enabling to deliver motion modulated electrical stimulation to the posterior or to the superior ampullary nerve. VA was determined using Sloan letters displayed on a computer screen, in four conditions: 1) with the patient standing still without moving (static), 2) while the patient was walking on a treadmill at constant speed with the vestibular implant prototype turned off (system OFF), 3) while the patient was walking on a treadmill at constant speed with the vestibular implant prototype turned on providing coherent motion information (system ONmotion), and 4) while the patient was walking on a treadmill at constant speed with the vestibular implant prototype turned on but providing aberrant motion information (i.e., electrical noise; system ONsham). VA values in each condition were normalized to those obtained in the static condition. A one-way repeated measures analysis of variance (ANOVA) was conducted to compare VA differences across conditions.

Results: The ANOVA analysis revealed a statistically significant difference between conditions ($F(3, 12) = 30.04$, $p<0.0005$). Post hoc tests using the Bonferroni correction revealed a significant decrease ($p<0.05$) of the VA in the system OFF and in the system ONsham conditions when compared to the static and the system ONmotion conditions.

Conclusions: In BVL patients, motion-modulated electrical stimulation of the vestibular nerve allows a significant improvement of the dynamic visual acuity while walking. This demonstrates that our vestibular implant prototype can significantly improve gaze stabilization by artificially restoring the vestibular function. For the first time it offers a promising therapeutic alternative to patients with a BVL.

FP3-6 Detection of Endolymphatic Hydrops in recurrent vertigos using MR imaging in 176 patients

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Objectives: Recurrent peripheral vertigos (RPV) including recurrent vestibulopathy (RV), Menire's disease (MD) and recurrent (idiopathic) benign positional vertigo (BPPV) is a public health problem, yet their etiology remains unclear. Recent developments in MRI of endolymphatic hydrops (EH) allow a better understanding of inner ear disorders. We intended to study the prevalence of EH in patients with RPV.
Methods: MRI scans were performed 4 hours after intravenous injection of gadoteric acid in 176 adults with RV (n=64), MD (n=68), associated benign paroxystic positional vertigo (aBPPV), i.e. MD+BPPV or RV+BPPV (n=25), and isolated unilateral recurrent idiopathic BPPV (iBPPV) (n=19). Twenty five patients with RV had atypical symptoms with episodic unsteadiness (instead of pure rotatory vertigos) without hearing impairment and described in most cases tinnitus during the periods of attacks (no neurological cause was found). The mean age of the RV (n=64) MD (n=68), aBPPV (n=25), and iBPPV (n=19) group was 48, 58, 61, and 59 years, respectively. Ten normal subjects were used as controls.
Two radiologists retrospectively studied the prevalence and localization of EH in RV, MD, aBPPV and iBPPV groups. EH of the vestibule was noted as absent in cases where less than 50 % of the vestibule was black (endolymphatic space). The degree of EH in the cochlea was classified as absent or present if irregular dilatation of nodular obstruction of the scala vestibuli was seen, implying a displacement of Reissner's membrane. Patients were graded based on the number and localization of hydrops, between 1 (EH in either cochlea or vestibule on one side) and 4 (EH in cochlea and vestibule on both ears).
Statistical analysis: Inter-rater agreement on detecting EH was estimated using Cohen's kappa coefficient. Between group comparison was analyzed with the Student's t-test. Pearson χ test was used for categorical data to explore the correlation between the side of the EH and the side of the hearing loss in the MD group. We considered p values of <0.05 as significant.
Results: in the RV, MD, aBPPV and iBPPV groups, we identified EH in 31 patients out of 64, 61 patients out of 68, 22 patients out of 25, and 9 patients out of 19, respectively. There was a significant difference regarding the number of subjects with EH between the two groups MD/RV (p0.01), with a higher average number of hydrops localization in MD group (p0.01). There was a significant difference between MD/iBPPV group (p0.01) but no statistical difference between MD/aBPPV groups.
Bilateral hydrops was observed in 34% of unilateral MD and in 32% of clinical unilateral RV (unilateral tinnitus), but in none of the 15 iBPPV. An isolated contralateral EH was found in 9 patients with MD (14%) and 15 patients with RV (23%) (side error). No hydrops was observed in our series of 10 normal subjects. The inter rater agreement between 2 radiologists using Cohen's Kappa coefficient was 0.72.
Conclusion: MRI with delayed acquisition helps clinicians to assess patients with recurrent vestibulopathy and select them appropriately, in order to enhance the therapeutic management. MRI may reveal EH in some cases with RV and iBPPV, suggesting similar pathophysiological mechanism in comparison with MD. Bilateral EH is observed in about 1/3 of clinically unilateral MD and RV. The frequent observation of EH in MD and aBPPV even in inter critical periods suggest that EH is a chronic state (status, order, condition).

FP3-7 MRI Inner Ear Imaging and Tone Burst Electrochleography in the Diagnosis of Meniere's Disease

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Objective: To compare the sensitivity of Gadolinium MRI inner imaging with tone burst electrocochleography (EcochG) for diagnosing endolymphatic hydrops.

Study Design: A prospective study on patients who were to have an MRI scan to exclude retrocochlear pathology.

Setting: Tertiary care centre.

Patients: 102: 57 patients with Possible, Probable or Definite Meniere's Disease, 25 with asymmetrical hearing loss, 18 with sudden sensorineural hearing loss and 2 with unilateral tinnitus had additional MRI inner ear imaging and click and tone burst stimulus EcochG testing.

Intervention: Diagnostic.

Main Outcome Measure: To compare the sensitivity of the two techniques.

Results: In 30 patients with symptom-based Definite Meniere's Disease tone burst EcochG was positive in 25 (83%) and the click EcochG was positive in 9/30 (30%), and Gadolinium MRI imaging diagnosed hydrops in 14 (47%). A positive result for either MRI imaging or tone burst EcochG was seen in 26 patients (87%). In 14 subjects with symptom-based Probable Meniere's Disease 10 (71%) had either a positive EcochG or MRI. In 13 with Possible Meniere's Disease 4 (31%) had a positive EcochG or MRI.

Conclusion: This study confirms the greatly enhanced diagnostic sensitivity
of tone burst EcochG over click response in diagnosing endolymphatic hydrops in Meniere's Disease. Even though adequate MRI imaging was achieved in 90% tone burst EcochG was a more sensitive test.

FP4-1 Endolymphatic Hydrops Detected by 3-Dimensional Fluid-Attenuated Inversion Recovery MRI following Intratympanic Injection of Gadolinium in the Asymptomatic Contralateral Ears of Patients with Unilateral Ménière's Disease

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Background: Marginal cells will release adenosine triphosphate (ATP) which was measured using a bioluminescence assay as we reported before. However, the storage of ATP in marginal cells is still unknown. This study investigates whether the ATP vesicles in the cytoplasm of in vitro cultured marginal cells in the cochlea of neonatal rats are lysosomes.

Methods: Primary culture of marginal cells in vitro of Sprague-Dawley rats aged 1-3 days was established. Vesicles in marginal cells staining with several markers were identified under confocal laser scanning microscope and transmission electron microscope. ATP releasing from marginal cells was measured using a bioluminescence assay after glycyl-L-phenylalanine--naphthylamide (GPN) treatment.

Results: Quinacrine-stained granules were labeled by the lysosome tracer LysoTracker and lysosomal-associated membrane protein 1(LAMP1), but not labeled by the mitochondria tracer MitoTracker. Treatment with 200μM GPN largely prevented the appearance of labeled puncta after incubation with LysoTracker or quinacrine, but did not affect by MitoTracker. In contrast, it will disrupt the labeled puncta of pre- incubation with MitoTracker by 1μM p-trifluoromethoxyphenylhydrazone (FCCP) and 10μM oligomycin, but did not affect LysoTracker or quinacrine staining. Quinacrine-labeled organelles observed by transmission electron microscope were lysosomes. Luminescence elevated 30 per cent in marginal cells after GPN treatment.

Conclusion: We identified the ATP vesicles in the marginal cells of the stria vascularis in the cochlea of neonatal rats were lysosomes. ATP release from marginal cells might be through lysosome exocytosis.

FP4-2 Developmental expression of inositol 1, 4, 5-trisphosphate receptor in the postnatal rat cochlea

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Inositol 1, 4, 5-trisphosphate receptor (IP3R) has been established to be essential for hearing. Here, the expression pattern of IP3R was studied in the developing postnatal rat cochlea by immunohistochemistry. At birth, IP3R was only found in Hensen's cells. At postnatal day 3 (P3), IP3R immunoreactivity was observed in sensory hair cells, and persisted until adulthood. From P8 onward, IP3R staining extended laterally, moderate expression was observed in the Deiters' cells and Claudius cells. IP3R immunolabeling was also observed in spiral ganglion neurons and the strial vascularis in the early postnatal period. In addition, mRNA expression was observed for all three IP3R isoforms (IP3R1, IP3R2, and IP3R3), in whole rat cochlea during four different developmental stages of cochlea, from P0 to P28, using real-time reverse transcription polymerase chain reaction (RT-PCR). Present immunohistochemical evidence of IP3R expression in the adult and developing rat cochleae may indicate a role in cochlear development. The immunolocalization of IP3R in different type of cells in the developing rat cochlea further implicates that IP3R-mediated calcium signaling plays important roles in auditory function.

FP4-3 Proteomic analysis of membrane transport systems of the epithelial tissue in the mammalian cochlea

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The cochlear endolymph is characterized by 150 mM [K^+] and a highly positive potential of 80 mV. These unique properties are essential for hearing and maintained by the K^+-transport across the stria vascularis. Principal molecules of the stria for the K^+-transport have been identified. The stria vascularis also carries a variety of other small molecules to establish the physiological functions of the cochlea, but these molecules are not elucidated. To clarify the proteins underlying these transport systems, we analyzed the membrane fractions of the stria by a mass spectrometry. We identified 1, 664 membrane proteins, which contained 25 ion channels and 79 transporters. 16 of the former and 62 of the latter have been for the first time detected in the stria. Network analysis suggested that Ca2+ signaling would play crucial roles in the strial transport. Besides, we identified 19 candidates for uncloned deafness genes. Our protein library is useful to elucidate not only molecular architecture of the membrane transport systems in the stria but also pathological processes of hearing disorders.

FP4-4 Politzer Prize Nominee (PP-1)

FP4-5 A New tail hanging method for vestibular animal research

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There is not a novel method to estimate vestibular function of small experimental animal. The methods for measuring vestibular ocular reflex is very complicated. Otherwise, vestibular spinal reflex could be used as a non-invasive method for estimating vestibular function in small experimental animal. Traditionally, researchers have used a circling or behavior changing with head position or body posture in their vestibular functional documentation. However these tests have many error in the interpretation because these are influenced from various environmental conditions like emotion, locomotion, or memory rather than actual vestibular function.

We has designed the tail hanging test in small rodent for performing vestibular function test like human posturography. We blocked visual cue by putting ointment on the both eyes before the test and blocked proprioception by hanging a tail. And then we observed body sway angle among tail-rump-snout. In a previous study, this method showed significant difference of minimal body sway angle between normal and unilateral labyrinthectomized (ULx) mouse. But this method had a limitation in some kind of mouse because of hair color issue and that system was not able to distinct difference between twisting and anterior bending.

Therefore, new version of tail hanging test used a colored-high speed camera and be added an improved algorithm to differentiate the twist motion. Each distance between the measuring points and sway angle were combined to complete the measurement. To verify the usefulness this experimental tool, Slc26a4 transgenic mouse and ULx mouse were used. The difference of minimal body sway angle between two groups was significance ($p<0.000$), and it was also different between Slc26a4Δ/+ and Slc26a4Δ/Δ ($p=0.038$).

We expect this experiment can do easy, non-invasive and useful for mass screening of vestibular function, and it also will be able to measure perfectly more than previous version by adding algorithm of anterior bending according to bilateral vestibular function changes.

FP4-6 THERAPEUTIC AND PROTECTIVE EFFECTS OF INTRATYMPANIC AUTOLOGOUS SERUM IN AMIKACIN INDUCED OTOTOXICIT

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Objective: We aimed to investigate therapeutic and the protective benefits of intratympanic autologous serum (AS) in amikacin induced ototoxicity in a guinea pig (GP) model.

Material and Method: Twenty-four guinea pigs were separated equally in two groups. In Group A intratympanic amikacin was applied three times a week. Following week, 0.3 cc autologous serum administered intratympanically three times a week. In Group B, 1 cc intramuscular amikacin was applied to the GPs for every day of the week. At the same time, 0.3 cc intratympanic autologous serum three times a week was administered. Hearing levels of Guinea pig in both groups were evaluated by otoacustic emission (OAE) initially and before scarification. In Group A, it was also recorded when intratympanic amikacin application was completed. Two positive and negative control GPs were created by amikacin and saline administration via intratympanic and intramuscular rote in group A and B respectively. The cohleas of the GPs were histopathologically analysed for apoptosis in corti, spiral limbus and ganglion with indirect immunohistochemical method. Apoptotic signalling cascades were determined by TUNEL method.

Results: OAE thresholds of all frequencies were improved after AS in the therapeutic group (A) but statistically significance was observed in only 4 kHz ($P<0.05$). Significantly protective effect of AS was also determined in only 4 kHz ($P<0.05$) in Group B. Apoptotic cells were lesser than in the therapeutic group comparing to positive control group. Cells of the corti, spiral limbus and ganglion were also protected in group B comparing to the positive control group.

Conclusion: Intratympanic autologous serum application may have potential in treating and protecting amikacin induced ototoxicity.

Key words: Autologous serum, growth factors, amikacin, ototoxicity, apoptosis.

FP4-7 Experimental patterns in animal studies encompassing cisplatinum induced hearing loss

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The aim of the present study was the evaluation of the treatment schedule of cisplatin in consideration of the ototoxic effect in animal for research purposes. By means of literature research we examined official sources for studies, published from 1960 to 2014. The evaluation was sorted into a descriptive and a statistic part. The statistical analysis was accomplished by the method of Hedges, in order to compare the direct influencing values: dose, way of application and mode of application. The studies included had to depict the dose in relation to the bodyweight, the way and manner of administration, the number of treated animals and either the standard deviation or the standard error of the results was evident.

According to the descriptive and the statistic analysis, the cumulative dose could be identified as the uppermost important factor in regard to ototoxicity not a continued, discontinued or single shot application. A linear increase of ototoxicity with higher doses became evident.

In the descriptive analysis studies with ototoxicity as target value, controlled studies on the basis of animal experiments and publications in English and German language were included and evaluated. A pool of 150 studies established the basis of the descriptive analysis. A final conclusion concerning the ototoxic level of the mode and way of application by statistical analysis was not possible. The statistic comparability is not sufficient because of the minor collective of groupings, which can be traced back to the amount of direct and indirect influencing factors manipulating the classification.

FP5-1 **Withdrawal**

FP5-2 **Politzer Prize Nominee (PP-3)**

FP5-3 Cochlear Implantation has a Positive Influence on Quality of Life in Elderly Adults

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Background: Hearing impairment causes difficulty in communication, and it leads apathy and depression. Especially in elderly, the difficulty in communication caused by hearing impairment induces not only depression but also social isolation, which means that hearing impairment ruins the quality of life. Therefore, it is considered that improvement of hearing level plays an important role in elderly adults.

Methods: Fifteen patients over 65-years-old who were underwent cochlear implantations at Osaka University Hospital from January 2013 to December 2014 were included in this study.

We evaluated the hearing level, the QOL for hearing and the grade of depression at before surgery and 6 months after surgery using CI2004, NICQ (the Nijmegen cochlear implant questionnaire) and SDS for each.

Results: The NCIQ scores improved in all sub-categories (sound perception, sound production, self-esteem, activity and social interaction) after surgery. The SDS scores also improved.There was a strong correlation between the sound perception scores and SDS scores.

Discussion: erception and SDS score suggests that complete deafness is the most stressful factor. The fact that the score of social interaction improved after surgery is a considerable point. The improvement of hearing prevents social isolation. Therefore, it is significant to improve hearing by surgery for elderly adults.

FP5-4 Outcomes with Cochlear Implantation in Early Deafened, Delayed Implanted Adults

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Background: Indications for cochlear implantation have expanded and become more precise in recent times. Due to neural plastic changes in the congenitally deafened auditory brain, there is a critical age for cochlear implantation. Candidates with shorter period of deafness who receive implants early in life, acquire the most optimal outcomes with implant aided hearing. But, there still remains a group of individuals who have become deafened, early in childhood due to varied etiology, but have been implanted later on as adults, after a prolonged period of hearing deprivation. These pre/peri-lingual candidates have adapted to alternative communication skills like signing and lip reading and their speech development remains inadequate after CI. It is interesting to assess the benefit provided by cochlear implants in this group, as restoration of auditory perception via the implant influences their communication skills, thereafter.

Study Method: Retrospective, Descriptive and Analytical cohort study to assess the outcomes of cochlear implantation in a cohort of 25 early deafened, delayed implanted adults (age range: 18 to 68 years; duration of hearing loss 15 yrs and higher, implanted between 1993 to 2014). Study performed at the Richard Ramsden Centre for Auditory Implants, Manchester using medical records of outcome measures like BKB, CUNY, 3AFC, Environmental sound tests and SIR scores recorded over the first year of implant use, plus a customized feedback questionnaire on the benefit from CI.

Results: Study highlights the demography, etiological spectrum, pre-implant hearing amplification and speech scores, auditory and speech outcomes with implantation and its impact on their communication skills and quality of life. Overall, the auditory perception scores on all tests significantly improved after cochlear implantation, although mean values were lower as compared to those achieved by a reference group of post-lingually deafened adults. The speech intelligibility rating scores did not significantly improve after CI. The QOL measures improved after implantation and most candidates felt a positive impact with the implant aiding their daily communication. It also improved their mental health like cognition, emotion, self-esteem & social interaction. These results project the fact that benefits are obtained through CI, in this special cohort.

Conclusion: The study explores the influence of prolonged duration of deafness, on the less than optimal outcomes obtained among delayed cochlear implantees. It also provides an insight on how the implant helps to improve communication in this cohort, to know whether it overcomes or assists in signing and lip reading skills, which these patients have developed and identifies non-users.

FP5-5 Ipsi- and Contralateral Auditory Brainstem and Cochlear Implant Combinations

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Introduction: In patients deafened by neurofibromatosis type II (NFII) often the dilemma arises concerning the correct sequence and timing of the surgery together with the question whether to implant an Auditory Brainstem Implant (ABI) or a Cochlear Implant (CI). In some of these patients implantation of a CI at the side of a slower growing tumour and subsequent removal of the contralateral faster growing schwannoma with placement of an ABI might provide a solution securing the optimal functional result.

In NFII patients in whom during the surgical removal of schwannoma the cochlear nerve has anatomically been preserved but the intraoperative monitoring shows loss of acoustic hearing it is possible that deafness has been caused by compromised vascularisation of the cochlea and not by the damage to the acoustic nerve itself. In these cases CI would be the best solution yet it is extremely difficult to definitively confirm the precise localisation of the damage and the results of CI remain uncertain. In these cases a combined ipsilateral auditory brainstem-cochlear implant (ABCI) system could be an interesting option.

Material and Methods: Patients in whom ipsi- and contralateral combinations of CI and ABI have been used will be presented. For contralateral applications the Nucleus devices have been used. Before CI implantation the electrical functionality of the acoustic nerve was confirmed by the round window electrical stimulation under local anesthesia.

The combined ipsilateral ABCI system was a custom-made modification of the commercially available ABI device produced by the Cochlear company, based on the Nucleus-24M system. The implant's 22-contact active array was divided into two parts: one had the design of the typical surface ABI electrode, the second one was the cochlear implant electrode, each of the electrodes had every second contact connected.

Results: Primary implantation of a CI before contralateral schwannoma removal and ABI application allowed for restoration of functional hearing before the fitting of an ABI had to be performed. This sequence resulted in optimal fitting of the ABI and added benefit of bimodal (ABI and CI) stimulation for speech understanding in noise and sound localisation.

In the first of the ABCI cases the cochlear implant part shows full functionality and normal behaviour, while stimulation of the brainstem electrode results in mostly side effects and has been deactivated. In the other ABCI patient only stimulation of the brainstem electrode elicits auditory sensations. In both patients postoperative results are typical for respective CI or ABI systems.

Conclusions:
1.) Primary implantation of a CI before contralateral schwannoma removal and ABI application might provide an optimal functional solution for particular NFII patients.
2.) Combined ipsilateral ABCI system is an interesting "two-in-one" option for the deaf NFII patients during removal of the tumour and intraoperatively anatomically preserved acoustic nerve.

FP5-6 Long Term Outcome and Application of Objective test in Children with Audiotry Brainstem Implant

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Background: Auditory Brainstem implant (ABI) is a recent trend in restoring hearing in children with inner ear or nerve aplasia and anomalies. Unlike cochlear Implants, outcomes in ABI are variable and not very promising in vast majority of the recipients. ABI pose several challenges right from positioning the electrode intra-operatively till optimizing the stimulation parameters post-operatively. Challenges are more especially in children, who cannot give any feedback regarding the presence or absence of auditory and non-auditory sensation and as well as the quality of auditory sensation while programming the psychophysical levels. So there is need to depend upon the objective measures to identify auditory and non-auditory electrodes as well as to optimize the stimulation parameters. Since there is dearth literature on the outcomes in children with Auditory Brainstem implant there is no re/habilitation protocol to be followed in this population.
Primary objective: The purpose of this study is to formally and informally assess the long term auditory, speech, and language development of Indian paediatric ABI users at regular post-operative intervals.
Secondary Objective 1: To predict auditory and non auditory electrodes, using combination of electrophysiological, psycho acoustical and imaging techniques.
Secondary Objective 2: To understand the cross modal plasticity in children with ABI using PET CT
Methods: Ten children (18-94 months old) received an auditory brainstem implant. The children's auditory perception, speech intelligibility, and receptive expressive language development were accessed formally and informally at regular intervals up to 36 months device experience. All children attended post-operative habilitation sessions. Children also underwent electrophysiological (eABR and Aided CAEP) and psycho acoustic to predict the auditory and non-auditory electrodes. Children also underwent PET imaging to understand the cortical activation.
Results: All subjects' increased their auditory perception, speech intelligibility, and receptive language scores over time, although none achieved maximum scores on any test. Only few subjects were assessed beyond the 12-month interval. Development stagnated after the habilitation program ended. Informal assessment (AuSpLan) gave a more detailed and nuanced pictures of subjects' development. Serial use of electrophysiological and psyco-acoustic test aids in predicting the auditory and non-auditory electrodes in very young children. There is a difference in cortical activity between subjects.
Discussion: All subjects benefited from implantation. Informal assessment provided a more nuanced and complete picture of development than formal tests alone, and is may be a valuable addition to test batteries. Clinics should strongly consider extending habilitation programs and/or devoting more attention to parent counselling and giving home-training tips. Understanding the auditory and non-auditory electrodes will play a major role in terms of deciding the re/habilitation technique to be used. Though there was both good and poor correlation between the electrophysiological and psycho acoustic test, serial testing does help in predicting auditory and non-auditory electrodes.
Conclusion: Auditory brainstem implantation allows paediatric users access to auditory stimuli and non-auditory stimulation. Clinicians and parents can see a more thorough picture of development if informal tests are included in the test battery. To maximize benefit, it is important for clinics to properly counsel parents, especially on the importance of habilitation. The re/habilitation technique has to be adopted case by case rather than following a standard protocol. There seem to be trend for cross modal learning in children with Auditory Brainstem implant.

FP6-1 OTITIS MEDIA AND MAST CELLS

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Introduction and aims of the study: New concepts are needed to explain the pathophysiology of otitis media. Mast cells have been demonstrated to play an important role not only in allergic but also in inflammatory immune reactions. Mast cells are common in the normal middle ear mucosa, but their potential role in the innate immunity of the middle ear, and in the expression of inflammatory responses to bacterial challenge in that space has received relatively little attention. The course of bacterial otitis media in the presence and in the absence of mast cells, TNF and Interleukin 10 is examined.

Purpose: To examine the role of Mast cells and important Mast cell mediators in otitis media.

Methods: Wild type mice, mast cell deficient mice, mast cell deficient mice whose mast cell populations were restored by transplantation of bone marrow derived mast cells and TNF- and IL-10-deficient were challenged, employing a model of bacterial middle ear inflammation.

Results: The results indicate that mast cells account for a substantial proportion of the innate immune response to bacteria in the middle ear. TNF as well as IL-10 are key mediators in otitis media.

Conclusions: The mast cell may be a critical control element in the pathogenesis of otitis media. Mast cell derived TNF and IL-10 are important regulators of this disease.

FP6-2 Streptococcus salivarius, a potential probiotic against pneumococcal colonisation and otitis media: a preliminary study

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Outcome Objectives: Nasopharyngeal colonisation is the initial step in pathogenesis of pneumococcal diseases, including otitis media. Pneumococcal vaccines are less effective against otitis media, than they are against systemic pneumococcal infections. Previous studies suggested that *Streptococcus salivarius*, a commercially available probiotic, originally isolated from the throat, could be a potential pharyngeal probiotic. We investigated the effects of *S. salivarius* on pneumococcal colonisation and otitis media by in vitro and in vivo models of infection. The colonisation pattern of *S. salivarius* was explored by a pilot study in humans.

Methods: Descriptive study conducted at Melbourne University and Murdoch Childrens Research Institute, Melbourne from 2011 to 2013.

High (5 to 10 times more than pneumococci), medium (approximately equal) or low numbers (5 to 10 times less) of *S. salivarius* were added before, with, or after pneumococcal administration (pre-, co-, and post-administration respectively) to human epithelial (CCL-23) cells in vitro. The percent colonisation of pneumococci was determined after 3 h incubation. In experiments using infant mice, repeated pernasal administration of *S. salivarius* (~107 CFU/ dose) was used as an intervention in pneumococcal colonisation model and otitis media. Colonisation of upper respiratory tract (nasopharynx and throat) of healthy adults after one week of probiotic consumption was determined.

Results: There was time-dependent (pre-administration more effective than co- and post-administration) and dose-dependent (high numbers more effective than medium or low numbers) inhibition of pneumococcal adherence to CCL-23 cells by *S. salivarius*. However, *S. salivarius* colonised the nasopharynx of mice poorly, and didn't inhibit the development of otitis media in vivo. *S. salivarius* did not have a sustained effect on long term pneumococcal colonisation in mice. *S. salivarius* naturally colonised the throat. Oral administration of *S. salivarius* in humans increased the colonisation levels in throat for up to two weeks.

Conclusion: Our data indicated that *S. salivarius* can inhibit pneumococcal colonisation in vitro, but not in infant mice. Colonisation levels in throat increased after oral administration. Further well-designed human trials are warranted to evaluate *S. salivarius* as a potential probiotic to prevent otitis media.

FP6-3 A novel experimental model for cholesteatoma-induced bone destruction

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Background: Advanced cholesteatoma can cause osteolysis, which leads to severe complications such as facial nerve palsy, meningitis and brain abscess. Several studies have reported that osteoclasts and their precursors exist in the cholesteatoma tissue. Osteoclast differentiation and activity require macrophage colony-stimulating factor (M-CSF) and receptor activator of nuclear factor κβ ligand (RANKL). Recent investigations have demonstrated that RANKL is expressed in the cholesteatoma tissues, however, it is unclear how RANKL expression is regulated. Thus the mechanisms underlying osteolysis is still incompletely understood, although it has been suggested that osteoclasts could be involved in bone destruction caused by cholesteatoma as well as other bone destructive diseases (e.g. rheumatoid arthritis).

Experimental models are of importance to investigate the pathogenesis. However, so far, no suitable animal model for cholesteatoma-induced bone destruction has been developed. Therefore the generation of an animal model, especially a convenient mouse model, is desirable.

Objectives: This study aimed to establish the new experimental model of the cholesteatoma tissue in vivo and in vitro and investigate the mechanism underlying bone destruction caused by cholesteatoma.

Methods: For the generation of cholesteatoma mouse model, fibroblasts and keratinocytes were isolated from ear pinna of mice, and these two types of cells were mixed and injected under the periosteum of mice. One week after the injection, mice were sacrificed and histological examination was performed. In order to observe osteoclasts on bone surface, we used TRAP-tdTomato transgenic mice for recipient mice, in which tdTomato is driven under the control of the mature osteoclast-specific tartrate resistant acid phosphatase (TRAP) promoter.

For in vitro reproduction of cholestatoma tissue, pinna-derived keratinocytes were cultured at an air/liquid interface that allows three-dimensional differentiation of epithelial cells. Pinna-derived fibroblasts were cocultured with 3D cultured keratinocytes for 2 days and sequentially cocultured with bone marrowderived cells in the presence of M-CSF. After several days we evaluated osteoclast differentiation by counting multinucleated cells (MNCs) positive for TRAP.

Results: One week after the cell-injection, the formation of a mass was identified under periosteum. Histochemical analysis showed that it consisted of cornified epithelium containing lamellated keratin and surrounding fibroblast layer. These structures were similar to the histology of cholesteatoma. We observed large TRAP-positive (tdTomato) cells on the bone surface in contact with the mass, representing mature osteoclasts.

Furthermore, in vitro coculture assay showed that fibroblasts cocultured with keratinocytes highly express RANKL and induced differentiation of TRAP+ MNCs more effectively than untreated fibroblasts.

Conclusion: We succeeded in generating the novel mouse model of cholesteatoma-induced bone destruction. Together with in vitro coculture assay, it is suggested that fibroblasts stimulated by keratinocyte-derived soluble factors induce osteoclastgenesis, which can lead to bone resorption at the site adjacent to the cholesteatoma tissue.

FP6-4 Vibratory axis of the ossicular chains

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Introduction: Recently, numerous studies have reported sound-induced motion of the tympanic membrane (TM) and ossicular chain using non-contact laser Doppler vibrometry (LDV). Most measurement has been investigated in the temporal bone of human cadaver and animals, rarely in living humans. Despite positive characteristics such as noninvasiveness and reproducibility, LDV has not yet gained wide use in clinical practice. Although the high costs of devices and complexity of measurements seem to be contributing factors, we expect the adoption of LDV to increase in the near future. An operative optical system appeared relatively suited with LDV just mounting laser Doppler vibrometer. We have investigated multipoint TM measurement in living humans to demonstrate sequential motion characteristics of the entire TM by LDV, resulting that TM motion differed substantially according to the part and stimulus frequency. Additionally, we also investigated the ossicular chain movement in living humans by LDV. The malleus head and incus moved in synchronization, in contrast, stapes movement was opposite in phase. In this study, we analyzed the vibratory axis of the ossicular chain using a 3-dimensional model.

Materials and Methods: A 3-dimensional model of the ossicular chain was mounted in the same position as the live surgery, using wires on a testing table. The laser beam was emitted from the laser Doppler vibrometer to measure the vibration pattern at malleus head, incus body, and posterior crus of the stapes. We tried 2 different vibratory axes, one was linking the anterior ligament of malleus to the posterior ligament of incus, and another was linking the tendon of tensor tympani muscle to the posterior ligament of incus. The phase direction at each point was measured using an oscilloscope. These measured data was compared with that obtained in living humans.

Results: The relationship of ossicular chain movement that was seen in living humans was recognized only in the situation with the axis linking the tendon of tensor tympani muscle to the posterior ligament of incus.

Conclusions: In this study, the ossicular chains could vibrate on the axis linking the tendon of tensor tympani muscle to the posterior ligament of incus under certain conditions. In consideration of a possibility that the vibration axis changes depend on the frequencies, further research is needed.

FP6-5 Double Oblique images in temporal bone CT to approximate microscopic surgical views

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Objectives: In this study, "Double Oblique (DO) images of temporal bone CT" were made based on the results from measurements of the angle between the visual axis under microscope and the axis of bony external auditory canal (EAC). DO CT enabled cross section images to show the approximate surgical field of view under microscope. We considered the availability of DO images and also measured the distance between the facial nerve and chorda tympani in the DO images based on information from the visual axis of the posterior tympanotomy.

Materials: 11 cadaveric temporal bones were used in this study. CT images of the temporal bone were taken using Cone beam CT (Accuitomo 3DX Multi Image MicroCT, Morita Mfg. Kyoto, Japan).

Methods: emporal bones were prepared in retro-auricular incision, and canal wall up procedure.

In order to visualize the direction of microscopic visual axis in CT, a fine piano wire (0.25×15 mm) was placed in the 11 cadaveric temporal bones before CT scanning. The piano wire was precisely set parallel to the visual axis of the microscopic view. The obliquity of the piano wire in two different visual axis was measured, one along the visual axis in view of the tympanic membrane through the EAC and the other via the posterior tympanotomy opening. The reference line for obliquity measurement was set to the axis of the bony external ear canal, defined as the line which connects the tip of the mallus and the middle point of lateral bony external ear canal. Based on results obtained from the obliquity measurements of the piano wire, DO images were made of the slices perpendicular to the piano wire using Multi-Planar Reconstruction (MPR) technique. To reconstruct DO images, Z axis of sagittal plane was modified depending on the obliquity of the piano wire. After this process, DO images perpendicular to the visual axis can be obtained.

Results: he direction of the visual axis in view of the tympanic membrane through the external ear canal was virtually the same as the axis of the bony external ear canal. The direction of the visual axis of the posterior tympanotomy was inclined backward (ave.10.9 degree, SD 5.4) toward the axis of the bony external ear canal in axial plane, and also inclined upward (ave.7.7 degree, SD 3.1) toward the bony external ear canal in coronal plane. The average distance between the facial nerve and the chord tympani in the DO images was 2.91mm and it was longer than the same measurement in those sagittal plane (2.59mm) ($P<0.01$).

Discussion: O images can be fused together to approximate the surgical view by conducting an appropriate rotation or making mirror-reversed images, and help to intuitively understand anatomical structures and their spatial relationships. DO images which are based on the visual axis in view of the tympanic membrane through the external ear canal can provide anatomical information of the structure beneath the external ear canal. In addition, DO images based on the visual axis along the posterior tympanotomy via the facial recess opening provide anatomical information around facial recess, such as the distance between the facial nerve and the chorda tympani nerve.

Conclusions: DO images provide intuitive recognition of surgical structures and enable measurement of anatomical relationship that are difficult to obtain from routine CT images using axial and/or coronal projections.

FP6-6 Politzer Prize Nominee (PP-2)

FP7-1 A comparison between Oticon Neurelec Digisonic SP Binaural and bilateral cochlear implants

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Objective: To compare a group of adults wearing bilateral cochlear implants (BIL patients, n=6) with a group of Oticon Neurelec Digisonic SP Binaural implant users (BIN patients, n=7), which allows stimulation of both cochleae by a single internal processor.

Methods: Prospective study. Speech perception was assessed by word recognition in quiet and noise. The sound localization task was to determine the source of a sound stimulus among five speakers. Quality of life was assessed by two questionnaires (APHAB and GBI).

Results: Speech perception was not significantly different between the two groups (mean percent word recognition in the BIN and BIL groups: 70% versus 56, 7% in quiet, 55, 7% versus 43, 3% in noise). There was also no significant difference between the two groups with respect to performance in sound localization and self-assessment of quality of life.

Conclusions: According to our results, Oticon Neurelec Digisonic SP Binaural implantation seems to provide benefits similar to those of bilateral implantation.

FP7-2 Hearing preservation after cochlear implantation in children

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Aim: Several studies have shown that with appropriately designed and inserted electrodes, acoustic hearing can be preserved in the majority of subjects during cochlear implant (CI) surgery. Having increasingly higher number of cochlear implant patient with hearing preserved, there is a need for hearing preservation classification. The aim of this retrospective study was to applied the HP classification, which was recently proposed by the group of HEARRING centres, in assessment of children after Partial Deafness Treatment (PDT).

Material and Method: The already published hearing preservation data from PDT patients implanted in the Institute of Physiology and Pathology of Hearing were re-evaluated using the HP classification system

Results: The individual hearing preservation results were stratified into 4 categories: Complete, Partial, Minimal hearing preservation and Loss of Hearing.

Conclusion: The Hearing Preservation Classification System allows for a larger overview of hearing and structural preservation and should be used as universal standard for reporting.

FP7-3 Vestibular function changed after cochlear implantation: a preliminary observation

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Background and Objective: Cochlear implantation(CI) is a widely accepted treatment method to restore hearing to patients with severe to profound hearing loss. The surgical risks of cochlear implant have been minimized. Most post-operative dizziness is transient and short lived, related to surgical trauma and/or vestibular system stimulation by the CI. Histopathologic studies had presented that saccule, uticle and semicircular canals could be damaged after the surgery.
The aim of this work was to evaluate the effect of cochlear implantation on the function of lateral semicircular canals, utricle and saccule. **Objective:** To determine the incidence of vestibular dysfunction in a group of patients with severe or profound sensorineural hearing loss receiving a cochlear implant and to follow up the prognosis of the vestibular dysfunction.
Methods: Observational cross-sectional study A total number ofof 2301 patients (14 males and 7 femalesages 9-89 years) with single-sided multichannel implants were conducted. between 9 and 89 years of age were included in this study. All patients were diagnosed with severe or profound sensorineural hearing loss and received multichannel cochlear implants. An initial vestibular system assessment was conducted prior to implantation by bithermal caloric irrigation and vestibular myogenic evoked potential (VEMP, cVEMP &oVEMP). Vestibular evaluation was done 1 week and 1 month after the surgery, and 1, 3, 5months after switching on the device.
Results: Nystagmus was observed in 1725 patients but only 24 subjects were reported vertigo symptoms immediately after the implantation, one patient was diagnosed BPPV 2 weeks after the surgery.
Pre-operiativep functional testing of the hSCC yielded valid results in 812 patientears, among themwhich 57(7/12) patientears had a substantially reduced but irreversible responses of caloric irrigation after the implantation, 35 (5/12) patients showed a stable response.
Among fourteen20 (66.7%20/30) normal cVEMP ears that were implanted, 812 ears (57.1%12/20) were tested with no response 1 week after the surgery (only 23(3/12) ears were re-detected with cVEMP response at the time of 1 month after the switching on), 6 ears got significant asymmetries with the amplitude being smaller 1 week after the surgery but showed a trends of recovery with the following up of 5 months. Seven10 (10/30) ears with absent pre-operative cVEMP continued to be absent after the implantation.
Among ten14 (47.6%14/30) normal oVEMP ears that were implanted, 79 ears (70%9/14) showed no response 1 week after the surgery (only 2 (2/9) ears showed oVEMP with smaller amplitude at the end of follow-up), 35 ears (30%5/14) showed smaller amplitude but also a trrends of recovery. 16 (16/30)11 ears with absent pre-operative cVEMP continued to be absent after the implantation.
Atraumatic cochlear implantation surgery were conducted in 2 patients with good residual hearing and normal VEMP (cVEMP &oVEMP). 1 week after the implantation, surgery, one patient got a well-preserved residual hearing but smaller-amplitude VEMP (cVEMP &oVEMP). While residual hearing was lost in another patient with an absent cVEMP and smaller-amplitude oVEMP.
Conclusions: Cochlear implantation does do damage to the function of lateral semicircular canals, utricle and saccule, but sometimes the affection were reversible. Even atraumatic techniques were used, the affection couldn't be avoided.
Key words: Cochlear implantation, Vestibular function, VEMP, Bithermal caloric irrigation, Atraumatic cochlear implantation surgery

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FP7-4 LOW-TRAUMA ELECTRODE-ARRAY DIGISONIC SP EVO: FEATURES AND FIRST RESULTS

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Objectives: Cochlear implants (CI) are nowadays expected to be as atraumatic as possible in order to preserve delicate internal cochlear structures. The following presentation reports surgical experience and clinical data following first implantations using Neurelec Evo low-trauma electrode-array (EA).

Method: Data analysis from surgical records following implantation in Bordeaux University Hospital.

Results: Evo EA has been designed to minimize insertion trauma (0.4 to 0.5mm diameter) with 20 electrodes on a single insertion length (25mm) offering long insertion adapted to several anatomical configurations and atraumatic surgeries. 10 implantations were performed in our center following the same procedure with posterior tympanotomy and round window insertion. Healon has been used for lubrication. All surgeries showed full EA insertion, with smooth insertion. No complication has been observed.

Conclusions: Altogether, these first data suggest that Evo EA design is satisfactory. Residual hearing preservation study could now be considered as a next step.

FP7-5 Underwater endoscopic ear surgery for preservation of inner ear function

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We propose a novel technique of "underwater" endoscopic ear surgery (UWEES) to preserve inner ear function for labyrinthine fistula and cochlear implantation. This technique provides a clear operative field without requiring suction and protects the inner ear from unexpected aeration that may damage its function. The mastoid cavity was filled completely with saline water by perfusion for the appropriate management of labyrinthine fistulas and cochleostomy. Saline water perfusion is provided through an Endo-scrub lens cleaning sheath (Medtronic) covered on 0 degree 2.7mm diameter high-definition endoscope (Storz) that cleared the surgical field and prevented refraction effects.

A several cases of labyrinthine fistula were performed by UWEES to remove the matrix of cholesteatoma. Surgery was performed for removal of the cholesteatoma and closure of the fistula of the semicircular canal. The cholesteatoma was extirpated except for the island lesion of the matrix over the fistula under the operating microscope. Subsequently, saline solution was infused into the mastoid cavity until both the island residual matrix and the tip of the inserted endoscope were filled completely. The saline water was continuously perfused using a syringe by an assistant or Endo-scrub lens cleaning sheath (Medtronic). The island residual matrix was exfoliated and plugged with temporal fascia endoscopically and the fascia covered with bone paste.

Cochlear fistula, which is rarely encountered, may cause difficult situations to preserve hearing functions because of the vulnerability. Underwater endoscopic ear surgery (UWEES) was also applied for cochlear implantation to identify the scala tympani with clear surgical view. A-77-years old woman was suffered from chronic otitis media due to aspergilloma infection on both sides. Her hearing level was deteriorated after the twice episodes of acute inflammation periods, the former one concomitant with facial palsy on her right side. Two staged surgeries were planned, and cochlear implantation was performed on her left ear by UWEES successfully six months after blind sac closure of the outer ear canal at the first staged operation. UWEES with perfusion system was suitable to cochlear implantation when cochlear fistula existed.

UWEES have a great potential in ear surgery for preventing the risk to inner ear function, specifically in other interventions such as stapes surgery and temporal bone destruction corrective surgery.

FP8-1 Regeneration of traumatic Tympanic Membrane Perforation Using ofloxacin otic

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Regeneration of traumatic Tympanic Membrane Perforation Using ofloxacin otic drops: is this a challenge for traditional concept of dry therapy ?

Objective: To investigate the effects of direct application of ofloxacin otic drops (FLOX) on the treatment of large traumatic tympanic membrane perforations (TMPs).

Study Design: Prospective, sequential allocation, controlled clinical study.

Setting: Tertiary university hospital.

Subjects and Methods: 149 patients with traumatic TMPs were recruited. They were sequentially allocated to two groups: conservative observation (A) group (n = 75) and direct application of ofloxacin otic drops (B) group (n = 74). The closure rate, closure time, and rate of otorrhea were compared between two groups at six months.

Results: In total, 145 patients were analyzed in this study. The closure rates of medium-sized perforations between the two groups were not significantly different ($P>0.05$); however, the B group had a significantly shorter closure time for mediumsized perforations than the A group ($P<0.01$). Additionally, the B group showed improvement in the closure rate of large-sized perforations ($P<0.05$) and a significantly shorter mean closure time ($P<0.01$) than the A group. However, purulent otorrhea between the A and B groups were not significantly different ($P>0.05$).

Conclusions: The present findings first indicate that direct application of FLOX shortened the closure time and improved the closure rate, but didn't affect the hearing improvement and increase middle ear infection of large traumatic TMPs. Thus although the dry naturopathy of traumatic TMPs demonstrate a higher healing rate moist therapy that results from topical application of FLOX should be recommended for traumatic, large-sized TMPs in the future.

FP8-2 Simplified myringoplasty and tympanoplasty using fibrin glue by transcanal approach

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Simple underlay myringoplasty (SUM), which is widely performed in Japan as a less invasive procedure of myringoplasty, has been gradually recognized in the world since an original article in English was published[1] and the detail of the procedure had been introduced into AAO-HNS (American Academy of Otolaryngology - Head and Neck Surgery) for the last 8 years. For this method, a transcanal approach through an ear speculum is applied. No skin incision is necessary except to harvest subcutaneous connective tissue at the retro-auricular region for the graft. After the topical anesthesia of the tympanic membrane, the perforation edge is removed for both the debridement and the vascularization to the graft. The pressed graft is inserted into the tympanic cavity through the perforation, and then the graft is elevated to touch the perforation edge. The graft is fixed to the tympanic membrane with a few drops of fibrin glue. Packing is not necessary either in the tympanic cavity or in the external auditory canal. The surgery is performed under local anesthesia except in cases with children because thirty minutes is sufficient to accomplish the surgery for one ear by this method. Regarding results, the rate of initial closure was 478/621 (77.0%). This rate is lower than that of conventional methods. For these persistent perforations after this method, re-closure is attempted in the outpatient clinic by the same procedure using frozen autologous tissue which has been harvested in the initial surgery. After this re-closure procedure, overall success rate was 595/621 (95.8%). There was no significant difference of the success rate among any size of the perforation or any frequency of otorrhea. There was no serious complication such as sensorineural hearing loss. SUM is indicated for the case as follows: 1) any size of the central dry perforation, 2) no pathology in the tympanic cavity, 3) a sufficient hearing gain after the patch test using thin wet cotton. The case of cholesteatoma or adhesive otitis media is contraindicated. Because the postoperative hearing deterioration is extremely rare, SUM is also indicated for cases with the only hearing ear or with the same day surgery for bilateral diseases[2), 3)]. Additionally, this method is applied to tympanoplasty by the transcanal approach. After the canal skin is anesthetized by an infiltration of 1 % Lidocaine, the canal skin is incised and elevated through an ear speculum to check both of the tympanic cavity and of the ossicular chain. Then the perforation is closed using modified procedure of SUM. The posterior part of the graft is set between the elevated skin and the canal bone.

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FP8-3 Withdrawal

FP8-4 Ossicular reconstruction for postperative aural atresia

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Ceramic ossicular replacement prostheses have been used for more than 30 years in Japan. The use of this prostheses was limited to certain institutions. Recently, artificial materials, mainly titanium, have become more commonly used in Europe and the USA. In Japan, this prostheses have also been frequently used to reconstruct the ossicular chain. This prostheses are effective as long ceramics for type IV tympanoplasty and lateralized tympanic membranes. However, there are issues with the surgical method to return the lateralized tympanic membrane to its physiological position. There have been many patients for whom the tympanic membrane returns to its previous lateralized location after the surgery, resulting in recurrent lateralization. Due to this phenomenon, no desirable amelioration in hearing is observed in some patients. We have reported improvements in hearing by using a long ceramic without changing the location of the lateralized tympanic membrane. However, there are still patients with extremely lateralized tympanic membranes for whom even the use of the long ceramic cannot lead to reconstruction of the chain.

We observed a patient with an extremely lateralized tympanic membrane, which was in an advanced state such that a finger could easily touch the tympanic membrane through the external ear. We reported a case with implantation of both P- and T-type ceramics, which were securely adhered to each other with medical Aron-Alpha, into the area between the lateralized tympanic membrane and the stapes improved hearing.

FP8-5 Use of Tissue Fillers In The Treatment of Patulous Eustachian Tube

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Objective: To determine the effect of tissue fillers in the treatment of patulous Eustachian tube (PET). PET may cause symptoms like autophony, breath synchronous tinnitus, pressure sensation, and conductive hearing loss and therefore causing quality of life impairment. Sometimes the diagnosis can be challenging. PET can be diagnosed by patient history, physical examination especially observation of the movements of the tympanic membrane during forced nasal inhalation, and tympanometry with reflex-decay.

Material and Method: Six patients with unilateral PET were injected with a hyaluronic acid based tissue filler through transnasal approach. All patients were followed up for at least 6 months. For all injections 0.6-1.0 mL of tissue filler was used. Pre and postoperative subjective sypmtoms as well as endoscopic tympanic membrane video images and tympanometry were recorded.

Results: There were 6 subjects. Four patients had only one injection, one with two injecitons and the other patient had 3 injecitons. The patient who received 3 injections was a combination of post-radiotherapy atrophy and oral contraceptive use. On follow-up 5 patients had complete revovery and 1 patient had partial recovery.

Conclusions: Due to the nature of the hyaluronic acid this procedure is supposed to be temporary. A long lasting cross-linked hyaluronic acid with microsphreres should be used in order to prolong the symptom free interval. One injection per year is considered a successful treatment for this patient group.

FP8-6 Balloon dilatation for eustachian tube dysfunction; a systematic review

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Purpose: Eustachian tube dysfunction (ETD) in adults is a disorder for which there are limited medical and surgical treatments. Recently, Eustachian tube balloon dilation (ETBD) has been proposed as a potential solution for patients with chronic ETD. We systematically review the currently available literature to evaluate the evidence for its use.

Methods: A systematic literature review is performed according to the PRISMA and Cochrane Collaboration guidelines. Pubmed, Medline and EMBASE were searched using the keywords "Eustachian tube", "auditory tube", "dilation", "dilatation" and "balloon". Abstracts were selected for relevance and pooled data analysis and qualitative analysis was performed.

Results: Nine prospective studies, describing 713 ET balloon dilations in 474 patients (18- 86 years) were identified. Follow-up ranged from 1.5 months to 18 months. Ability to Valsalva improved from 20/ 245 ears to 177/245 ears post ETBD, and where data was reported as patients, from 15/210 to 189/210 patients. Type A tympanogram was present pre-operatively in 7/129 ears, and in 86/141 ears post-operatively.

Conclusion: Prospective case series establish the safety and efficacy of ETBD. As a potential solution for chronic ETD, further investigations with RCTs are warranted to establish a higher level evidence of efficacy.

FP8-7 Dilatation of the Eustachian Tube in children and adults

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Background: One of the main causes for chronic otitis media is a chronic obstructive dysfunction of the Eustachian Tube, which can now be treated with the endonasal dilatation with the help of a balloon catheter.

Patients and Methods: Since July 2010 we treated children and adults with a tubal dysfunction with a balloon dilatation of the Eustachian Tube with the help of an endoscope through an endonasal approach. Such a dilatation was done in patients where we found a tubal dysfunction in the tube manometry and impedance audiometry. The treatment was performed by inserting a specially designed balloon catheter into the cartilage part oft he Eustachian Tube and inflating it with 10 bar for 2 minutes.

Results: Until July 2013 we treated 234 patients (age 4-71, 106 female, 128 male) because of a tubal dysfunction. The dilatation was performed in general anesthesia with the utilization of an endoscope and a specially designed applicator. During our post OP check-up 190 (81%) patients reported an improved tubal function while a revision dilatation was necessary in 44 (19%) patients.

Conclusion: The endonasal dilatation of the Eustachian Tube utilizing the balloon catheter set to enlarge the cartilage part is a safe and reliable method in patients with a tubal dysfunction. Our clinical results confirm a functional improvement after a follow up period of one year.

FP9-1 Cone beam Computed Tomography in postoperative imaging of cochlear electrodes

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Introduction: Cone beam Computed Tomography (CBCT) has been introduced into Otolaryngology about 10 years ago. Whereas CT goes faster (acquisition time less than 2 seconds) than CBCT (acquisition time at least 7s) it has a higher average irradiation (about 2 to 3 times more). Furthermore, CBCT can realize a higher resolution and lower metal artefacts (figure 1). Until now, conventional x-ray examination or CT is predominating. CBCT has been come up and is now used in centers available. Aim of the current study is to show possibilities and limits of cochlear electrodes in CBCT.

Methods: All adults and cooperative children (down to age of 5) of the past 7 years underwent a postoperative visualisation of their implant by CBCT at the day of operation or one after. All data set were evaluated regarding the intracochlear position of the electrode and the safety of this evaluation by one observer. For evaluation, reconstructed enrolled electrodes with corresponding cross section through the cochlea were used (figure 2). All cases were discussed between observer and corresponding surgeon, if not the same. Intracochlear position was determined in the basal and medial turn of the cochlea. Three different positions could be evaluated (tympanic scale, vestibular scale, dislocation between the scales) (figure 3). The safety was graded into: 1 = sure, 2 = relative sure, 3 = unsure, 4 = not evaluable.

Results: Overall, 277 patients could be analyzed. The different kinds of implants with the corresponding typical electrodes were as following: Cochlear = 173; MedEl = 90; Advanced Bionics = 14. Regarding operation technique, in former times (before 2008) in general a cochleostomy was performed. Then, by changing the main surgeon, the inseration switched to a round window approach in principle. Two more surgeons started the implanting program later on. Over the whole period, a safe evaluation of the electrode could be seen in about 97% at the basal and only of about 44% at medial turn of the cochlear. Regarding intracochlear position, a dislocation between scales could be seen in 8% (figure 4). These cases were mainly in these one of the first implantations of the new surgeons of the Contour Advance electrode. But the information about the dislocation was essential to improve their operation technique. So an adoption of the technique could be realized and the learning curve shortened. As expected, no dislocation between scales could be seen in medial cochlear turn.

Conclusion: CBCT can visualize cochlear electrode in sufficient way in basal turn of the cochlear way. In our hand, a safe evaluation of the intracochlear electrode in the medial turn of the cochlear is only possible in about 45%. From our point of view, the detailed evaluation of the intracochlear position of the electrode is mandatory to improve the own operation technique and to give a helpful feedback to new surgeons, especially with the goal of hearing preservation implantation.

FP9-2 Straight electrode array of MED-EL cochlear implants has a low rate of scalar dislocation

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Objectives: To compare the fidelity of conebeam x-ray CT (CBCT) in vivo imaging in characterizing cochlear implant insertion with straight electrode arrays of one single Manufacturer (MED-EL GmbH, Innsbruck, Austria) and evaluate the incidence of a scalar dislocation.

Materials and Methods: All patients included in this study had severe, profound or total hearing loss without inner ear malformations. Patients were implanted with a MED-EL (MED-EL GmbH, Innsbruck, Austria) straight electrode array (FLEXsoft, FLEX28, FLEX24, standard) by the same surgeon using a round window insertion in all cases. Complete insertion within the round window had been performed in all cases. For this study, approval by the ethics committee of the university hospital was obtained. All patients underwent CBCT using the same machine, a 5G NewTom (NewTom, Verona, Italy). We defined a dislocation as the displacement of the electrode array from the scala tympani to the scala vestibuli across the basilar membrane or the osseous spiral lamina. This dislocation was evaluated by an expert neuroradiologist in sagittal and axial oblique reconstruction. We analyzed the impedance, the aided hearing threshold and the charge units of maximum comfortable loudness level at 3, 6 and 12 months.

Radiological procedure Post-operative CBCT imaging was performed with a NewTom 5G (NewTom, Verona, Italy). The system used a 200 x 25 mm flat panel detector at 650 mm from the radiation source. The 360° rotation of the X-ray tube took 18s. Tube voltage was 110kV, with a 19 mA charge at the terminals. Total filtrations were 2 mm and pitch 125 m, with field of view corresponding to a 12 x 7.5 cm diameter cylinder. Images were reconstructed in 125 m isometric voxels and obtained in axial, coronal and sagittal planes, using the software provided by NewTom.

Results: Sixty cochlear implants (13 FLEXsoft, 40 FLEX28, 4 FLEX24 and 3 standard) and 54 patients (29-91 years) were analyzed (6 bilateral implantations). Two dislocations out of 60 cochlear implants (3.3%) were noted. These dislocations were located on the apical part of the cochlea. There was no significant difference of impedance between the electrode arrays located in the scala tympani than in the scala vestibuli. Moreover, there was no significant difference in the maximum comfortable loudness level at 3, 6 and 12 months after implantation.

Conclusion: CBCT is a fast and accurate examination in the postoperative imaging of cochlear implants that enables to control the scala position of the electrode array. The straight flexible electrode array has a low rate of an intracochlear dislocation using a round window approach. A dislocation had no negative effect on our series (2 cases out of 60) on the neurophysiological outcomes like the impedance or the hearing thresholds and the comfort levels.

FP9-3 Development of Novel Self-Coiling Cochlear Implant Electrode Array with Use of Shape Memory Polymers

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Cochlear Implants have enabled deaf patients worldwide to gain the ability to hear and communicate with mainstream society. Advances in implant design, speech coding strategies, and surgical techniques have enabled many deaf patients to gain open set speech recognition. However, cochlear implant function can be limited by several factors. Previous studies have indicated that the fibrosis resulting from trauma during insertion may significantly limit functional performance outcomes in patients. We are developing a novel cochlear implant electrode array incorporating shape memory polymers that allow the array to self-coil around the turns of the cochlea atraumatically. With this polymer, we have generated a prototype electrode array that is shaped in a coil that matches the turns of the cochlea. We can place the array into a straight metastable state at room temperature, and then when inserted into the cochlea and warmed to body temperature, it will slowly re-conform to its native coiled shape. We will present our data demonstrating this self-coiling during insertion into a cochlear model. In addition, we will compare the differences in cochlear tissue trauma resulting with our shape memory polymer cochlear implant with that from a standard straight cochlear implant by histological analysis in rats.

FP9-4 Expanding Indications for Cochlear Implants

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Introduction: Cochlear implantation is widely approved for patients with severe to profound hearing loss. Advances in cochlear implantation technology and surgical technique enable the safe and effective use of cochlear implants in patients with single sided deafness or patients with moderate to severe hearing loss. Electric Acoustic Stimulation (EAS) and the hearing preservation of fine structures of the cochlea have expanded the candidacy criteria for both adult and paediatric cochlear implantation.

Objective: To determine the various differences in candidacy criteria worldwide.

Methodology: Data was collected via questionnaire from professionals working in the field of cochlear implants. This paper provides an overview of the current selection criteria in the world's major markets and explores possible future indications for cochlear implantation.

Results: Data from the questionnaire will be presented.

Conclusions: Indication criteria for cochlear implants have evolved differently across the globe and there is no uniform set of candidacy criteria. With cochlear implant technology ever advancing to meet the needs of the younger and the elderly population, the measures, timeframe and guidelines for cochlear implant candidacy remain considerably varied. Existing candidacy guidelines, such as those of the FDA do not represent strict legal requirements, but recommendations. For example, many surgeons implant children much younger than the FDA-recommended 12 months of age and research shows this intervention to be both safe and successful.

Cochlear implantation is expanding in major markets around the world. Advances in technology and surgical technique will continue to transform the criteria for cochlear implant candidacy in the future.

FP9-5 Peripheral Electrical Stimulation for Tinnitus Suppression

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Introduction: Peripheral electrical stimulation with cochlear implants (CI) might provide a solution for a limited number of patients with uni- or bilateral deafness and otherwise untreatable tinnitus. Yet, as our previous studies have shown, there exist no audiological nor anamnestic predictive factors that would allow to correctly identify patients in whom such stimulation would efficiently suppress tinnitus. Without high probability for a successful outcome it is very difficult to propose costly cochlear implantation as a treatment option. Therefore diagnostic round window (RW) stimulation has been studied as means to correctly identify the potentially successful candidates.

Material and Methods: Prospective study comprising 15 patients with severe unilateral tinnitus. In all patients acute electrical round window (RW) stimulation has been performed under local anaesthesia. A ball electrode has been microsurgically placed in contact with the RW membrane and driven by the 3WIN Round Window Stimulator. High and low frequency pulsatile and sinusoidal current stimuli have been used.

Results: Complete inhibition of tinnitus was obtained in 5/15 patients (33%). In another 5/15 patients partial inhibition was observed. In remaining 5/15 patients no effect of electrical stimulation on tinnitus was noted. In 5 patients with complete tinnitus suppression at RW stimulation ipsilateral cochlear implantation was performed. All these patients show a total or quasi-total relief from tinnitus after at least 1 year observation period. Cochlear implantation was also performed in 2 other patients in whom the RW stimulation showed only partial tinnitus suppression In these patients only partial tinnitus suppression after cochlear implantation was obtained.

No statistically significant correlation was obtained between any of the tinnitus parameters and the result of the RW stimulation (yet slight trends existed for: short duration, tonal character and positive acoustic masking).

Conclusions:
1.) In our material 65% of the cochlear implant candidates suffer from uni- or bilateral tinnitus.
2.) Approximately 33% of patients with severe unilateral tinnitus can be successfully treated by electrical stimulation in the ipsilateral ear with a cochlear implant.
3.) Since no strong predictive factors exist that would allow for selection of potentially successful candidates we believe that acute RW stimulation is the best way to identify these patients.

FP9-6 Screening for hereditary deafness gene in cochlear implantation patients and analyzing postoperative effect

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Objective: To determine genetic etiology of cochlear implantation (CI) recipients and investigate the auditory performance and speech intelligibility.

Method: We enrolled 188 patients who received CI in Shandong provincial hospital from January, 2013 to May, 2014. The cohort included 110 boys and 78 girls with implantation ages of between 1 years old and 7 years old. Genomic DNA was extracted from the blood of all patients, and 9 hot mutation points of 4 national common deafness gene: GJB2 35delG 176del16 235delC 299delAT, GJB3 538C>T, SLC26A4 2168 A>G IVS7-2 A>G, mitochondrial 12S rRNA 1494C>T 1555A>G was screened by gene microarray. All surgeries successed, and cochlear smoothly started 1 month later. Test of scores of categories of auditory performance (CAP), speech intelligibility rating (SIR), Meaningful Auditory Integration Scale (MAIS) and auditory threshold was done by professionals at 4 time points: before implantation, 1 month after implantation, 3 months after implantation, 6 months after implantation. Statistical analysis was performed using software SPSS19.0, repeated measurements General Linear Model for evaluating CAP and SIR scores, repeated measurements mixed linear model for MAINS and average auditory threshold.

Result:

1. Mean scores of MAIS (x±s) at before implantation, 1month afte implantation, 3 months afte implantation, 6 months afte implantation were respectively12.09±10.5, 16.05±8.5, 20.73±9.2, 23.49±13.3, p=0.00<0.05, there was significant difference. Group A, C, E means were respectively 22.2±0.8, 23.69±1.07, 17.52±0.6, p =0.001<0.05, there also was significant difference. Group A and C were better than group E (both p<0.05, there was significant difference); Group A was better than group C (p>0.05, there was no significant difference).
2. Mean value of CAP (x±s) at 4 time points as has been noted were 2.17±1.9, 2.67±1.8, 3.62±1.5, 4.56±1.2, time difference Wald $\chi 2$= 111.6, p=0.00<0.05, there was significant difference. Group difference Wald $\chi 2$= 4.8, p=0.09>0.05, There was no significant difference.
3. Mean value of SIR (x±s) at 4 time points as has been noted were 1.27±1.4, 1.47±1.2, 1.89±1.2, 3.72±1.5, time difference Wald$\chi 2$=84.8, p=0.00<0.05, There was significant difference. Group difference Wald$\chi 2$=2.7, p=0.26>0.05, There was no significant difference.
5, Mean auditory threshold at 4 time points as has been noted were 64.40±19.3dB, 46.66±13.18 dB, 37.65±8.7 dB, p =0.00<0.05, there was significant difference. Mean auditory threshold of group A, C, E were 52.0±1.4dB, 48.3±2.0 dB, 50.19±1.3 dB, p =0.32>0.05, there was no significant difference.

Conclusion: The cochear implantation effect has time-dependent side, the time longer, the result better. The present result showed that high scores of MAIS the mutated group got than the control group, which was similar to the international recognized results. There was no difference about value of CAP among groups, maybe the scoring is simple, so it can't distinguish the difference. Moreover, the difference of speech development is hard to observe in short time, matching with our evaluations about SIR. In a word, there was no significant difference among different groups upon short-time clinical follow-up

it confirmed that even if gene mutation screen was positive, rehabilitation was as sure as the negative group. In order to get more information, we should continue long-time follow-up.

FP10-1 Middle Ear Cholesteatoma Treated Via Transcanal Endoscopic Ear Surgery (TEES)

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Introduction: We acquired a full high definition (HD) camera for endoscopes last year. We introduced this HD camera to upgrade our TEES capability. We usually utilize 4 mm diameter endoscopes, 18 cm length (0 or 30 degrees), which are commonly utilized for sinus surgery. When necessary, we utilize a 2.7 mm diameter, 18 cm length endoscope (0 or 30 degrees). All instruments which we utilize during TEES are commonly utilized for conventional microscopic surgery. For bone dissection, we have been utilizing chisels and curettes. Thus, we have been doing all TEES procedures only utilizing conventional instruments. Herein, we will present our strategy for determining surgical indications for TEES and our surgical procedures.

Determination of Surgical Indication of TEES: A first step in TEES is to determine whether TEES is spatially appropriate, or not. The most important factor is the size of the external ear canals (EACs). The EAC size may differ depending on age, race and underlying pathological conditions. Preoperatively, we simply insert a 4 mm diameter endoscope into a patient's EAC. If we are able to observe all surfaces of the tympanic membrane and the EAC without any pain, TEES will be feasible in the patient. If the patients perceive any pain during insertion, it usually means the endoscope is touching the bony auditory canal; to note, we are unable to see the edge of the tip of the endoscope during insertion. Our indications for TEES include chronic otitis media, middle ear cholesteatoma and external auditory canal conditions.

Patients and Results: We have performed 65 TEES so far, including 45 middle ear cholesteatoma cases, 1 external auditory canal cholesteatoma case and 19 non-cholesteatoma cases. Among 45 cholesteatoma cases, 5 cases had cholesteatoma invasion to the antrum and/or to the mastoid air cells: with 4 cases only endoscopes were utilized; and, on 1 case a microscope was also utilized. Also among these 45 cholesteatoma cases, 23 cases underwent type I ossiculoplasty, 8 cases underwent type III ossiculoplasty and 3 cases underwent type IV ossiculoplasty. The other 11 cases underwent type 0 ossiculoplasty because 10 patients were in the middle of planned staged operations, and one patient had preoperative severe sensorineural hearing loss. All patients cured quickly after the surgeries without any complications.

Discussion: The merits of TEES, include less invasive and hence quicker wound healing when compared with postauricular incision surgery. Additionally, we think that having a wide angle view with an endoscope may increase preservation rates of the ossicles and of the posterior bony wall when compared with conventional under-microscopic surgery.

Application range of TEES is controversial. Among our series of cholesteatoma, without microscope usage we performed TEES on 4 cholesteatoma cases whose cholesteatoma extended to the antrum and/or to the mastoid air cells, though, it is time consuming work to dissect bone in order to reach the antrum or the mastoid air cells without any drill systems. We therefore changed the surgical strategy as follows: when we perform a cholesteatoma surgery when there is extension beyond the posterior part of the antrum, we perform a 'combined approach': the cholesteatoma which exists in the antrum or to the mastoid air cells is removed via a cortical mastoidectomy approach, subsequently, the remaining anterior part of the cholesteatoma is removed via TEES. During the "combined approach", it is important to try not to detach the skin from the bony EAC in order to avoid postoperative EAC swelling.

FP10-2 Residual cholesteatoma after endoscope-guided surgery in children

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Objective: Endoscopes can be used to facilitate surgery within tympanomastoid recesses that are hidden from view with the operating microscope. This study investigates whether use of endoscopes to guide dissection of cholesteatoma leads to lower rates of residual cholesteatoma than using the endoscope only for inspection after microscope-guided dissection.

Study Design: Comparative cohort study

Methods: 236 cases of acquired or congenital cholesteatoma having intact canal wall surgery and follow up of more than 12 months were identified in children under 18 years of age from a prospective database. Residual cholesteatoma rates were compared between two groups: (A) endoscopes used only for inspection after microscope surgery, (B) endoscopes used where necessary to guided dissection. Analysis controlled for site of initial cholesteatoma, detection by second stage surgery and length of follow up. The primary outcome measure was selected a priori as the presence of retrotympanic cholesteatoma at second stage surgery as this was the sub-site considered most likely to benefit from cholesteatoma clearance using endoscopic dissection.

Results: Endoscopic dissection was associated with less residual cholesteatoma in the middle ear (risk difference =0.12; p=0.026, Kaplan Meier log rank analysis; number needed to treat =9) but not at other sites. Of 106 cases with retrotympanic cholesteatoma, there were four cases of residual disease without endoscopic dissection, and two cases after endoscopic dissection, representing 12% versus 7% of second-stage surgeries (NS, Fisher exact test). Use of endoscopic dissection allowed more cases to be completed with permeatal surgery. No complications were attributable to endoscope use. Wound complications occurred in 4% of open cases.

Conclusion: Endoscopes enhance surgical access to tympanomastoid recesses. In conjunction with the availability of the operating microscope, angled instruments and KTP laser, endoscope-guided dissection provides a small incremental benefit for prevention of residual cholesteatoma, and facilitates a minimally invasive approach. Together, use of these techniques help to ensure a low rate of residual cholesteatoma in the sinus tympani, even in paediatric cholesteatoma.

FP10-3 Advantages of endoscopic surgery for adhesive otitis media

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In general, surgery for adhesive otitis media is known to be difficult; one reason is that retracted tympanic membrane cannot be directly seen by microscopic view. Moreover, elevation of tympanic membrane adhered with tympanic mucosa is also difficult under microscopy. Recently, endoscopic ear surgery (EES) has been widely used for various middle ear diseases. The main advantage of endoscopy in the ear surgeries is wide view especially at blind lesion behind bony structures. Thus, we have applied EES for adhesive otitis media to obtain certain visualization of tympanic membrane. Using EES, we could easily elevate tympanic membrane from the edge of posterior wall of the outer ear canal, which is difficult to directly see by microscopic view without removal of bony edges. Complete elevation of tympanic membrane from the ossicular chain, especially from stapes is also technically difficult under microscopic surgery. However, endoscopic high power view provides clear and certain elevation procedure, which is helpful for preservation of the ossicular chain. Moreover, clear and high power endoscopic view enables to separate adhered tympanic membrane from tympanic mucosa, which has a key role to avoid re-adhesion. In this presentation, we will show our recent endoscopic surgical procedures, and discuss about advantages and disadvantages of EES applied for adhesive otitis media.

FP10-4 Value of Endoscopic Ear Surgery Beyond Cholesteatoma

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Subject area: New technique & technologies.

Objective: The new trend is to use endoscope and microscope interchangeably throughout the course of surgery. Because of the poor access offered by the straight vision of the microscope, the concomitant use of endoscope throughout the course of surgery provided excellent control over the pathology particularly in the well-known hidden recesses viz. sinus tympani, facial recess and anterior epitympanic recess. Because the use of endoscope in cholesteatoma surgery is now well established, the objective of this study is to evaluate the value of endoscope in pathologies other than cholesteatoma.

Methods: The use of different angles endoscope allowed the surgeon to consider removing pathology using endoscope-assisted surgery before resorting to extra drilling to widen exposure. Because endoscopic ear surgery (EES) has its own peculiarities, the use of instruments specially designed for working under angled vision is fundamental. Major invention includes curved suctions and angled shaft-instruments together with incorporating suction into the shaft of the instruments, which overcome the main problem of bleeding. New instrumentations specifically adapted for EES are now available. Also, new technologies have stimulated the creation of powered endoscopic equipment particularly designed to fulfil the exclusive requirements of EES.

Results: Our results confirmed that perfect control over the pathology, especially in hidden recesses, is possible with the help of endoscope. Advancement in instrumentation and technology will in turn contribute to the progress of EES therefore pushing the limits of endoscope and widening its indications.

The author presents different recent indications of endoscope in the field of otology and skull base surgery. EES is increasingly used for removal of various middle ear (ME) tumors: glomus tympanicum (2cases), ME adenoma (1case), foreign body behind intact drum (1case), otosclerosis surgery (22cases) and cochlear implant surgery (20cases). Also, during CPA surgeries such as micro-vascular decompression and acoustic neuroma to achieve complete removal from the fundus of IAC (35cases).

Conclusion: Combining the attributes of endoscope together with the microscope is the most efficacious approach and will widen the indications of endoscope in the future. Advancements in EES improved maneuverability and offered better visualization over the pathology. Finally, EES is technically feasible for the majority of surgeons in terms of both levels of required surgical skill and accessibility to new equipment. It should also be included in all residency training programs & temporal bone courses.

FP10-5 Withdrawal

FP11-1 Updated urgent referral pathway for cochlear implant assessment following bacterial meningitis: The St. Thomas' Protocol

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Aims: To develop an updated algorithm for the optimal audiological and radiological investigation of children with suspected profound sensorineural hearing loss (SNHL) secondary to bacterial meningitis. Secondarily, to review audiological outcomes of these children following cochlear implantation (CI).

Methods: A retrospective case series (1999-2015) at St Thomas' Hearing Implant Centre, London, UK. The pathway of children receiving CI subsequent to bacterial meningitis was analysed, identifying the adequacy of investigations leading to referral and implantation. Post-operative audiological outcomes were examined.

Results: 17 children received 25 cochlear implantations for profound SNHL following bacterial meningitis. Mean age at presentation was 10.5 months (median 8.8 months, range 3 days-41 months). Referrals were received from 12 regional hospitals. Hearing loss was usually detected through early use of auditory brainstem responses (ABR) and otoacoustic emissions or elective audiological assessment after discharge from hospital. In some earlier cases, diagnosis of hearing loss was delayed until development of speech or behavioural problems. The mean time from presentation of meningitis to referral and to first implant assessment was 4.4 and 5.4 months (median 2.1 and 2.9 months, range 0.914.4 and 1.515.8 months respectively). Nine patients had ABR at their local hospital, all of which were repeated in our centre. Bilateral profound SNHL was confirmed in all except 2 patients who had profound loss in one ear and moderate loss in the other.

Imaging: Pre-operative MRI was available in 14 of 17 patients (82%) for review by a single consultant neuro-radiologist. Six patients had repeat MRI as the initial imaging was inadequate for CI assessment. Ten patients had pre-operative CT. Adequate CT and MRI scans were retrospectively graded for signs of labyrinthine ossification or fibrosis. 16 of 34 ears showed evidence of cochlear ossification.

Implantation: Mean age at first implantation was 20.4 months (range 345 months). The mean time from presentation to first implantation was 9.5 months (median 5.8, range 2-30 months). There were 10 unilateral, 4 bilateral simultaneous and 3 bilateral sequential implants. In two of the unilaterally implanted children, the other ear was deemed unimplantable due to excess ossification of the labyrinth. Intra-operative details were available for 22 implantations. Normal anatomy was encountered in nine ears (41%), round window fibrosis in one (5%), round window ossification in four (18%), and ossification within the basal turn necessitating additional drilling in eight (36%). Electrodes were inserted via the round window (12 ears) or conventional cochleostomy (10 ears). Full insertion of a single electrode was achieved in 15 ears (68%) and partial insertion in five (23%). A split array electrode was required in two cases (9%).

Outcomes: Mean follow up is 5.9 years (range 0.6-14.9 years). 15 children (88%) are consistent implant users. Serial assessment includes Category of Auditory Performance (CAP), Speech Intelligibility Rating (SIR) and Meaningful Auditory Integration Scale (MAIS). CAP increased from 0.41 pre-operatively to 5.3 post-implantation, SIR from 1.1 to 2.75 and MAIS from 17% to 90%. Six children communicate verbally, seven with Sign Supported English and two use British Sign Language. One child, implanted aged 3 months, is pre-verbal.

Discussion: As labyrinthitis ossificans may develop early, urgent identification and assessment of SNHL following bacterial meningitis is of utmost importance to reduce the likelihood of ossification complicating or preventing implantation.

Conclusion: There are inefficiencies in the current pathway, including delayed, repeated or inadequate audiological and radiological investigations. Based on our experience and currently available guidelines, we have developed an updated algorithm to provide optimal access for urgent referral and consideration of cochlear implantation.

FP11-2 Second-look Cochlear Implantation Surgery in Abuja, Nigeria

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The cochlear implants program was established in 2010 at National Hospital Abuja and to date 10 ears have been implanted, including one adult ear, and 9 pediatric ears. Implantees were largely pre lingually deafened (9/10 ears). All implanted ears have been followed up for period ranging from 12 months to 48 months. One case of post-traumatic implants failure was successfully re-implanted. There were 3 cases of secondary surgical wound infection after initial good surgical wound healing, and all were pediatric cases, and 2 of these 3 cases were believed to be secondary to head trauma. 3 ears were explanted and and 2 ears successfully re-implanted. This paper previews the challenges facing pediatric cochlear implantation in Abuja, stressing the role head trauma might be playing in second-look cochlear implants surgery in our environment.

FP11-3 Cochlear Implantation in Fractured Temporal Bone

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Background: In 75% of motor vehicle accidents, head injury is common. Approximately 4% of patients treated for head trauma have skull fractures, and 1422% of patients with skull fractures have temporal bone fractures. Complications of temporal bone fractures are often associated with injuries involving other areas of the craniomaxillofacial skeleton, include conductive and sensorineural hearing loss (SNHL), facial nerve injury, dural sinus thrombosis, carotid dissection, and cerebrospinal fluid leak. Subsequent labyrinthitis ossificans resulted from transverse fractures which directly destruct organ of Corti, striavascularis and finally lead to hemorrhage into the inner ear. The opportunities to provide optimal aural rehabilitation for these patients have expanded due to modern improvements in cochlear implant (CI) techniques.

Method: Here we present our experiences in CI two patients with transverse temporal bone fractures. CI surgery was done on a 32-year-old man, and a 39-year-old woman with a history of HL following truma . The audiological examination, including pure tone audiometry (PTA), auditory brain stem response, and distortion-productotoacoustic emission (DPOAE) revealed profound bilateral SNHL for both. A CI device was implanted and all of the electrode pairs were successfully inserted.

Results and Conclusion: Following mapping and programming, the patient was immediately able to understand speech and talk on the telephone. The details of our study will be present at congress .

FP11-4 The middle turn cochleostomy

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Objective/Background: Bacterial meningitis accounts for a significant number of cases of profound/moderate sensorineural hearing loss. Meningitis is sometimes associated with ossification of the bony labyrinth which makes cochlear implant electrode insertion difficult using the standard surgical approach. One technique to overcome bony obstruction of the labyrinth is to use a middle turn cochleostomy either to provide a retrograde insertion or, more commonly, to insert the upper electrode when a split electrode array is used. The middle turned cochleostomy was investigated using cadaveric temporal bones.

Methods: 10 cadaveric temporal bones were dissected using the facial recess approach. A standard middle turn cochleostomy was performed 2 mm anterior to the oval window and just inferior to the cochleariform process. Electrodes were inserted and microdissections performed. The location of the cochleostomy in the scalar compartments was identified for each bone and the path of the electrode within the cochlea identified.

Results: 8 of the 10 cochleostomy's were located approximately 360° on the cochlear spiral, near the transition between the basil and middle turned. One cochleostomy entered into the apex and one into the distal basil turn. The cochleostomy entered scala vestibuli in 6 bones and scala media in 4. The number of contacts placed within the cochlear lumen ranged from 4 to 9. There was evidence of insertional trauma to the lateral wall of the cochlear duct, basilar membrane, and Reissner's membrane but no evidence of fractures to the osseous spiral lamina or modiolus.

Conclusions: Electrodes inserted into the middle turn are likely to enter scala vestibuli and had access to the middle and apical cochlear turns. Middle turn cochleostomy is a viable alternative basal turn but is unlikely to result in retention of residual hearing

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FP11-5 Air bone gap component before and after cochlear implantation

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Background: Cochlear implantation (CI) is associated with deterioration in hearing. Despite the fact that the damage is presumed to be of sensory origin, residual hearing is usually assessed by air-conduction thresholds alone. A series of clinical and basic-science studies conducted in our cochlear implant program, sought to determine the presence of ABG in CI candidates and to assess the effect of surgery on the conductive component .

Methods: This case series included 50 candidates for cochlear implantation in 18 of them post operative data will be presented as well. Inclusion criteria were, the presence of an air-bone gap of 10 dB over three consecutive frequencies and measurable masked and reliable bone-conduction thresholds of operated and non-operated ears. Inner ear anomalies were assessed by imaging.

Results: Imaging revealed an abnormal inner-ear structure in 46% of cases, mostly a large vestibular aqueduct, alone or combined with other cochlear or vestibular malformations. ABG was evident over high and low frequencies and was significantly larger at low frequencies and in ears with structural anomalies. A high rate of CSF leak was observed in patients with an ABG and structural anomalies imaging as well as in those with an ABG and normal imaging findings. Air-conduction thresholds in the treated ears significantly ($p<0.005$) deteriorated after surgery, by a mean of 10-21 dB. Bone-conduction levels deteriorated nonsignificantly by 0.8-7.5 dB.

Conclusion: In cochlear implant candidates, the presence of a third window could cause an ABG. The post operative findings indicate that the increase in air-conduction threshold after cochlear implantation accounts for most of the postoperative increase in the air-bone gap. Changes in the mechanics of the inner ear may play an important role.

FP12-1 Conservatively managed sporadic vestibular schwannoma: Audiovestibular factors influencing quality of life

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Introduction: The objective was to evaluate the quality of life (QoL) of patients with conservatively managed Vestibular Schwanommas (VS) and describe their sociodemographic characteristics.

Methods: The questionnaires were answered by patients via a newly developed website using a unique token. Those who did not accept or understood answering via the internet had a second possibility of a paper version, which were send to them by post. They were asked to return their completed questionnaires in a prepaid envelope.

Results: 87.7% response rate (994/1133). The questionnaires included Short Form 12 Health Survey Version 2 (SF-12v2), the Hearing Handicap Inventory (HHI), Tinnitus Handicap Inventory (THI), Dizziness Handicap Inventory (DHI), The Penn Acoustic Neuroma Quality-of-Life Scale (PANQOL scale), and questions on sociodemographic characteristics. 898 patients reported hearing loss (95.8%). Six hundred eighty four reported tinnitus (72.9%) and 463 reported imbalance (49.4%). Regression analysis showed that DHI score and age were strong predictors of physical component summary. DHI and THI scores were significant predictors of mental component summary.

Conclusion: Dizziness is the most significant audiovestibular predictor of QoL in patients with VS. Tinnitus also has an impact on mental QoL. Hearing loss does also influence QoL significantly. Other factors may have an important role to play in determining QoL.

FP12-2 Management of meningiomas of the posterior petrous face

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Objective: The objective of the present study was to report our surgical strategy in the management of 81 patients with posterior petrous face meningiomas.

Study Design: Retrospective study.

Setting: This study was conducted at a quaternary private otology and cranial base center.

Patients: Of 139 patients with posterior fossa meningioma, 81 occurred on the posterior petrous face of the temporal bone and were the object of this study.

Interventions: Thirty-one patients were managed by the enlarged translabyrinthine approach. The enlarged translabyrinthine approach with transapical extension Type II was performed in 29 patients. The combined retrosigmoid-retrolabyrinthine approach was chosen in 8 cases. The modified transcochlear approach Type A with permanent posterior transposition of the facial nerve (FN) was performed in 6 patients. Two patients underwent a retrolabyrinthine subtemporal transapical approach. One patient underwent a transpetrous middle cranial fossa approach. Four patients with intracanalicular meningiomas were operated through the enlarged middle cranial fossa approach.

Results: Total removal of the tumor (Simpson Grade I and II) was achieved in most patients (92.5%). The facial nerve was anatomically preserved in 79 of the 81 (97.5%) patients. Five patients had less than 1year follow-up, and 2 patients were lost to follow-up, these were excluded in evaluation of the final FN outcome. At 1-year follow-up, 46 patients (63%) had Facial nerve (House Brackmann) Grade I to II, 19 (26%) had Grade III, 4 (5.4%) had Grade IV, 1 (1.3%) had Grade V, and 3 (4.1%) had Grade VI. Hearing-preserving surgery was attempted in 15 patients (18.5%) with preoperative serviceable hearing. Of these 15 patients, 11 had their hearing preserved at the same preoperative level, and 4 experienced postoperative deafness. Postoperatively, a new deficit of 1 or more of the lower cranial nerves was recorded in 3 patients. One patient experienced subcutaneous cerebrospinal fluid collection that required surgical management.

Conclusion: Total tumor removal (Simpson Grade I-II) remains our treatment of choice and takes priority over hearing preservation. Subtotal resection is indicated for older and debilitated patients with giant lesions to relieve the tumor compression on the cerebellum and brainstem. Subtotal removal is also preferred in the face of the absence of a plane of cleavage between the tumor and the brainstem, in the presence of encasement of vital neurovascular structures, in elderly patients with tumors adherent to preoperatively normal facial or lower cranial nerves.

FP12-3 SURGERY OF JUGULAR FORAMEN TUMORS

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Objective: To report the clinical manifestations, imaging characteristics, surgical approaches, managements, and outcome of jugular foramen tumors.

Methods: From 1985 to 2013, 63 patients with jugular foramen tumor (43 cases of jugular paragangliomas, 20 cases of tumor with particular pathological types) were enrolled in this study. The infratemporal type A, combined translabrinthin and/or transchecholea approaches were selected for the treatment of jugular paragangliomas; while, the modalities of infratemporal type A, enlarged mastoidectomy, or mastoid-neck approach were employed for the remained cases.

Results: Foutrty-three patients in this report were categorized into beyond C types based on FISCH classification in which all had invaded to posterior fossa. In the 43 cases, the major initial clinical symptoms were tinnitus, hearing loss, and facial palsy; while, in the 20 specific cases, the main symptoms did not possess any unique trait for the diagnosis and 5 of which were found via CT or MRI examination by chance. Facial nerve management included permanent anterior transposition (30 cases), facial nerve bridge technology (18 cases), interposition graft (8 cases), VII-XI jump graft (2 cases), and VII-XII anastomosis (1 case), unreconstruction (4 cases).

Conclusions: The preoperative estimation of tumor in nature was of great importance in the determination of proper surgical approaches and the infratemporal type A could fully meet the requirement for resection of tumors in jugular foramen. The CT or MRI characteristics of tumors with particular pathological types were different from those of jugular paragangliomas. The preoperative management, surgical skills, and experience played a pivotal role in complete tumor resection.

FP12-4 REVISION SURGERY OF THE LOWER CRANIAL NERVES ROOT

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Objective: To report the revision surgery principles of recurrent diseases of the lower cranial nerves root after primary surgery.

Methods: Between 2000 to 2013, fourteen patients with recurrent diseases of the lower cranial nerves in Shandong provincial hospital were recruited in this study, all of whom were subjected to revision surgery.

Results: Of the five patients with recurrent trigeminal neuralgia primarily underwent microvascular decompression (MVD). In the remaining 3 patients, the II and III branches partial sensory rhizotomy was firstly performed and, subsequently, the pain reoccurred in the I branch distribution area, then the remnant sensor fibro was resected in the reoperation by which the sufferings were controlled completely. In five patients with hemifacial spasm underwent re-exploration, there appeared obvious fibrosis, conglutination, and the formation of new vessels around the facial nerve, with which the result of reoperation for this disorder was unsatisfied. In four glossopharyngeal neuralgia patients, regeneration of the glossopharyngeal nerve were found in two patients, adherence between the glossopharyngeal nerve and the vagus nerve was found in one patient.

Conclusions: Revision surgery is much riskier and, technically, much more difficult than fist-time operation. For recurrent trigeminal neuralgia, partial sensory rhizotomy is recommended because of the severe adherence. The result of reoperation for hemifacial spasm was poor. Not only the glossopharyngeal nerve but also the consecutive fibers of vagus nerve should be cut off and, moreover, part of the nerve tissue should be removed or coagulated in reoperation of glossopharyngeal neuralgia in case of the recurrence.

FP12-5 Endoscopy-Assisted Microvascular Decompression for Trigeminal Neuralgia: The Prognostic Impact of the interposing material

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Objective: Trigeminal neuralgia is a disorder associated with severe episodes of lancinating pain in the distribution of trigeminal nerve. The major- ity of these patients eventually requires surgical management to achieve remission of symptoms. Microvascular decompression addresses the root cause of the disease and is more effective than ablative procedures at preventing recurrence of symptoms. However, several long-term follow-up studies have disclosed that the efficacy of the procedure gradually decreases over time and have related recurrence to some clinical variables. Our objective is to study the impact of the type of interposing materials used for decompression on long-term success rate.

Materials and Methods: We conducted a retrospective chart review of 65 patients with trigeminal neuralgia operated between 2007 and 2010 in an otology/base of skull tertiary referral center. Endoscopy-assisted microvascular decompression was used for all patients. Three types of inter- posing material were used: Teflon in 30 patients (Group I); muscle in 19 patients (Group II); and a combination of both in 16 patients (Group III). The minimum follow-up period was 3 years.

Results: In total, 17 (26.1%) of the 65 patients had recurrence of their symptoms. Average time for recurrence was 7.82+/-4.31 months; 95% of recurrences appeared within the first year. Recurrence rate was lower in Group II (5.2%) as compared to Group I (40%) and Group III (23%), and the difference was statistically significant (p0.05).

Conclusion: Microvascular decompression with interposition of a muscle pad carries a lower recurrence rate as compared to interposition of Teflon alone or in combination with muscle.

Key Words: Trigeminal neuralgia, retrosigmoid approach, microvascular decompression, endoscopy

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FP12-6 Management of cavernous hemangioma of the internal auditory canal

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Object: Cavernous hemangioma of the internal auditory canal (IAC) is an extremely rare tumor that only fifty cases had been reported in the literature. The aim of this study was to analyze the symptomatology, radiological features, surgical outcomes, and to discuss the diagnostic criteria and treatment strategy of the cavernous hemangioma of the IAC.

Methods: Six patients with cavernous hemangioma of the IAC were subjected in this study. All the patients had presented with sensorineural hearing loss and tinnitus, and two of them suffered from vertigo. Five patients presented facial symptoms with hemispasm or palsy; three of them with progressive facial weakness; one with hemispasm; and one with a history of recovery from sudden facial paresis. Computed tomography (CT) and magnetic resonance imaging (MRI) were performed in all the patients to make differentiation from intrameatal vestibular schwannomas (VSs) and facial nerve schwannomas. Surgical tumor removals were performed in five patients and wait and scan policy in one patient without facial problems. Follow-up period was performed for at least one year in all the patients.

Rusults: All patients had got a diagnosis of cavernous hemangioma of the IAC before surgery and confirmed pathologically in five cases who received the surgical tumor removal. Translabyrinthine approach was performed in four patients and middle fossa approach in one with useful hearing. Tumors were adherent to VII and/or VIII cranial nerve and difficult to dissect from nerve sheaths during surgery. No useful hearing was preserved in all 5 patients. Facial nerve cannot be separated from tumor in three cases and end-to-end anastomosis was performed in the same stage. Intact facial nerve preservation was achieved in 2 patients. Postoperatively, facial nerve paresis was noted in all five cases; improvement was subsequently observed in all of them (HB Grade II in one patient, Grade III in two patients and Grade IV in two patients), including the three patients who received facial nerve reconstruction. During follow up, MRI scanning showed no evidence of tumor regrowth.

Conclusion: Cavernous hemangiomas of the IAC can be diagnosed preoperatively by typical symptoms and radioimagings. The management of these tumor should be more aggressive because early intervention may improve the chance of preserving the functional integrity of the facial nerve and provide better results after nerve reconstruction.

FP13-1 Flexible Nasoendoscopy decontamination - a comparison between Rapicide Solution and Tristel wipes

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Background: The regular use of nasendoscopes in Otolaryngology departments are well established. The current gold standard for disinfection of nasoendoscopes in our clinic setting is a 3-step process involving Rapicide, a peracetic acid based as the disinfectant solution. Disinfection with Rapicide, however, requires a twenty-minute soaking process. It can also cause irreversible eye damage and skin irritation after exposure.

A recent study in the UK validated the efficacy of Tristel wipes in 2012, a chlorine dioxide based disinfectant, in the cleaning of flexible nasoendoscopes in preventing bacterial transmission in a clinic setting. In 2007, the Health and safety Executive of the NHS illustrated that Tristel wipes is the safer disinfectant when compared to Rapicide.

Aims: Our study aimed to validate the efficacy of Tristel wipes as a comparable alternative to peracetic acid based disinfectants.

Methods: We recruited a hundred volunteers from our clinic. They were then be subjected to a standardized flexible nasoendoscopic examination by the same clinician. Two separate endoscopes were used for each examination.

A swab was sent from the tip of each nasoendoscope once the procedure was completed. These swabs were used as the control. The two nasoendoscopes were the subjected to a similar 3-step decontamination process. The 1st step was done with a multizyme solution. For the 2nd step, the one scope was placed in Rapicide for 20 minutes and the other was cleaned with the Tristel wipe according to the manufacturer's guidance. Both were then washed with distilled water in the final step. After which a second swab was taken from the tip of each nasoendoscopes and sent for cultures.

Costs: The costs of the study were provided by grant from the institution. The authors have no financial interest to disclose.

Results: We recruited a hundred volunteers with a mean age of 40.9 years. There were 62 males and 38 females. They included a varied number of diagnoses from Allergic Rhinitis, Obstructive Sleep Apnoea to Sinusitis.

Out of the 100 swabs from the tips of the nasoendoscopes prior to decontamination, we grew 82 positive cultures prior to cleaning with Rapicide solution and 76 positive cultures prior to cleaning with Tristel wipes. The difference between either was not considered to be statistically significant p=0.298.

With regard to the post decontamination results, there were 4 positive culture swabs for those disinfected with Tristel wipes and 1 positive culture swab for the Rapicide cohort. Theses outcomes were assessed using the McNemar test which showed a p-value of 0.375 suggesting there was no statistical difference between the outcomes.

We attributed the positive cultures post decontamination likely due to improper handling of the nasoendoscopes post decontamination.

The statistician from Tan Tock Seng Hospital, Singapore, analyzed all results.

Discussion: We do note that there are a few limitations with our study. Firstly, given our sample size is a hundred patients, it is still relatively small to detect a significant difference between the two disinfectants. However, to our knowledge, this is the only study that compares Tristel wipes and a peracetic acid based disinfectant in a clinical setting. Although the study numbers may be small, the results are encouraging in that there is no significance between the two respective cohorts. Also, we were unable to test the scopes for mycobacterium, viral or parasitic contamination due to the high costs of culturing them.

Conclusion: This study validates the efficacy of Tristel wipes as a comparable alternative to peracetic acid based disinfectants for disinfection of flexible nasoendoscopes. Furthermore, we can use Tristel wipes to disinfect our portable scopes when flexible nasoendoscopes are used in the inpatient setting.

FP13-2 The treatment outcomes of primary squamous cell carcinoma of the external auditory canal

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Introduction: The occurrence of squamous cell carcinoma of the external auditory canal (EAC) is rare, with a reported prevalence of 1 per 1 million persons. The treatment is still controversial, because of the rare incidence which leads to limited experience. In our institute, we decided on courses of treatment based on the Pittsburgh staging system. Our basic treatment course is surgery when possible, and the operative procedure was determined by T stage diagnosed from preoperative images. On this occasion, we basically predetermine the tumor resection or the lateral temporal bone resection for cT1, the lateral temporal bone resection for cT2, the subtotal temporal bone resection for cT3 and cT4 patients. As necessary, we prescribe additional treatment before or after surgery. On the other hand, the chemoradiotherapy was performed for inoperable cases.

Objectives: In this study, we examined the treatment outcomes of squamous cell carcinomas of the EAC in our all cases.

Materials and Methods: A retrospective review of medical records from 2004 to 2014 identified 17 patients (9 males, 8 females, mean age 68 years, range 55-82 years) with histologically confirmed squamous cell carcinoma of the EAC. The mean observation period was 51.8 months (6-94 months). Treatment outcomes according to stages were investigated.

Results: There was one pTis patient, three pT1 patients, six pT2 patients, five pT3 patients, and two pT4 patients. Five patients were treated with only surgery, two patients with surgery and chemotherapy, three patients with surgery and radiotherapy, six patients with surgery and chemoradiotherapy, and one patient with chemoradiotherapy. Patients of stage I showed a 100% of 3-year survival rate, 100% in stage II, 80% in stage III, and 65% in stage IV. Their prognoses were either disease-free or death from other causes. All of the patients with poor prognosis started the treatment after 70 years of age. There is a significant difference in age between the good prognosis group and the poor prognosis group (p=0.02).

Conclusions: We think that the appropriate treatment would be performed because we have no recurrent patients in our outcomes. The patients with poor prognosis were older, therefore they might have less capacity with a combined therapy. We have experienced only a few patients, so further studies would be required to evaluate the clinical benefit of the treatment.

FP13-3 Early Intervention of Infected Preauricular Sinus

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Objective: Preauricular sinus is a benign congenital malformation that is usually asymptomatic. However, surgical excision is recommended in cases of infection or troublesome discharge. In general, surgical treatment is performed after the control of infection and improvement of skin lesion delaying the time of surgery especially in cases of skin necrosis or granulation tissue formation. Thus, we evaluated the clinical manifestations, time for surgical intervention, and surgical techniques and analyzed the outcome of early intervention of infected preauricular sinus.

Materials and Methods: We enrolled 144 patients (190 ears) who were diagnosed as preauricular sinus and underwent preauricular sinus excisions between January 2012 and June 2014 in Ajou University Hospital (Suwon, Korea). A retrospective review of otology database (patients' symptoms, time of surgery, surgical techniques, post-operative complications, and prognosis) was performed. Surgical excision was followed regardless of their infection status. In cases of deep fistula tracts or large cysts, a parallel incision was added along with the classic elliptical skin incision.

Results: Among 144 patients (62 males, 82 females), 53 patients were right sided, 45 patients were left-sided, and 46 patients were both sided. Age ranged from 5 months to 63 years with a mean age of 23 years. The patients were classified into 3 groups; asymptomatic, infection without abscess, and infection with abscess group. We defined 'early intervention' as surgical excision performed within 3 weeks from the first visit to our hospital. This early intervention was done in 39 patients regardless of their infection status. During surgery, a parallel incision was added if necessary and skin graft was not performed in any of the cases. Post-operatively, 3 cases (2.1%) showed complications; 1 case of keloid scar, 1 case of adhesion scar, and 1 case of granulation tissue formation. No other complications or recurrence were detected in our study.

Conclusion: Preauricular sinus requires surgical excision in symptomatic cases. According to our results, there is no reason to delay the surgical treatment after infection control. Instead, the key point of complete removal of the sinus and prevention of recurrence is an effective surgical technique. An addition of parallel skin incision is a simple and helpful method to fulfill these goals resulting in better outcomes and prognosis.

FP13-4 Mastoid subperiosteal abscess in children are there any predisposing factors?

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Objective: The incidence of the subperiosteal abscess has increased in the last few years. The aim of this paper is to assess the causes of this growth.

Patients and Methods: Is a retrospective study based on the medical records of 31 children who were diagnosed and treated in a tertiary center for subperiosteal abscess.

Results: The possible predisposing factors found were: recurrent and prolonged acute otitis media, antibiotic-multiresistant bacteria, sinusitis, small age, the presence of enlarged adenoids, poor socio-economic conditions. The abscess resolved in all patients and hearing was restored in all cases. Recurrence occurred in no patient.

Conclusion: Subperiosteal abscess in children has a good vital and functional prognostic. Removal of the possible predisposing factors may be considered together with the standard treatment.

Key words: SUBPERIOSTEAL MASTOID ABSCESS, CHILDREN

FP13-5 MANAGEMENT OF ACUTE MASTOIDITIS 14 YEARS OF KOSOVO EXPERIENCE

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Objective: Acute mastoiditis (AM) represents an important health problem all around the world. The goal of this study is to discuss differences between children and adults regarding to the incidence, clinical signs, diagnostics and especially on the therapy of AM.

Methods: In a retrospective study, all clinical records of patients with AM admitted to the ENT Clinic, University Clinical Center of Prishtina in period from 01.01.2000 to 31.12.2014 were reviewed .

Results: From a total of 160 patients that suffered from AM, 88 (55%) were younger than 18 years, while other 72 (45%) were older than 18 years. Ninety-three (58%) were female, 67 (42%) were male. Median age was 24 years, youngest patients was 1 year old, the oldest 85 year. In the children's group, 63% had received antibiotics prior to admission, while in adult's group 66%. Pain in retroauricular palpation and otoscopy pathological findings were present in all patients. Retroauricular swelling was present in 31% of patients, while auricular displacement was present in 51.4% of children and 8.6% of adults. From laboratory findings, in 87% of patients erythrocyte sedimentation rate (ESR) and C-reactive protein were elevated, while in 70% the white blood count (WBC) was also elevated. In 85.7% of patients a mastoid tip x-ray showed characteristic radiological changes, while CT scan was performed only in 45% of cases. The therapy applied for this series of patients was combined surgical and medical (intravenous antibiotics) in 122 patients (76.3%), than medical therapy only received 38 patients (24.7%). Out of 122 patients that underwent surgical treatment, simple mastoidectomy was performed most often, 44 patients (27.5% of all patients), and aeration tube insertion in 34 patients (21%). From total, 25 patients (15.6%) experienced an another intracranial or extracranial complication, except AM. None of these patients in this series died because of AM.

Conclusion: Mean duration of symptoms prior to admission in the clinic was longer in adults than in children; use of antibiotics prior to admission was frequent in adults than in children; retroauricular swelling and displacement was frequent in children than in adults, while mastoidectomy was frequently performed in children than in adults. Associate complications were frequent in children than adults. For other parameters there were no difference between two age groups.

FP13-6 Biofilms in Otitis

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Objectives: To describe the existence of biofilms in otitis
To analyse the role of biofilms in the pathogenesis of otitis media

Methods: Study Design : review of the literature
Study Conducted from 1995 to 2015
Disease/Condition Studied : biofilms in otitis media
Subjects Studied: demonstration using electronic microscopy, confocal laser scanning microscopy, FISH, biofilm physiopathology related to otitis media.

Setting: The literature review conducted on the databases Pubmed and Embase reached back 20 years (1995-2015) and was updated until February 2015.

Intervention(s): Articles of which methodology was reviewed and scored using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system.

Results: Biofilms are multicellular network of bacteria encased in a matrix and are noticeably resistant to both antibiotics and host defenses. Substantial effort in understanding the biologic nature of biofilms has resulted in evidence supporting their importance in otitis media and adenoids. Transfer of evidence about the predominant role played by in biofilms is important, both from the perspective how pathogens develop viable communities in the middle ear as well as how this structure impedes successful antibiotic therapy.

Conclusion: Biofilms definitively exist and play a role in otitis media. Understanding the nature of the biofilm component in the pathogenesis of chronic otitis media will likely have a meaningful influence on the development of novel strategies of treatment.

FP14-1 Characterisitics and Maskability of Self-reported Tinnitus in Adult Nigerians

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Background: Tinnitus has always been a perplexing symptom to sufferers as well as otolaryngologists saddled with managing such patients. With several theories of etiopathogenesis, and not a single one to explain all types of tinnitus, tremendous research efforts is being expended on causes of tinnitus. Yet the most relevant issue appears to be what property of tinnitus the patient possesses, and how can this be ameliorated, an issue that has commanded few research interests to date

Setting: Tertiary care otolaryngology clinics in Abuja.

Objective: To determine characteristics and maskability of tinnitus seen in adult Nigerians who self-report tinnitus as the main presenting symptom

Methodology: A prospective study involving 100 adult Nigerians seen at 2 specialist Otorhinolaryngology clinics in Abuja - National Hospital Abuja and CSR Otologics Specialist Clinics, Abuja between January 2008 - June 2014. Clinical and audiological history and findings were captured in the study protocol. Participants were then assessed to determine Tinnitus pitch match, loudness match, mask ability and minimum masking level as well as residual inhibition.

Result: 100 participants aged 24 - 58 years were assessed. Male to female ratio was 1:4. Tinnitus was sudden in onset in 24%, and gradual in 76%, involved the right ear in 32%, left ear in 38% and both ears in 30%. 48% of participants have other symptoms apart from tinnitus, and 32% were on other medications known to induce tinnitus. 16% of participants gave history of exposure to significant loud sound. Only 16% of participants have significant otoscopic findings.

Tinnitus abated with carotid pressure in 64%, with extra ocular muscle movement in 16%, with teeth clenching in 32%, with neck movement in 28%, and with movement of arms or legs in 8%. The mean difference in hearing threshold of ear with and without tinnitus is 12.09 dB HL. Tinnitus pitch match was 4KHz in 44%, 3KHz in 24%, and 2KHz in 32%, while mean tinnitus loudness match was 41.24 dB SL. Tinnitus was maskable in 88% of subjects, with a residual inhibition of 2 to 76 seconds.

Conclusion: Majority of adult Nigerians that self-report tinnitus have maskable tinnitus, and this should be considered when considering hearing augmentation for those with associated impaired hearing.

FP14-2 Objectification and differential diagnosis of pulsatile tinnitus by spectro-temporal analysis

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Background: Although the symptoms are frequently classified as "objective tinnitus", in most cases vascular pulsatile tinnitus (VPT) is not equal to objective tinnitus because it is typically not easy to objectively document VPT. Thus, the present study developed a novel transcanal sound recording and spectro-temporal analysis method for the objective and differential diagnosis of VPT.

Methods: This method was tested using six VPT subjects and six normal controls based on recordings obtained from the ipsilateral external auditory canal (EAC) using an insert microphone with the subject's head in four different positions: 1) neutral head position, 2) head rotated to the tinnitus side, 3) head rotated to the non-tinnitus side, and 4) neutral position with manual compression of the ipsilateral carotid artery. The control group underwent the same measurements. The recorded signals were first analyzed in the time domain, and short-time Fourier transform (STFT) was performed to analyze the data in the time-frequency domain.

Results: On temporal analysis, the ear canal signals recorded from the VPT subjects exhibited large peak amplitudes and periodic structures, whereas the signals recorded from the control subjects had smaller peak amplitudes and weaker periodicity. On spectro-temporal analysis represented by 3-dimensional waterfall diagrams, all of the VPT subjects demonstrated pulse-synchronous, mutually exclusive, acoustic characteristics that were representative of their respective presumptive vascular pathologies, whereas the control subjects did not display such characteristics.

Conclusion: The present diagnostic approach may provide additional information regarding the origins of particular VPT cases as well as an efficient and objective diagnostic method. Furthermore, this approach may aid in the determination of appropriate imaging modalities, treatment planning, and evaluation of treatment outcomes. Future studies with a larger sample size, diverse etiologies, and more refined recording techniques are warranted.

FP14-3 A pilot study of the use of EEG source analysis based rTMS for treatment of Tinnitus

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Objective: To determine whether low-frequency repetitive Transcranial Magnetic Stimulation (rTMS) induced a lasting suppression of tinnitus by decreasing neural activity in cortex navigated by high-density electroencephalogram (EEG) source analysis and the utility of EEG for targeting treatment.

Methods: In this controlled 3-armed trial, Seven normal hearing patients with tonal tinnitus in each group received a 10-day course of active 1-Hz rTMS (1000 pulses at 110% of motor threshold) to the cortex navigated by high-density EEG source analysis, the left temporoparietal cortex region and left temporoparietal sham stimulation respectively. 10 volunteers with normal hearing and without tinnitus participated with EEG measure in the control group. Tinnitus handicap inventory (THI) was used to scale tinnitus severity. In addition, the subjective tinnitus loudness perception in patients was obtained on a Visual Analogue Scale (VAS). The measurements were taken before, immediately, 2 weeks, and 4 weeks after the end of the interventions.

Results: Low-frequency rTMS significantly decreased tinnitus after active but not sham treatment. Responders in EEG source analysis based rTMS group, five out of seven (71.4%) patients experienced a significant reduction in tinnitus loudness, as evidenced by THI and VAS scale. Three out of seven (42.8%) patients experienced a decrease in tinnitus loudness after left temporoparietal rTMS stimulation. The target site of neuronal generators most consistently associated with a positive response was the frontal lobe in right hemisphere sourced by the components of Evoked Related Potential using a high-density EEG equipment in tinnitus patients.

Conclusions: Active EEG source analysis based rTMS led to a significant suppression in tinnitus loudness. EEG source analysis based rTMS gives a clear superiority of neuronavigation guided coil positing while dealing with tinnitus. Non auditory areas have been involved in the pathophysiologic considerations on tinnitus. This knowledge in turn can contribute to investigate the pathophysiology of tinnitus.

FP14-4 Can EEG Recorded from the Fp1 Electrode Be Used to Accurately Diagnose Tinnitus?

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No simple objective test is available for diagnosing most tinnitus cases; rather, diagnosis is typically made on the basis of medical history. Here, we report on the utility of using a newly developed, simplified EEG device and analysis strategy to objectively detect tinnitus in patients visiting a typical doctor's office. We developed a simplified, portable EEG device and used it to measure and analyze EEG recorded at Fp1 in chronic tinnitus patients and healthy volunteers. Fp1 is located on the left forehead scalp, just above the ventromedial prefrontal cortex, an area engaged in higher cognitive processes. The Keio University Hospital IRB approved this study. We detected four general EEG patterns at Fp1: pattern A (lower power spectrum at higher EEG frequencies); pattern B (8 Hz at EEG peak amplitude); pattern C (9-11 Hz at EEG peak amplitude); and pattern D (alpha and beta waves at peaks). In the healthy control group (N=24), 23 subjects displayed pattern C, one displayed pattern A. In the tinnitus group (N=25), 11 displayed pattern A, four displayed pattern B, seven displayed C, and three displayed pattern D. The typical pattern detected in the no-tinnitus, healthy control group was C (peak frequency 9-11 Hz). Seven subjects in the tinnitus group displayed the C pattern. These may have been false negatives in tinnitus group. Our novel Fp1 measurement device reliably detected tinnitus (sensitivity, 72%; specificity, 96%). EEG measurement at FP1 may reflect anxiety in patients with tinnitus. Further study is necessary to refine accurate detection of tinnitus and to determine its pathophysiological basis.

FP14-5 Politzer Prize Nominee (PP-4)

FP14-6 The cortical area dorsally to auditory cortex involved in sound-shape association memory in mice

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We can recall a particular shape from the sound stimulus intimately associated with the shape. For example, if we hear "meow" from somewhere, we can associate a cat immediately. To investigate this sound-shape association memory in mice, we developed a M-shaped maze equipped with a screen and a speaker.

First, a combination of sound (A) and shape (A), or sound (B) and shape (B) was presented to water-deprived mice. After that, shape (A) and shape (B) were presented at the two inlets of the M-maze branches. If the mice choose the branch with the same shape presented before, they could obtain a small amount of water. This trial was repeated 20 times per each day. In this visually-guided task, mice learned to select the correct shapes after about 20 sessions of 20 trials. To test sound-shape association memory, we further tested whether the mice could select the shapes based on the associated sound cues only. In this association memory-guided task, we confirmed that wild-type mice could select the correct shapes based on the sound cues only.

Clustered protocadherins (cPcdhs) are neuron-specific cell adhesion molecules with multiple clusters. Wild type mice have 12 clusters (α1-α12) of cPcdh-α, while, in cPcdh-α1, 12 mice, cPcdh-α clusters between α2 and α11 are missing so that the multiplicity of cPcdh-α molecules is largely reduced. cPcdh-α1, 12 mice exhibited no apparent abnormality, and primary visual and auditory functions were normal compared with that in wild-type mice. Although cPcdh-α1, 12 mice could learn the visually-guided task, their performance in the association memory-guided task was significantly worse compared with that in wild-type mice. We showed that wild-type mice could acquire the sound-shape association memory and cPcdh-α1, 12 mice had some disturbance of this memory.

Furthermore, we investigated cortical responses to the associated sound stimuli using flavoprotein fluorescence imaging. In trained wild-type mice, the responses to the associated sound stimuli appeared in the auditory cortex and the cortical area located dorsally to the auditory cortex. While, in trained cPcdh-α1, 12 mice, the cortical area dorsally to the auditory cortex was not activated by the associated sound stimuli. These results suggest that the cortical area dorsally to auditory cortex activated by the associated sound stimuli is involved in sound-shape association memory. Additionally, although the higher visual cortex responsible for shape recognition was not identified in mice, the cortical area dorsally to the auditory cortex may play an important role in shape recognition.

FP14-7 OFF responses produced by short-term depression to inhibitory neurons in the mouse auditory cortex

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Neurons in the auditory cortex exhibit marked activities at the onset of sound stimuli (ON responses), but not at the offset of the stimuli (OFF responses). When the cortical responses to tone bursts for 1 s were visualized using transcranial flavoprotein fluorescence imaging in mice, we could observe only monophasic ON fluorescence responses but not OFF responses in the primary auditory cortex (A1). When long tone bursts for 7 s were presented to mice, however, we observed not only ON responses but also clear OFF responses at the end of the stimulation. OFF responses appeared in the area near the A1. In contrast to clear tonotopic distribution of ON responses in the A1, OFF responses at the nearby site showed no tonotopic map. In the presence of MK801, an antagonist of NMDA receptors (NMDARs), OFF responses were not observed.

The susceptibility of OFF responses to MK801 suggests that OFF responses are produced by NMDAR-dependent short-term depression of thalamic inputs to inhibitory neurons and the resulting disinhibition of OFF responses. To test this possibility, we investigated fluorescence responses to short tone bursts for 1s, which was started 30 s after cessation of preceding long tone bursts for 10-20 s. As expected, OFF responses were recorded at the offset of the short tone bursts as well as ON responses. These OFF responses appeared at the same site where OFF responses to long tone bursts for 7 s were observed. We investigated frequency specificity between the preceding sustained tone bursts for 10 s and the following short tone bursts for 1 s. After sustained tone bursts at a particular frequency, OFF responses to short tone burst at various frequencies were observed.

We investigated neuronal activities using two-photon calcium imaging at the area where OFF responses were observed. These results support our hypothesis that OFF responses are produced by short-term depression of thalamic inputs to inhibitory neurons and the resulting disinhibition. We are currently investigating the origin of thalamic inputs to the OFF response area using morphological techniques. We also would like to include these recent data in the presentation.

FP15-1 Comparison of the Bone Anchored Hearing Devices

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Introduction: Hearing loss of various type or degree affect a considerable portion of the population. Management of hearing loss is selected based on the etiology, type, laterality, severity and patient expectations and needs. Bone anchored hearing devices (BAHD) have been more commonly utilized for the management of hearing loss. Technological advancements provide newer types and models as an option. However, each type and model has advantages and disadvantages that may or may not be suitable for a specific type or degree of hearing loss, life style, needs or expectations of the patient.

Objectives: Describe the surgical techniques and compare the surgical and hearing outcomes and the patient satisfaction with three different BAHD systems.

Methods: The surgical and audiological effectiveness with the bone anchored hearing devices in patients with conductive, mixed or sensorineural hearing loss was evaluated. Different techniques with dermatome, linear incisions, magnetic implants and subcutaneous implants will be shown on short videos from surgical procedures. Postoperative period is discussed as well as the incidence of complications occurring after implantations. A retrospective chart review was conducted on patients between ages 19 to 80 with conductive, mixed hearing and sensorineural hearing loss that received BAHD in a tertiary care center. Patients were implanted with either BAHA system (BAHA Connect or BAHA with hydroxyapatite abutment) or magnetic implant (BAHA Attract System) or the Sophono Alpha System. Pure tone audiometry and speech recognition test were performed in the qualification process and after the operation. A dermatom was used in about half of the cases. Different incision types including a linear incision, C-shaped incision or retroauricular incision were used. The soft tissue reduction was done as indicated according to the type of BAHD according the recommended protocol. Minimal or no skin reduction was performed with the implant with abutment covered by hydroxyapatite or the magnetic implants. Patients were fitted 2 weeks to 3 months after surgical procedure, as per the specific type of the BAHD.

Results: The wounds in most patients healed without or minor complications. Holger's classification was used to evaluate skin reaction. The overgrowth of subcutaneous tissue, numbness and hypoesthesia of skin around the abutment and temporary headaches in the area of implantation, local wound infection requiring oral antibiotic, local wound infection and granulation in the area of incision were observed in small proportion of patients. A patient with skin overgrowth underwent a 2-stage procedure to exchange BAHA Connect into BAHA Attract. Most patients had objective and subjective improvement of hearing. The improvement in speech discrimination also was observed.

Conclusion: Patients implanted with bone anchored systems experienced a benefit in quality of live and the improvement in speech recognition. Different bone anchored systems, types of surgical procedures and indications give a patient the best possible choice for the implantation. New bone conduction hearing devices without a skin-penetrating abutment are available and show promising results in the patients with hearing loss population. While the new transcutaneous magnetic systems provide better cosmetic results minimal skin complications, they may not be optimal for patients with more advanced hearing loss, thick skin, or active life style. When one type of BAHD is not tolerated well due to any of the potential reasons, converting it to another type may be considered.

FP15-2 Retrospective study of Baha performance outcomes

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Purpose: Bone conduction hearing solutions have been successfully used for over 30 years and about 90 000 people worldwide have been helped to better hearing with the BAHA treatment. Analysis of the data colected from Maribor (Slovenia), Nicosia (Cyprus) and Msida (Malta) has been performed.

Materials and Methods: All the patients included in the study had a percutaneous bone conduction device. Descriptive statistics for the demographics and the scores for the Glasgow Benefit Inventory (GBI) questionnaire and regression analysis comparing the demographics and the GBI questionnaire score was done. Only the adult patient data were included.

Results: 82 patients participated in the study with mean total GBI score 34.3 (sd 22.1). Mean general GBI subscore was 45.0 (sd 26.0), mean social subscore was 18.7 (sd 31.8) and mean phisical subscore was 7.5 (32.9).

The results of the analysis of variance showed that the following factors are significantly correlated to the GBI questionnaire score: hearing loss type (Pr 0.03490), hours of use per day (Pr 0.03130) and degree of hearing loss (average) (Pr 0.03891).

Conclusion: The achieved GBI total scores were quite high and and did not vary much between the countries. A conclusion of regression analysis could be that more use leads to better hearing results. It could also be interpreted in the reverse direction, i.e., a patient who does not receive as much benefit from their Baha will use it less on a daily basis. It's likely a combination of both.

FP15-3 Audiological outcomes after Baha Attract surgery

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Objective: Baha Attract is a bone implanted hearing system, which provides transcutaneous transmission of sound signals. Patients using this system receive acoustic signals directly to the inner ear, bypassing the outer and middle ear. It is recommended in 3 groups of indications: conductive, mixed hearing loss and single side deafness. This device could be used in patients with chronic otitis media and congenital malformations, posttraumatic damages of temporal bone. General aim of the research was to evaluate hearing results of the Baha Attract implantation procedure.

Material and Methods: Our study refers to all ?? cases of Baha Attract implantations, which have been performed in the Institute of Physiology and Pathology of Hearing in Kajetany in Poland since the 30th of October 2013 up to now. Main analyze consists of the results of pure tone audiometry before and after the surgery and speech audiometry 1 month after the activation of the speech processor.

Results: Our study has showed a decrease of postoperative pure tone thresholds in the free field conditions in comparison to the preoperative results. Speech understanding among Baha Attract users has also decreased. Although Baha Attract procedure provided hearing preservation.

Conclusions: It is a safe, feasible and effective procedure, which allows to preserve the hearing. It helps to improve speech understanding and overcome effect of head shadow (single side deafness). It is necessary to underline that this system gives little lower amplification of the hearing than that from Baha. However, in the opinion of patients it is preferred because of the maintenance advantages. Baha Attract is a good alternative for other types of bone conduction systems, which cannot be applied because of the anatomical contraindications or skin reactions.

FP15-4 Middle Ear Implant System for bilateral congenital anomalies of the ear

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The Audiologic Research Centre of the Hospital de Reabilitao de Anomalias Craniofaciais of the University of So Paulo (CPA-HRAC/USP) is a national reference for treatment of craniofacial malformations as well as hearing restoration through electronic devices, having conducted more than 1,000 cochlear implant surgeries. The Centre maintains a physical structure and excellent professionals in this field.

In this context, the HRAC provides those patients who have external ear malformations congenital or acquired with surgically implanted hearing devices to restore hearing to this population.

The object of this study was to determine the audiologic benefits of the Vibrant Soundbridge in patients with bilateral congenital aural atresia.

This study was conducted at the Audiologic Research Centre of the Hospital de Reabilitao de Anomalias Craniofaciais of the University of So Paulo (CPA-HRAC/USP) and approved by the Ethics Committee (EC).

Ten patients mean ages of 16±2 years with bilateral congenital aural atresia underwent surgical insertion of the VSB middle-ear prosthesis. All patients underwent radiological evaluation by high-resolution computed tomography that presented no alterations in the inner ear, middle ear space for FMT, bilateral ear bone atresia; stable medical condition; and free of infections at the time of surgery.

Patients underwent tympanomastoidectomy with wide opening of the attic and removal of atrophic bone, removal of fixed malleus and incus, and exposition of the supply-structure of the stapes. The FMT was coupled to a specific titanium prosthesis (Clip-coupler) and fitted in the movable stapes. Patients showed good postoperative course and returning at 8 weeks for Amadeo Hi processor activation.

The evaluation process proposed in this study was comprised of free-field audiometry and the following speech perception tests: monosyllable word recognition and Hearing in Noise Test (HINT).

Patients returned 8 weeks after internal device surgery, without postoperative complications.

The mean of the free-field audiometry thresholds was 58.33 dB HL in the preoperative without hearing aids and 28.33 dB HL in the postoperative using VSB, equivalent to a functional gain of 30 dB HL.

The mean of monosyllable recognition was less than 40% in the preoperative condition without hearing aids and more than 80% in the postoperative using VSB.

The mean of threshold recognition in HINT exceeded 70 dB HL with S/N ratio greater than 5 dB HL in the preoperative condition without hearing aids and below 50 dB HL with S/N ratio less than 1 dB HL in the postoperative using VSB.

The results obtained in the patients evaluation showed improvement in scores using the VSB compared to a condition without amplification. Even considering the first time of initial device activation in which the patient has no familiarity with this new technology, improvement can already be measured. The results agree with the literature, showing improved functional gain and performance in speech perception tests conducted in quiet and in noise.

Considering the study group formed by patients with bilateral congenital aural atresia with conductive hearing loss, the Vibrant Soundbridge middle ear acts as an effective alternative for rehabilitation in these patients, providing a satisfactory functional gain in sound perception and speech recognition, thereby contributing to improved communication for these patients.

FP15-5 Vibrant Soundbridge- round window direct stimulation

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Objective: Middle ear implant Vibrant Soundbridge was originally designed to treat patients with mild and severe sensorineural hearing loss. Round window application of vibrant soundbridge, where FMT is directly placed in the round window, is a quite new method of treatment of conductive or mixed hearing loss. Otological etiologies of patients selected for this study included complications concerning chronic otitis media, cholesteatoma, and ossicular malformation. This study was performed to investigate the effects of placing the FMT on the round window's middle ear.

Material and Methods: Our study refers to all cases of FMT placing on the round window. Such implantations have been performed in the Institute of Physiology and Pathology of Hearing in Kajetany in Poland since 2003. Analyzes focused on the results of the pure tone audiometry at 0.5, 1, 2 and 4kHz before and after the surgery, and the speech audiometry one month after the activation of the speech processor. Intraoperative and postoperative complications were also analyzed.

Results and Conclusions: Functional hearing results using the Soundbridge were improved with all patients (speech in quiet and speech in noise were compared with preoperative scores). Our results show that round window direct stimulation using the FMT is a safe option for treating moderate hearing loss. It is a good alternative for patients who would not tolerate traditional hearing aids and bone hearing aids. To evaluate the long-term outcomes of this kind of FMT's placement we have to wait, but this solution seems to be remarkable. No complications were observed.

FP15-6 Benefits after application of Bonebridge

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Objective: Bonebridge is an active bone conduction system, which transduces sound signals into mechanical vibrations of the bone. The external processor collects the sound signals and transmits the signals by the radiofrequency to the implanted part, which generates vibrations of the bone and then stimulates the cochlea. Bonebridge system is used in treatment of conductive, mixed hearing loss and single side deafness. Main aim of the study was to achieve the benefits after Bonebridge implantation.

Material and Methods: Our study includes all cases of Bonebridge implantations, which have been performed since the beginnings of this method in the Institute of Physiology and Pathology of Hearing in Kajetany in Poland. All the implantations have been performed since the 19th of December 2012 up to now. Main analyze focused on the hearing results after the surgery and their follow-up.

Results: Our findings show significant improvement of speech recognition and hearing preservation among Bonebridge users.

Conclusions: Bonebridge implantation procedure is safe and effective. It is a solution which gives the sense of natural sounds. This system can be a good alternative for other types of bone conduction systems, because of the comparable hearing results, easy maintenance and aesthetic features. It causes less feedback effects, so it should be beneficial in cases of unilateral conductive or mixed hearing loss. But it is required to have a good cooperation with a patient during the fitting of the speech processor.

FP15-7 A "STAMP" Plate Guided BONEBRIDGE Implantation

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The BONEBRIDGE (BB) is a transcutaneous bone conduction implant system designed for patients with conductive or mixed hearing loss and good speech discrimination in whom conventional hearing aids are inadequate and reconstructive middle ear surgery is not recommended. It is semi-implantable and the bone conduction implant is positioned completely under the skin. However, the bone conduction-floating mass transducer (BC-FMT) is large (8.7 mm in thickness, 15.8 mm in diameter) therefore deciding on an appropriate location is difficult. The STAMP (surface template-assisted marker positioning) method is an epoch-making method of carrying out registration using the features of the person's bone surface, and it is possible for the target part to be shown correctly. This is the first report to describe the STAMP method applied for BB surgery and we were able to implant it safely and accurately into the targeted place. We have applied this method to three different cases including bilateral congenital auricular atresia, unilateral middle ear ossification and unilateral sensorineural hearing loss. From their own CT scan data, 3D temporal bone images were generated, and the optimal implant site was determined to the right side by software (Mimics, Materialise Japan, Tokyo, Japan). From this data, a Guide plate (BB-STAMP plate) and Confirmation plate (C-STAMP plate) indicating an appropriate implant site were generated by the STAMP method. The BB-STAMP plate was assigned to the bone, and the correct place for a good fit was searched for assisted by the typical bone surface structure. A round mark was put on the guide hole and the mastoid bone was carefully debrided. After checking the size and depth of the hole by a T-Sizer included in the surgical kit, the C-STAMP plate was applied to this hole. Finally, the coil part of the BB was inserted under the temporal muscle, and the transducer was loaded into the bed. The lug part of the transducer was fixed with regular screws, and the BB implant was successfully placed at the optimal site. The BB is an excellent option when a patient wishes that no part of the implanted device to be left penetrating the skin. A considerable difficulty of BB implantation is preparing a relatively large hole enough to enclose BC-FMT, and the ironical fact that BB candidates include those with congenitally small temporal bone. Of course, the 3D simulation software for BB has been developed to enable safe implantation. However, since there is no landmark in the actual surgery, the sigmoid sinus and dura are sometimes inadvertently exposed. Alternatively there is also a report of using a navigation system, but the necessary equipment is large and expensive and registration of the temporal bone is difficult, hence, it cannot be said to be useful or practical. The STAMP method is one of the registration methods with high accuracy in the operation field, and it is already being applied in image-guided otologic surgery. It is characterized by high precision and simple template technique due to the registration with the complex unevenness of the bone surface. We applied this STAMP method to an actual operation, and considered how to create a hole of the right size in which BC-FMT can be fixated in one try in the safe target place. With this method, the hole was created exactly in the safe part chosen with 3D simulation software. Although it does take time and effort to create the BB- and C-STAMP plates, this is not a big drawback for BB implantation since these operations are conducted with sufficient preparation periods. This preoperative simulation served as an excellent practice session before surgery, ensuring optimal results from the actual surgery.

FP16-1 A two-staged study on hearing and communication problems of elderly taxi drivers

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The proportion of Japanese aged 65 years and older exceeded 21% of the total population in 2007 and has been increasing steadily. Japan's social security costs, including pensions, medical treatment, and nursing care have been also increasing every year like other advanced countries. From the limited budget of the Japanese government, the present pension system has been revised and a new pension system paid on a so-called macroeconomic sliding scale is to be adopted in April, 2015. The new era requests the elderly aged 65 years and older to seek a second career after their mandatory retirement at the age of 65 in Japan. However, age-related hearing impairment may prevent the elderly from working, especially in the service industry. The number of the elderly among taxi-drivers, who need communication skills, has been increasing recently in Japan. We investigated in the first stage study whether elderly taxi-drivers had hearing and communication problems during work and then conducted the second stage study for volunteers to measure their hearing levels and to collect their opinions about hearing aids.

In 2014 the first questionnaire study for 122 aged 60 years and older of 143 taxi-drivers who belonged to Privately Owned Taxi Co-operative Society, Okayama Branch was performed to investigate hearing and communication problems based on age-related hearing impairment after the approval of the Okayama University Ethics Committee. Responses were obtained for 117 (average age, 67.7 years). Although a small proportion of responders noticed hearing and communication problems, only one driver owned a hearing aid but did not use it.

Nineteen volunteers (average age, 67.5 years) of 26 taxi-drivers who had agreed to further examination underwent the second questionnaire, otoscopy, and audiometry at Okayama University Hospital. The second-stage questionnaire consisted mainly of questions about hearing aids. Three representative questions are shown as follows: 1) Do you think about buying a hearing aid when having difficulty working due to hearing impairment? (10 yes, 9 no). 2) Do you think about buying a hearing aid when a hearing loss is diagnosed? (18 yes, 1 no). However, none of the participants wished to be assessed for benefit from amplification using a hearing aid. 3) When a hearing loss is diagnosed, where do you think you will buy a hearing aid? (consultation with an ENT doctor before buying a hearing aid, n=6; authorized hearing aid shop, n=2; glasses shop n=1; mail order, n=0; uncertain, n=7; non-answer, n=2). No abnormal findings with otoscopy were found except one with calcification in the bilateral tympanic membrane. Since Japan adopts left-hand traffic, the hearing level of the left ear is more important for taxi-drivers to talk with passengers. The distribution of hearing levels (4 divided method) in the left ear is shown in the followings: <19dB, n=1; 20-29dB, n=11; 30-39dB n=5; 50-59dB, n=2. Three with at least 37.5dB HL of seven with at least 30 dB HL in the left ear noticed their hearing loss.

Since hearing aids remind us of ageing, we dislike wearing hearing aids even if we noticed a hearing loss. This study shows that elderly taxi-drivers may have communication troubles based on their hearing impairment without awareness of the necessity of hearing aids. In Japan employees must receive a medical examination every year, including simple audiometry (using two pure tones). They are informed of their hearing test results, but are not obligated to receive further examination. Although a further larger-scale audiometric study for elderly employees should be performed to confirm the results of this study, a novel comprehensive system from periodical medical examinations to hearing interventions for hearing impaired employees should be constructed.

FP16-2 Sarcopenia and Hearing Loss in Older Koreans: Findings from the Korea National Health and Nutrition Examination Survey (KNHANES) 2010

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Backgound: Age-related hearing impairment (ARHI) is becoming a more significant issue as geriatric population grows. There have been some studies about the association of central obesity with ARHI and the one of visceral adipose tissue with hearing thresholds in adult women, but there has not been studies whether muscle mass is associated with ARHI.

Methods: We used the 2010 data of the Korea National Health and Nutrition Examination Survey to examine the associations between sarcopenia and hearing loss. A total number of participants was 1622 including 746 males and 876 females aged 60 years or older. Hearing loss was defined as the pure-tone averages (PTA) of test frequencies 0.5, 1, 2, 4 kHz at a threshold of 40 dB or higher in worse hearing side of the ear.

Results: Among 1622 participants, 298 men and 256 women had hearing loss. Appendicular muscle mass (ASM), expressed as kg, was categorized in tertiles. After adjustment for age, smoking, drinking, amount of exercise, total body fat, educational status, income levels, and tinnitus, the odds ratio (OR) for hearing loss was 1.571 (95% confidence interval (CI)=0.922-2.677) in the middle tertile and 1.786 (95% CI=1.034-3.084) in the lowest tertile, compared with the highest tertile. P for trend in this model was 0.036.

Conclusions: Larger muscle mass is associated with lower prevalence of hearing loss in elderly Korean females.

FP16-3 Clinical analysis of inner ear disorders caused by acute otitis

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Acute otitis is one of most common disease which we often find in otolaryngology clinic. We retrospectively reviewed cases of inner ear disorders caused by acute otitis. This included 12 ears of 11 patients who had acute otitis media with an elevated bone-conduction hearing threshold. All patients were hospitalized between April 2008 and June 2014. The median age was 35.5, with a range of 13 to 63. We divided hearing prognosis into complete recovery, marked improvement, improvement, and no recovery. The patients complained of otalgia, hearing loss, and headache. They were treated with ear drum incision, antibiotic therapy, and steroid intravenous injection. Hearing prognosis was not correlated with days from the onset or those of ear drum incision. Three cases had vertigo and 6 cases had nystagmus. Most of these patients showed elevated hearing threshold. Following results were obtained: complete recovery in 8, improvement in 3 and no recovery in one case. The overall hearing improvement rate was 72.7%. All of the cases with poor hearing prognosis had nystagmus. It was suggested that the presence of nystagmus results in a poor hearing prognosis. We recommend early hearing test including bone-conduction threshold for patients who had complained of vertigo, tinnitus and severe hearing loss. We should be aware of an elevated bone-conduction threshold associated with acute otitis.

FP16-4 Effects of bomb blast injury to the ears: Aga Khan University Hospital experience

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Objectives: To evaluate the frequency of hearing loss and tympanic membrane (TM) perforation in bomb blast victims. To determine the factors affecting hearing loss and TM perforation in bomb blast victims in terms of distance, and presence of victims in open or closed space, and the amount of exposed explosive.

Materials & Methods:

Study Design: Retrospective chart review

Setting: Aga Khan University Hospital, Karachi, from January 2011 to July 2013.

Subjects: A total of 196 patients were included in the study. These were patients who were stable enough to have an ontological examination and hearing assessment. All other patients with incomplete records, missing data, with history of ear complaints or prior ear surgeries were excluded from the study.
In file review, patient demographics, date of blast, date of ear examination and of PTA, presence or absence of symptoms, type, duration and intensity of symptoms, otological findings for presence of tympanic membrane perforation, presence of blood/clot or discharge in external auditory canal and pure tone audiometry findings determined and noted.
Approximate distance from the blast, and presence of victim in an open (in an area where blast occurred, market, road, ground, praying area) and closed space (house, car), amount of explosive was determined by information given in print media.
All patients who had ear related complaints and abnormal PTA findings were called for telephonic interview, after a follow up period of at least 2 months. These patients were asked about improvement of symptoms, and any other missing information was also noted.

Results: Total 196 files were reviewed. There were 158 male and 38 female. Forty seven patients i.e. 24% of the study population had affected ears. The most common symptom was hearing loss seen in about 19% of patients. The other symptoms were earache, vertigo, tinnitus and ear discharge. Six patients had abnormal clinical examination without any symptoms which is 3% of study population. Among these 196 patients 19% (37 out of 196) had decreased hearing. It was conductive, sensorineural and mixed, in 11%, 6% and 9% respectively. Tympanic membrane perforation was seen in 42 patients i.e. 21%. The presence of victims in an open space during bomb blasts was found to be statistically significant to affect hearing of patients and cause tympanic membrane perforation with Chi square values of 0.000 and 0.000 respectively. Similarly, distance within 10 meters had Chi square value of 0.001 and 0.006 when compared with tympanic membrane perforation and hearing loss respectively. The amount of explosive greater than 80 kg had Chi square value of 0.001 and 0.000 when compared with tympanic membrane perforation and hearing loss respectively.

Conclusion: Significant number of bomb blast victims had affected ears. Hearing loss and tympanic membrane perforation were more common in patients present in open or within 10 meters of bomb blast, or exposure to explosives greater than 80kg.

FP16-5 ALPHA-MANNOSIDOSIS. HEARING AND MIDDLE EAR STATUS IN 35 CHILDREN AND ADOLESCENTS

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Objective: To analyse hearing and middle ear status in a group of patients with alpha-mannosidosis. This is a rare lysosomal storage disorder with autosomal recessive inheritance. The condition is progressive. Frequent findings include facial coarsening, intellectual disability, motor function disturbances, skeletal abnormalities, muscular pain and weakness. Furthermore, hearing impairment, recurrent infections and impaired speech.

Methods: As a part of a European project investigating the possible benefits from enzyme replacement therapy 33 children and adolescents with the condition underwent a thorough oto-laryngological and audiological examination. The examination took place at our institution in 2012 through 2015. All subjects were examined four times.

Results: None of the patients had normal hearing. The median age for identification of the hearing loss was 3 years (range 0.5 15.5 years). The hearing losses ranged from mild to profound. Although most subjects had some degree of conductive malfunction the predominant component of the hearing impairment was of sensorineural character.

Ventilation tube had- at some point of time - been inserted in 26 (74 %) of the patients.

Hearing instruments had been issued in 32 patients.

Conclusions: Hearing loss and middle ear abnormalities are very frequent findings in subjects with alpha-mannosidosis. All subjects with this conditions should receive a full oto-laryngological examination, including audiometry. Also, a hearing loss in combination with the characteristic physiognomy may prompt the otologist or audiologist to recommend paediatric or genetic consultation for such a patient. A number of photos shall be included in the presentation.

FP16-6 Hearing screening for school age children in 3 continents

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Introduction and Objective: Hearing disorders among school-age children are a current concern. Continuing studies have been performed in Poland since 2008, and on December 2, 2011 the EU Council adopted Conclusions on the Early Detection and Treatment of Communication Disorders in Children, Including the Use of e-Health Tools and innovative Solutions. The discussion now focuses not only on the efficacy of hearing screening programs in school children, but what should be its general aim and what kind of tests it should include.

The aim of the study is to present pilot hearing screening results from 3 continents (Africa, Asia, Europe) performed with Pure Tone Audiometry and dedicated questionnaires.

Materials and Methods: During hearing screening programs conducted in Poland in 200812 over 500000 (712 years old) were screened in 9, 325 schools. In 2012-2014 next 1034 children were screened in Armenia, Azerbaijan, Georgia, Ivory Coast, Kyrgyzstan, Senegal, Tajikistan, Romania, Russia and Ukraine. Screening programs were conducted using the Sense Examination Platform.

Results: With the cut-off criterion set at the 5th percentile, results were divided for two age categories. In 7-8 years old group positive results were in 13, 7% (Europe), 22, 0% (Asia), 30, 1% (Africa). In older (12 15 years old) 15, 9% (Europe), 19, 4% (Asia), 36, 0% (Africa)- . =Conclusions

Conclusion: There is high need for performance easy and cheap solution for hearing screening. There is more positive results in Asia and much more in Africa. Morover eduction about hearing disorders should be implemented together with programs. There is lack of knowledge especially in Africa.

FP17-1 Are middle ear implants superior to bone-conduction devices in conductive/mixed hearing loss

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Introduction: Recently, we published our data on the maximum power output (MPO) of several kind of amplification options for patients with conductive and mixed hearing loss. 1 The MPO or the loudest sound that can be produced by the device was measured with the devices in linear amplification mode. Bone conduction works but it is not an effective means for sound transmission to the cochlea. Therefore, bone-conduction devices (BCD) require powerful amplifiers, nevertheless the MPO of the standard percutaneous BCD (e.g. Cochlear BP100 or Oticon Ponto) is limited, approximately 70 dB HL. Transcutaneous BCDs have even lower MPOs. For middle ear implants, with their actuator coupled to one of the cochlear windows, MPO was found to be comparable to that of the most powerful BCD (Baha Cordelle).1 The Codacs device (Cochlear), developed for patients with otosclerosis, outperformed the other amplification options. Typically, its MPO exceeds 110 dB HL. The recently introduced active transcutaneous BCD (Bonebridge) has a MPO just below that of the standard percutaneous BCD. 2

To deal with the relatively low MPO of most amplification options, most users with minor or mild sensorineural hearing loss components choose for negative amplification, or, in other words, they chose a volume setting that compensate their air-bone gap only partially. Then the loudest input sound that can be processed without distortion caused by the MPO equals the MPO value plus the attenuation (remaining air-bone gap). 3

New results. Functional gain, defined as the bone-conduction thresholds minus the aided thresholds was calculated using data from relevant publications that could be traced using Pubmed (with certain exclusion criteria). These calculations showed that (owing to the MPO limitations) Baha and Ponto devices showed functional gain values about 15 dB below the well-validated NAL target gain for sensorineural hearing loss. It should be noted that all amplification options bypass the air-bone gap; so the air-bone gap plays no role. Transcutaneous BCDs showed an even 10 dB poorer result. Middle ear implants like the Vibrant Soundbridge and the Otologics devices, with their actuator coupled to one of the cochlear windows, showed functional gain values comparable to those of percutaneous BCDs. Functional gain of the Codacs was closest to the desired NAL target gain.

Conclusion: Based on this audiological evaluation of published data, there are good arguments to choose percutaneous BCDs instead of transcutaneous BCDs. Excluding Codacs, published audiological data indicate that middle ear implants and percutaneous BCDs are competitive options for patients with conductive or mixed hearing loss.

FP17-2 Bonebridge implant in adults and children: computer assisted 3D planning and audiological outcome

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Introduction: The study aimed on evaluating the benefit of a preoperative three-dimensional (3D) planning tool for surgically placing the bone conduction floating mass transducer (BC-FMT) of the Bonebridge (BB) bone conduction implant.

Method: A preoperative planning tool was developed which allowed to freely adjust the Bonebridge implant in an individual 3D model of the skull for checking the possibility of completely fitting the BCI-FMT into a bony bed and finding an optimal implant position. In the period from July 2012 to February 2015 the Bonebridge was implanted with mastoid or retrosigmoid placement after individual preoperative planning and "virtual surgery" in 11 adult and 6 pediatric patients (Age: mean = 34 y +/- 22, 18 SD; min 5, max 76 y) with conductive or mixed hearing loss due to chronic ear disease, malformation, or single sided deafness. The main outcome measures were feasibility of the preoperative 3D planning process, transfer into the intraoperative situation and audiological results after BB implantation.

Results: Individual preoperative planning was considered beneficial especially in cases of small mastoid bone volume, e.g. due to previous canal wall down mastoidectomies, and in cases with malformation including a case with simultaneous implantation of bone anchors for an ear prosthesis. Audiological data showed a significant benefit 3 months after implantation. These results were comparable to those reported in the few cases or small case series on Bonebridge implantation published so far and to those from studies with the Baha implant.

Discussion and conclusions: For optimal placement of the BC-FMT of the BB, preoperative 3D planning is recommended especially in primarily small, poorly pneumatized mastoids, hypoplastic mastoids in malformations, reduced bone volume after canal wall down mastoidectomy, small mastoids in children, and for planning of simultaneous implantation of bone anchors for ear prostheses. Efforts should be made towards reducing segmentation and surgical planning time by means of automatization.

FP17-3 Factors affecting attitudes towards loss of hearing loss and hearing aid/BAHA uptake

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Objective: Previous studies have shown that the use of amplification device in unilateral hearing loss improves speech understanding and reduces hearing handicap. Despite that, only a small fraction of individuals actually pursue the use of hearing aid or a bone anchored hearing aid device. It is plausible to assume that the attitudes towards hearing loss can influence the subjective perception of hearing handicap. The present study is aimed at investigating the factors such as age, gender, tinnitus, cause, duration and degree of hearing loss affecting the attitudes towards hearing loss and also to see the number of amplification device uptake.

Method: A total of 29 individuals (11 males and 18 females) with moderate to profound unilateral sensorineural hearing loss were recruited for the study. To determine the psychosocial attitudes towards hearing loss, individuals were asked to fill in the "Attitudes towards loss of Hearing Questionnaire" (ALHQ) using paper and pen format. ALHQ is a 22 item list with five subscales: Denial of hearing loss, negative associations, negative coping, manual dexterity & vision and hearing related esteem. Individuals were required to respond from "strongly disagree=a to strongly agree=e" against each question on five point rating scale. A score of 1 was given for "a" response, 2 for "b" response and so forth. Questions with negative factors were reverse scored. For interpretation, a high score on any subscale is associated with negative attitude and low score is associated with positive attitude. Therefore, for a successful outcome, low scores are preferred to high scores. Finally, total number of participants who purchased an amplification device was also noted.

Results: As the outcome scores were measured on an ordinal scale, Kruskal-Wallis H test was used to determine the effects of gender, tinnitus, and cause of hearing loss on each of the five subscales. Spearman rank order correlation coefficient test was used to check for any association between age (20-40, 41-60 and > 60 years), duration, degree of hearing loss and the outcome variable. Post hoc analysis with Bonferroni correction was used to account for any multiple comparisons. A p value of less than 0.05 was considered statistically significant. Results revealed significant effect of tinnitus and cause of hearing loss on denial of hearing loss subscale. In other words, participants with tinnitus and Meniere's disease readily accepted the hearing loss compared to participants without tinnitus and other causes of hearing loss. Spearman rank order correlation test showed a positive relationship between duration of hearing loss and negative coping strategies subscale. No significant effect of age, gender and degree of hearing loss was noted on any subscales. When analyzed the number of device uptake, only 17.2% (5 out of 29) actually pursued the use of hearing aid or BAHA for their UHL.

Conclusion: Indentifying the factors affecting attitudes towards hearing loss can have a potential clinical implication in audiological rehabilitation. Further, the study emphasizes the need for informational counseling to improve rehabilitation outcome in UHL individuals.

FP17-4 3rd Window Coupling of Vibrant Soundbridge - Artificial Vibration for Intracochlear Stimulation

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Objective: Various application methods of the Vibrant Soundbridge (VSB), eg. ossicular, round or oval window coupling, are implemented in modern ear surgery today. In rare cases with difficult anatomic variations a third window cochleostomy can be a successful solution.

Study Design: Prospective case study.

Settings: Tertiary, referral center.

Patient: A 51 year old male suffering from bilateral severe congenital, Thalidomid-induced ear dysplasia (atresia of the external ear canal, severe dysplasia of the ossicles, variant course of the facial nerve occluding round and oval window, combined hearing loss and partial palsy of the facial nerve). Insufficient speech recognition was achieved with current hearing aid.

Main Outcome Measure: Audiologic assessment involving pure-tone audiometry, aided and unaided free-field audiometry, Freiburg monosyllabic word test, and registration of any complications.

Results: The coupling of the floating mass transducer (FMT) to a third window cochleostomy resulted in satisfactory amplification and speech recognition as well as the patient´s own subjective assessment. The manner of surgery resembled the coupling of the FMT to the round or oval window. Postoperatively there were no signs of a peripheral vestibular or cochlear impairment or additional facial nerve dysfunction occurred.

Conclusion: We present a new method for direct acoustic cochlear stimulation using an active middle ear implant via third window cochleostomy.

FP17-5 Imaging after Bonebridge implantation bei Cone Beam CT, CT and MRI

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Introduction: The Bonebridge is a quite new bone conduction hearing aid. One advantage is the transcutaneous transmission of signals which minimizes the risk of infections. Disadvantages are the bigger size and the more invasive kind of surgery. In comparison the alternative of the active middle ear implants it the approval for MRI up to 1.5 Tesla. Nevertheless, the influence of the implant on a postoperative imaging is unclear.

Methods: Two fresh cadaveric human heads were implanted with a Bonebridge System in the mastoidal approach. Afterwards, different kinds of imaging (computed tomography, cone beam computed tomography, 1.5 and 3.0 Tesla MRI) was performed. Especially in postoperative MRT-scanning different sequences and new metal artefact reduction sequences (MARS) were performed. Images were analyzed regarding the artefacts and possibilities of visualizing inner- and middle ear structures as well as structures of the brain.

Results: Despite the existence of the implant an excellent visualization of the middle and inner ear structures was possible by CBCT and CT (fig 1). Even the inner ear canal could be evaluated. In 3.0 T MRI the artefacts were huge, so now evaluation of head was possible at all. At 1.5 T MRI a head shadow effect could be seen for at least half of the head. Interestingly, significant differences could be seen in dependence of the sequence and the orientation of admission. The new MARS sequences showed a further improvement of the imaging quality. So an evaluation of contralateral ear (with inner ear canal) was possible (fig 2).

Conclusion: No relevant limitations exist in imaging of the middle and inner ear after implantation of the Bonebridge using CT or CBCT. Regarding MRI, as expected relevant artefacts could be detected. Further research has to focus on different sequences and orientation of primary admission and potential of metal artefact reducing sequences to improve the imaging of brain and contralateral ear after implantation.

FP17-6 Outcomes after implantation middle ear implant MET

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During last years we can observe significant development in middle ear implants area. There are several attempts and still no consensus when exactly which implant should be applied.

Our material consists of 2 cases implanted in 2014. Patients had mixed hearing loss with PTA at level 35-50 dB SPL.

Surgical access to the body of incus could be achieved through atticotomy. Both patients were after several attempts with another solutions. Quality of life is much better than before intervention. Audiological outcomes were satisfied.

In conclusion MET device could be dedicated to the group of patients with pure SNHL and MHL. Longer follow up is mandatory to make more statements.

FP18-1 CONGENINTAL CHOLESTEATOMA- CLASSIFICATION AND SURGICAL MANAGEMENT

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78 ears with Congenital Cholesteatoma were operated. 27 patients presented with different grades of facial nerve palsy. In 1 case an incidental finding. 5 patients presented with recent one episode of ear discharge due to rupture of tympanic membrane. HRCT of Temporal Bone is mandatory in all cases. The characteristic feature of Congenital Cholesteatoma highly pneumatised mastoid with various extension from Petrous apex to the middle ear cleft and whole mastoid.

Invariably the first ossicle destructed will be stapes, unlike Incus in case of CSOM .with normal middle ear mucosa Classification

Type: 1: Small intact sac confined to the middle ear but not involving the Ossicles and mastoid.

Type 2: Lesions involving the whole middle ear cleft without extending into the mastoid with Ossicular destruction

Type 3: Extending into the mastoid with or without Facial Nerve palsy.

Type 4: Arising from Supralabyrinthine area and extending into middle ear or Internal auditory meatus with or without Facial nerve palsy.

Type 5: Arising from the Petrous apex with Facial nerve palsy with Dead ear.

Surgical Management: Depending upon the pathology, Type 1&2 intact canal wall Mastoidectomy were done, Canal wall down Mastoidectomy done in type 3 to 5. Total 27 cases of facial nerve palsy were seen, in 25 cases facial nerve decompression done, rest of the 2 cases managed with grafting. In dead ear Radical Mastoidectomy done. In 5 cases we encountered CSF leak which was well controlled.

Supralabyrinthine Cholesteatoma is seen in majority of cases.

FP18-2 Surgical intervention for pediatric cholesteatoma

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The incidence of congenital cholesteatomas has increased among pediatric patients with cholesteatoma because it has become common to use endoscopy or microscopy to examine the ears, allowing primary physicians to identify early and small cholesteatoma. It is usually accepted that pediatric cholesteatomas should undergo an operation as soon as possible because they spread rapidly and are very aggressive in nature. In contrast, we previously reported several cases of congenital cholesteatoma showing spontaneous regression. The present study was carried out to determine how long we can wait to determine whether surgical intervention is needed for pediatric cholesteatoma. We analyzed patients younger than 15 years of age with middle ear cholesteatomas who had been referred to our hospital. We analyzed the clinical characteristics of these children regarding the type of cholesteatoma, such as the pars flaccida type, pars tensa type, and congenital type. The clinical characteristics analyzed were as follows: the extent of cholesteatoma and mastoid pneumatization on computed tomography, the presence of bacterial infection, the extent of ossicular destruction, and the presence of complications. In some patients with congenital cholesteatoma, the cholesteatoma decreased in size without any ossicular destruction. However, in some children with attic cholesteatoma, the lesion increased in size very rapidly during the waiting period. When infection is not apparent, watchful waiting is recommended for small congenital cholesteatoma. The risk factors for aggressive cholesteatoma in children will be discussed.

FP18-3 A retrospective review of surgical success in pediatric compared to congenital cholesteatoma

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Objective: To investigate therapeutic success in cases of pediatric compared to congenital cholesteatoma and to evaluate the efficiency of second look surgery.

Design: Retrospective analyses of data from a case series spanning 5 calendar years.

Setting: Tertiary referral center.

Patients: Pediatric patients under the age of 18 presenting with cholesteatoma (acquired and congenital) or chronic otitis media with perforation requiring surgical intervention as well as patients presenting at a higher age with congenital cholesteatoma.

Methods: A consecutive case series of all cholesteatomas treated over a 5-year period were retrospectively analyzed to identify cases of pediatric cholesteatoma, congenital cholesteatoma and chronic pediatric otitis media with perforation. Groups were compared for the necessity of second look surgery and residual disease. Furthermore cholesteatomas were divided into subgroups according to the extent of the disease (Class I = single quadrant, II= multiple quadrants, III = ossicular involvement, IV = mastoid extension).

Results: Out of a total of 228 cases of cholesteatoma were treated across all age groups, 50 (22%) pediatric cases presenting with chronic ear disease in need of surgical intervention could be identified. This pediatric collective comprised of 35/50 (70%) pediatric cholesteatoma cases (Class I = 9, II = 3, III = 11, IV = 12) and 15 (30%) cases of chronic otitis media with perforation without evident cholesteatoma. 17 second look surgeries were performed. 12/35 cases (34%) showed residual disease postoperatively. Residual disease was found in 1/9 cases in Class I, 2/3 in Class II, 3/11 in Class III and 6/12 in Class IV.

In total 7/228 (3%) true congenital cholesteatomas were identified. 4/7 (57%) presented under the age of 18 years, while 3 cases presented during adulthood. 4 second look surgeries were performed in the congenital cholesteatoma group, which identified 2 cases (29%) of residual cholesteatoma.

Conclusion: Congenital cholesteatoma is rare and can present at any age, which makes predicting residual disease statistically difficult. In contrast, pediatric cholesteatoma seems to have the highest recurrence rates in groups where multiple tympanic quadrants and/or the mastoid is involved.

FP18-4 Congenital cholesteatoma in Japanese patients: Early diagnosis and check up systems

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Objectives: We described the characteristics of congenital cholesteatoma in Japanese patients and assessed which check up system is useful to detect congenital cholesteatoma in early stage.

Study Design: retrospective chart analysis of consecutive patients with congenital cholesteatoma.

Setting: Tertiary referral hospital.

Patients: Between September 2004 and August 2010 conclusive 37 patients underwent primary procedure.

Intervention: The diagnosis of congenital cholesteatoma with Potsic staging system and the therapeutic operation were performed.

Main outcome measures: The chance of detecting the congenital cholesteatoma, the patient age, the stage of the disease, the pathology of the ossicles and the hearing result of the surgery were studied.

Results: Twenty two percent of the patients belonged to the Stage I and II without ossicular involvement. They showed normal hearing. Eighty eight percent of the patients belonged to the Stage III or IV and 76% of the patients showed good hearing result postoperatively. Diagnosis of the congenital cholesteatoma were done after hearing check up at six years old preparing for the primary school in Japan. Earlier diagnosis were made by the otolaryngologist with endoscopic or microscopic examination when the patients visit ENT office accidentally with another disease.

Conclusion: Introducing the endoscope and microscope into the ordinary tools of ENT office contributed to make diagnosis of congenital cholesteatoma in early stage. The hearing check up system preparing for the primary school was also useful to detect congenital cholesteatoma in Japan.

FP18-5 Cholesteatoma in children long-term follow-up and outcomes in Romanian patients

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Introduction: Cholesteatoma is an abnormal growth of squamous epithelium in the middle ear and mastoid which destroy important structures in the temporal bone. The presence of cholesteatoma requires surgical intervention and the main goal is to achieve a safe, dry ear and to improve the hearing. The extension of surgery depends on the size of the cholesteatoma.

Methods: 875 patients were treated for cholesteatoma in our department between 2001 and 2010, 213 pediatric patients. We performed both open and closed and technique, depending on disease extension, bone erosion and complications, followed by second-look surgery in most of the closed-technique cases.

Results: The closed technique was the treatment of choice in 69, 2% of cases, most of them uncomplicated cholesteatomas. In 30, 6% we've chose the open technique for different reasons. The second look surgery was done in 57, 3% of cases after one and a half or two years. 27, 1% of patients were lose of follow-up program after the first years. Residual cholesteatomas were noticed in 17% of cases and the recurrent cholesteatomas were operated in 32% of cases. After the surgery the air-bone gape has improved in 67, 1% of cases because of tympanoplasty with autologous graft or different types of prosthesis. In some cases we've used the BAHA prosthesis with good results.

Conclusions: Cholesteatoma is a serious condition which affect both children and adults. The second-look control in closed technique should be done after one-one and a half year. Closed technique is recommended in order to restore the function of the ear, the hearing, which is very important for a normal development and a proper quality of life.

FP18-6 Pediatric cholesteatoma prone to recurrence after prior surgical intervention

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Objective: To investigate clinical findings of pediatric patients with middle cholesteatoma prone to recurrence after prior single or staged planned tympanoplasty.

Study Design: Retrospective

Setting: Referral hospital, otolaryngology department.

Patients: Pediatric patients with middle ear cholesteatoma who underwent revision tympanoplasty at our institution between 2006 and 2013 were included in this study. There were 15 ears of 15 patients (age 4-15 years, mean 9.6 years). Among them, six ears underwent prior surgery at our institute and nine ears underwent prior surgery at another hospital. All patients needed revision tympanoplasty for residual or recurrent cholesteatoma after prior single or staged planned tympanoplasty.

Main outcome measures: Clinical characteristics, including age at prior surgery, types of cholesteatoma, the histories before revision tymanoplasty, operative findings, surgical outcomes, were investigated in revision cases and also compared between revision cases and NOT revision cases (52 ears, age 2-15 years). Surgical procedure was canal wall down tympanoplasty with canal wall reconstruction with cartilage and or cortical bone graft (CWR).

Resuts: Age at prior surgery in revision cases was 3 to 10 years (mean 6.2 years), which was younger than that in NOT revision cases (mean 9 years). 8 ears were congenital cholesteatoma (53%), two ears were pars flaccida, one ear was pars tensa cholesteatoma. Other four ears were unclassifiable due to limited clinical information about prior surgery at another hosptital. Compared to NOT revision cases, congenital cholesteatoma was frequent in revision cases (53-80% vs 38-40%). It took almost 1 to 8 years (mean 4 years) from last prior surgical treatment to revision. The aims of revision were residual cholesteatoma in 6 ears, recurrence (retraction pocket formation) in 6 ears, both in two ears, and cholesterin granuloma in one ear. The stapes superstructure was more frequently absent in revision cases (10 ears, 67%) than that in NOT revision cases (13 ears, 25%). In revision cases, the ossicles were preserved only in four cases (26.7%) with small residual cholesteatoma or retraction pocket after single operation (not staged case). One case with multiple residual cholesteatoma underwent re-operation after revision tympanoplasty,

Conclusion: Cases prone to recurrence after prior or staged tympanoplasty were younger or preschool children with congenital or unclassifiable extensive cholesteatma (without the stapes superstructure or with multiple residual cholesteatoma at second look operation). We should careful attention to such patients after prior surgery until they reach adulthood. Reinforced scutumplasty and favorable relationships with patients and their parents were important.

FP19-1 Hearing outcome of the cartilage tympanoplasty for acquired cholesteatoma; middle term results

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Objective: To determinate the efficacy of cartilage tympanoplasty for acquired cholesteatoma.

Study Design: Retrospective review of cartilage tympanoplasties in 33 pars flaccida and 35 pars tensa cholesteatoma cases.

Setting: Tertiary referral center.

Patients: Total 68 patients (25 women and 43 men, mean age 48.5 years, age range 7-87 years) with acquired cholesteatoma were undergone primary surgery at our hospital.

Interventions: The approaches of the surgery were 15 trans-canal atticotomies, 4 canal wall up and 49 canal wall down tympanoplasties. Sliced auricular cartilage was used to reconstruct the tympanic membrane, drilled scutum and/or posterior wall of the external canal. Nine cases of type I tympanoplasty, 43 type III and 16 type IV tympanoplasty were carried out in this series.

Results: The mean follow-up period was 37.6 months in pars fluccida and 42.3 months in pars tensa cases. Over all postoperative air-bone gap (ABG) of 20dB or less was achieved in 29/33 (87.9%, pars fluccida) and 29/35 (82.9%, pars tensa) patients. The graft take rate was 100% and the average hearing improvement was 9.9 dB (P=0.01, par fluccida) and 4.5 dB (P=0.11, pars tensa). In patients with pars tensa cholesteatoma, postoperative ABG in type I tympanoplasty was better than type III and IV (p=0.03, 0.05). The range of aeration was expanded with cartilage tympanoplasty in both pars fluccida and pars tensa cholesteatome. Although it seems difficult to predict the postoperative hearing outcome, the post-operative induction of repeumatization may anticipate the good hearing outcome in acquired cholesteatoma surgeries.

Conclusions: Cartilage tympanoplasty might be one of the effective technique for hearing improvement in patients with acquired cholesteatoma.

FP19-2 Prof. Keehyun Park's technique, 'Atticosinoplasty' is effective for early cholesteatoma management

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Objective: The purposes of surgical treatments for cholesteatoma are to prevent recurrence and to restore one's hearing by complete removal of the lesion and reconstruction of tympanic membranes and ossicles. In course of time, surgery rates for early cholesteatoma and residual or recurrent cholesteatoma are increasing. For this matter, Prof. Keehyun Park suggested a surgical technique called 'atticosinoplasty' to mediate early cholesteatoma. Thus, we analyzed the adequacy and applicability of atticosinoplasty as a treatment for early cholesteatoma comparing with other surgical techniques.

Materials & Method: One hundred seventy two patients who underwent atticosinoplasty (n=72) or canal wall up mastoidectomy (n=73) in Ajou University Hospital (Suwon, Korea) between July 2002 and Feb. 2014 were enrolled in this study. Patients with less than 12 months of follow up period were excluded from this study. During the follow up, post-operative physical examination and audiometry were performed including temporal bone CT in necessary cases. Based on these data, recurrence and re-operation rate, pre- and post-operative hearing levels, and hearing gain were compared between both groups.

Results: The atticosinoplasty technique includes the removal of cholesteatoma through atticotomy or posterior sinusectomy, removal of incus and malleus, transmeatal endoscopic exploration, ossicle reconstruction and wall reconstruction with cartilage. There was no significant difference of hearing gain (PTA) between the atticosinoplasty group (44/72 patients) and the CWUM group (47/73 patients). Decrease of air-bone gap was detected in 61% (44/72) patients in the atticosinoplasty group and in 64% (47/73) in the CWUM group (p>0.05). Revision mastoidectomy was performed in 3 (4.2%) in the atticosinoplasty group and in 4 (5.4%) in the CWUM group. However, revision ossiculoplasty was done less in the atticosinoplasty group (7, 9.7%) rather than the CWUM group (18, 24.6%) (p<0.05).

Conclusion: Atticosinoplasty can be considered as an effective surgical technique for the treatment of early cholesteatoma, resulting in low recurrence rate and improved hearing.

FP19-3 Posterior Wall Reconstruction Using the Temporoparietal Fascia Flap After Canal Wall Down Technique

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Objectives: There are some general principles of tympanoplasty: complete removal of lesion, hearing improvement, quick epithelialization and prevention of postoperative complications. Additionally, recovery of mastoid aeration is desirable. In the present study, we used the pedicled temporoparietal fascia flap (TPFF) for posterior meatal reconstruction for the open cavity to achieve these principles.

Methods: The TPFF was used in 6 patients with cholesteatoma or cholesterol gramuloma for reconstruction of the posterior meatal wall. The skin of the posterior half of the external auditory meatus was elevated from the bony wall. After canal wall down tympanoplasty and mastoidectomy, the pedicled TPFF including the superficial temporal artery was raised ipsilaterally and rotated into the middle ear. The posterior meatal wall was reconstructed by gluing one side of the TPFF to the reverse side of the preserved posterior meatal wall skin.

Results: Mean time to complete epithelialization of the meatal skin in these 6 patients was shorter than that of 27 patients who underwent the meatal reconstruction using the free deep temporal fascia (26 days vs. 37 days) statistically. No postoperative infection in operated ears occurred. CT scans, which were performed one year after the surgery, revealed that recovery of mastoid aeration was observed in 2 patients despite thorough removal of the mucosa in the mastoid cavity.

Conclusion: The TPFF can provide optimal blood supply to the middle ear and external meatal skin. It is possible that the TPFF works positively not only for quick epithelialization and prevention of postoperative infection, but also for recovery of mastoid aeration.

FP19-4 EAC reconstruction/mastoid obliteration using modified Palva flap in canal wall down mastoidectomy

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Introductions: Canal wall down mastoidectomy with tympanoplasty (M&T) as a surgical treatment of chronic otitis media has advantages of easily removing the pathology and early detection of recurrence. However, this also has new discomforts contrast to canal wall up M&T such as long healing time, frequent OPD visit & dressing, difficulty in placement of hearing devices, life-long otologic care for the debris and complain of dizziness in cold weather or swimming. They inevitably come from a cavity developed in canal wall down M&T itself. Many different surgical methods have been introduced such as pedicle flap, use of bone and cartilage, and synthetic materials to prevent a cavity problem. Each method has merit and demerits in terms of efficiency in mastoid obliteration. Authors aim to introduce a different canal wall down M&T methods to overcome this cavity problem. Furthermore, we evaluate the availability of modified Palva flap in external auditory canal reconstruction and mastoid obliteration as a surgical treatment of chronic otitis media using postoperative hearing and temporal bone CT.

Methods and Materials: We analyzed pure tone audiometry and temporal bone CT pre and postoperatively in 31 patients with chronic otitis media from Jan. 2013 to Jan. 2015. Air-bone gaps are used for hearing change with average decibels of 0.5KHz, 1KHz, 2KHz, 3KHz. Effectiveness of mastoid obliteration is evaluated with changes of external auditory canal volume, which is calculated pre and postoperatively on the temporal bone CT using ROI (region of interest) in PACS system. The surgical procedures in this study are equivalent to conventional canal wall down M&T except excluding skin incision in EAC and meatoplasty. Palva flap is widely designed to support whole EAC and to cover the mastoid cavity up to the aditus ad antrum.

Results: The patients consist of 10 males and 21 females with average age of 53.03 years old (23-75 years old). Among 31 patients, 24 patients are operated initially and remaining 7 patients received revision surgery as an initial operation. The ABG is 28.13dB preoperatively and 19.83dB postoperatively. The ratio of pre and postoperative EAC volume is 1.388±0.57. One patient suffered from postauricular infection postoperatively but cured soon with I&D and usual antibiotics.

Conclusions: The modified Palva flap used in this study is an easy and effective method in EAC reconstruction and mastoid obliteration. The hearings are improved and the status of mastoid obliteration is stable until 1 year after operation.

FP19-5 Bony Obliteration Technique in Cholesteatoma Surgery. Results of 5 Year Follow-up in Adult and Pedia

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Introduction: Bony Obliteration Technique (BOT), proposed originally by Prof. Ulf Mercke from Lund in Sweden, comprises complete removal of cholesteatoma involving removal of the remnants of the sick tympanic membrane with malleus and incus, preservation or reconstruction of the posterior wall of the ear canal and obliteration of the mastoid cavity and the epitympanum by bone tissue. Bone chips are used to extend the canal wall medially to the level of the facial canal, closing tightly the posterior tympanotomy and isolating the epitympanum from the middle ear cleft. The mastoid cavity gets obliterated by bone pate mixed with rifampicine antibiotic. In our clinic the tympano-ossicular allograft material is used for the functional reconstruction of the middle ear.

The postoperative follow-up is performed by non-EPI diffusion MRI sequences. The second stage surgery is only performed in the cases of confimed residual pathology of for functional reasons.

The philosophy of BOT relies on an assumption that separation of the middle ear from the antrum and the mastoid cavity by a thick bony wall minimizes the risk of recurrent pathology and creates a small middle ear cleft. Such a small-volume cleft shows audiometric advantages at high (speech) frequencies and is often small enough to stay sufficiently aerated by the Eustachian tube.

Material and Methods: Results of BOT in adult (n=34) and paediatric (n=34) cholesteatoma patients have been evaluated in two separate studies and compared to our previously published results obtained with the canal wall-up technique but without bony obliteration. The follow-up period was 5 years. We looked at the rate of residual and recurrent pathologies in both groups.

Results: In adult BOT population the residual rate was 2, 9% and the recurrent rate also 2, 9%, in BOT pediatric population respectively 5, 8% and 2, 9%. This means significant improvement for both the residual and the recurrent rate comparing to our previously published adult and pediatric results of the canal wall-up technique but without bony obliteration. With the previously used technique the adult (n=319) residual rate was 7, 2% and the recurrent rate 5, 0%, in pediatric population (n=103) respectively 24, 3% and 19, 4%.

Conclusion: Bony Obliteration Technique results in significantly better cholesteatoma control than our previously used canal-wall up technique without bony obliteration. Both the residual pathology rate and the chance for recurrent pathology have been significantly reduced.

FP19-6 Effect of polyglycolic acid sheets on epithelialization in canal wall-down tympanoplasty

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Introduction: Canal wall-down (CWD) tympanoplasty is an established method for the control of infections and has a low risk of cholesteatoma recurrence. However, one disadvantage of the procedure is the long duration of epithelialization. In some cases, failed epithelialization results in long-term discharge, referred to as a cavity problem. This study evaluated a new method using a polyglycolic acid (PGA) sheet for quicker epithelialization in CWD tympanoplasty.

Patients and Methods: Between October 2009 and March 2014, 236 ears underwent tympanoplasty at the Department of Otolaryngology, Kochi Medical School; of these, 52 ears (50 patients) subjected to CWD tympanoplasty were used as study subjects. PGA sheets (0.15 mm thick; Neoveil, Gunze Co. Ltd., Kyoto, Japan) were used to cover the bony surface of the mastoid cavity after the completion of CWD tympanoplasty (PGA group, n = 13). This group was compared with the Kichin group (n = 31), in which the bony surface was covered with poly-N-acetylglucosamine sheets (Beskichin W; Unichika Co. Ltd., Aichi, Japan). The following data were obtained by a retrospective chart review: sex, age at operation, number of operations, preoperative secretions, preoperative bacterial culture results, postoperative diagnosis, complications, days between the operation and completion of epithelialization, and duration of the follow-up period.

Results: In the Kichin group, bacterial cultures revealed the presence of methicillin-resistant Staphylococcus aureus (MRSA) in three ears, Pseudomonas aeruginosa in two ears, and fungi in seven ears. In the PGA group, they showed MRSA in one ear and P. aeruginosa in one ear. The mean operation numbers were 1.7 times in the Kichin group and 1.9 times in the PGA group. Three ears had not epithelialized even on the last visit (155, 626, and 1059 days after the operation). In the PGA group, 13 ears of 13 patients were operated on and 1 ear had not epithelialized at 365 days after the operation. The mean duration for complete epithelialization was 213 days after the operation in the Kichin group, and 97 days in the PGA group. The PGA group showed significantly faster epithelialization ($p < 0.01$), although the number of operated ears was limited.

Discussion and Conclusions: PGA sheets are a new material for reinforcing sutured wounds; the sheets were designed for pleural or peritoneal wounds. Such sheets are bioabsorbable; the material is absorbed in 15 weeks, and it has been shown to cause few xenobiotic reactions. Recently, PGA sheets have been used in oral wounds after partial glossectomies or resection of the buccal mucosa with fibrin glue, and less scar formation and faster epithelialization were reported. We have used PGA sheets instead of poly-N-acetylglucosamine sheets in CWD tympanoplasties since November 2013. Using PGA sheets, secretion from the mastoid cavity was reduced and quicker epithelialization was obtained without complications. PGA sheets facilitate quicker epithelialization of bony surfaces in CWD tympanoplasties.

FP19-7 Canal wall up tympanoplasty with tissue-engineered cell sheets transplantation

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Objectives: In many cases with intractable otitis media including cholesteatoma and adhesive otitis media, tympanoplasty with mastoidectomy is presently a common surgical treatment. Postoperative middle ear mucosal regeneration is of great importance after otological surgery. The likelihood of recurrent retraction and adhesion of newly formed tympanic membrane is high when normal middle ear mucosa is extensively lost during intractable middle surgery. If rapid postoperative regeneration of the mucosa on the exposed bone surface can be achieved, prevention of recurrent tympanic membrane adhesion and cholesteatoma formation can be expected. We have previously demonstrated a new method to transplant autologous nasal mucosal epithelial cell-sheets into the damaged middle ear cavity using temperature-responsive culture insert in a rabbit model. The aim of this study was to develop a new method to transplant autologous cell-sheets to promote postoperative regeneration of the middle ear mucosa in clinical trials.

Methods: We harvested 10-by-10-mm specimens of inferior turbinate mucosal tissue from the patient with aquired middle ear cholesteaoma. Tissue-engineeed epithelial-cell sheets were fabricated ex vivo by culturing harvested cells for three weeks on temperature-responsive culture dishes in a cell-processing center (CPC) according to good manufacturing practice (GMP) guidelines. After canal wall up tympanoplasty with mastoidectomy had been performed, sheets of cultured autologous cells that had been harvested with a simple reduced-temperature treatment were transplanted directly into the exposed bone surface of middle ear cavity from which normal mucosa had been defect.

Results: During the cultivation, the sterile environment in the CPC was confirmed. Autologous cell sheets were successfully transplanted to human middle ear. We have already clinically applied cultured autologous nasal mucosal epithelial cell sheets fabricated on a temperature-responsive culture dishes to treat 4 patients of middle ear cholesteatoma after middle ear surgery. There was no recurrence in all patients. They are making steady progress after transplantation.

Conclusion: This is the clinical study whose protocol has been formally approved from the Ministry of Health, Labour and Welfare in Japan. Furthermore this is a first-in-man study in the world that the cultured cells were transplanted to the human ear. This novel technology of transplantation might be an effective alternative to the surgical operation on intractable otitis media in the near future.

FP20-1 COMPARATIVE ANALYSIS OF PREOPERATIVE HRCT AND CBCT SCANS IN HISTOLOGICALLY DIAGNOSED STAPES FIXATION

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Introduction: Otosclerosis is a disease of a complex and unique inflammatory bone remodeling disorder of the human otic capsule with still unclarified etiology. Intact tympanic membrane with subsequent conductive hearing loss, reveals to various types of stapes fixations. According to previous reports, approximately two-third of these cases can be considered as otosclerosis. Different imaging modalities might exclude several differential diagnostic problems, such as superior semicircular canal dehiscence syndrome, congenital middle ear malformations or enlarged vestibular aqueduct. Currently, preoperative differential diagnosis of stapes ankylosis has high priority due to the patients' requirements and consents and also to the most appropriate treatment planning for ear surgeons.

Objective: To estimate the diagnostic values of HRCT (high resolution computed tomography) and CBCT (cone-beam computed tomography) in the preoperative diagnosis of stapes ankylosis in comparison with preoperative audiometric results and postoperative histopathologic findings, respectively.

Materials and Methods: Three overlapping studies were performed on 132 patients with clinically diagnosed stapes ankylosis. Patients were recruited into three different study groups: 1) a total of 57 patients underwent preoperative HRCT, audiologic examination and unilateral stapedectomy due to stapes ankylosis. HRCT findings were categorized according to Marshall's grading system and were compared to postoperative histopathologic findings; 2) 32 patients were preoperatively analyzed by CBCT, who underwent unilateral stapedectomy and then otosclerosis was confirmed histologically as being an inclusion criterion; and 3) 43 patients were investigated both by CBCT and HRCT preoperatively, then unilateral stapedectomy followed and all the stapes footplates contained otosclerotic focus similarly to the previous project. Finally, all fully removed stapes footplates were reconstructed and the grade of histopathologic activity of otosclerosis was determined.

Results: Active otosclerosis was demonstrated by HRCT with a sensitivity of 76.3%, whereas sensitivity levels for histologically inactive otosclerosis were limited to 61.9%. Sensitivity for non-otosclerotic stapes fixations (51.7%) was much lower. In contrast to HRCT, active otosclerosis was evaluated by CBCT with the sensitivity of 100%, however; it was unable to detect histologically inactive otosclerosis (0%). In our comparative study, active otosclerotic foci were identified by both CBCT and HRCT in all cases (100%). Histologically confirmed inactive otosclerosis could be noticed by HRCT with the sensitivity of 59.3%, although CBCT likewise could not detect inactive foci and retrofenestral lesions.

Conclusion: CBCT is a reliable imaging method with considerably lower radiation dose than HRCT. However, these high sensitivity is associated by hypodense lesions due to histologically active otosclerosis. According to these results, HRCT still remains the basic imaging modality in the preoperative diagnosis of otosclerotic- and non-otosclerotic stapes ankylosis, since it has much greater sensitivity and specificity in the detection of retrofenestral hypodense lesions and histologically inactive otosclerotic foci in the oval window niche. In the nearest future, continuous evolving of analyzer softwares, CBCT might replace HRCT in the preoperative analysis of stapes fixations.

Keywords: Audiometry, CBCT, Histopathology, HRCT, Otosclerosis, Non-otosclerotic stapes fixations

FP20-2 Withdrawal

FP20-3 Causes of failure in otosclerosis surgeries

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Over 25 years of otosclerosis treatment, including operation of over 15000 ears allows us to critically analyze the sparse failures we encountered. Failures in stapedotomy occur statistically rarely. We should however remember that these failures may include cases of sudden deterioration of hearing or sometimes total deafness. The aim of the study is to analyze failures after otosclerosis surgery. The study is based on the assessment of intraoperative conditions.

The material included 502 cases (3.2%) of the ears chosen from the 15673 of all operated ears. Reoperations were conducted mainly after previous otosurgeries in other hospitals (58.6%). Detailed analysis of the reoperation material allows us to indicate a few groups of causes of failures which we have encountered in last 25 years of otosclerosis treatment. In the present study the authors discuss in detail all main groups of failures in otosclerosis surgeries. They illustrate the material with difficult cases.

Most of the failures resulted from the stapes prosthesis applied during the previous operations. The first group of failures include patients with tantalum wire prosthesis used with a fat clot which in time got resorbed or formed adhesions in the area of the round window niche. The second group of the failures can be caused by self-crimping prosthesis that were slipping from the long process of the incus or if fixed tight caused the long process necrosis. Third group of failures, followed usually by serious complications, was caused by lack of the sealing between the hole in the stapes footplate and a piston; removal of considerable part or whole stapes footplate resulting in formation of a fistula. The fourth group includes cases of excessive and unjustified in some cases surgeon's approach to the vestibule. It can be a result of difficult local conditions, such as overhanging nerve VII, narrow round window niche or obliteration of the round window. The next group of failures concerns surgical approach of an operator and his experience. Problems may be caused by excessive broadening of external meatus, followed by a collapse of the tympanic membrane on the process of the incus; incorrectly adjusted length of the prosthesis and careless suction of the endolymph.

Even though the results of treatment of otosclerosis obtained in the World Hearing Center of the Institute of Physiology and Pathology of Hearing are the best in the whole otosurgery of the middle ear we cannot exclude the other unforeseen failures, which can occur directly after operation; active otosclerosis process afterwards and age deterioration of related hearing.

FP20-4 Surgical treatment of otosclerosis with limited air-bone gap

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Dynamic development of otosurgery, increasing availability of the properly manufactured stapes prosthesis allows us to broaden the indications to perform stapedotomy in some justified cases. Such indications include advanced otosclerosis with limited air-bone gap.

It should be emphasized that considerable air-bone gap revealed by audiometric test is not the only eligibility criterion for otosclerosis surgery. Rapid deterioration of hearing, increasing tinnitus, progressive changes within cochlea and often a very young age of patients decide on earlier surgery, even in cases of patients with limited (15-20 dB) air-bone gap. Computed tomography is a useful tool for the diagnostics in such cases. It allows to detect otospongiotic lesions or other causes of congenital or acquired hearing loss.

Material consists of 247 cases of ears with advanced mixed hearing loss and limited air-bine gap mean 20 dB. Results obtained in this group indicate improvement of hearing with air-bone gap closure and in over 50% of cases lowered bone conduction thresholds.

One of the important reasons for the decision on surgical treatment included seizure of hearing loss progression in the postoperative period. In most of the cases tinnitus disappeared or was decreased which improved the quality of life of the patients.

Concluding the authors maintain that the decision on surgery depends on the surgical experience of an operator. It is reasonable to perform stapedectomy in cases of progressive mixed hearing loss, progressive otosclerotic lesions in the inner ear and coexisting long-lasting tinnitus by the experienced surgeon, who performed several thousand surgeries and dealt with various difficult anatomical issues.

FP20-5 Stapedotomy in advanced pathology of the middle ear

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The Institute's team practical experience in otosclerosis treatment includes 15500 standard operations on stapes. The surgery is a method of choice in conductive and mixed hearing loss in children and adults. The experience gained in otosclerosis treatment allowed us to broaden indications for such surgeries in cases of stapes immobilization in treatment of other middle ear pathologies. Indications included congenital malformations of the middle ear, posttraumatic stapes immobility, immobility of more than one ossicles in treatment of tympanosclerosis and immobility of stapes' suprastructure in chronic otitis media. In chronic cases there were two surgeries performed, the second one included structure reconstruction and removal of postinflammatory lesions in the middle ear.

Our material included 15673 ears operated in 1997-2013.

Surgical techniques were applied depending on local conditions and included opening of the middle ear via acoustic meatus. In cases of immobilized stapes or a missing stapes suprastructure, a 0.6 mm opening was performed in a footplate so that a suitable piston (of a diameter 0, 37; 0, 42 or 0, 6 mm) could be inserted in the opening. The piston surroundings was sealed with a venous blood clot. Depending on the circumstances a titanium clip was fixed on a crus of the incus, neck or manubrium of the malleus, glassionomer attachment or to a cartilage plate attached to the tympanic membrane during previous surgery. For the last 4 years titanium prostheses with micro ball joint have been used in such surgeries.

The long-term (10 ten years) results, 5 years and 6 months results are stable. We have observed good and constant audiological results in most of the patients.

Obtained results allow us to extend previous indications to apply stapedotomy in various pathologies of the middle ear but it will always require extraordinary caution for the benefit of the patients and their ears.

FP20-6 Hearing results in otosclerosis surgery after total stapedoectomy and stapedotomy

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Otosclerosis is occurred when the structure of connecting tissue in the area of stapedius and the oval window has changed and become unmovable. Consequently, conductive hearing loss and therefore severe sensorineural hearing loss are caused.

Any research works has not been done on stape otosclerosis in Mongolia until now and we have conducted the research in 2008-2013.

We selected 41 patients /47 ears/ who were diagnosed of having otosclerosis with conductive hearing loss, no middle ear infection through the comprehensive ear and hearing examinations in EMJJ Clinics between 2007 and 2013. We used titanium prosthesis with 0, 4-0, 6 MM wide and 4, 0-4, 5 MM long of KURZ company, Germany. 35 patients (85.4%) were female while 6 patients (14.6%) were male.12 patients (85.4%) had the tinnitus symptom and 4 (85.4%) had the symptom of tinnitus and dizziness.

11 people, who were 8-25 years olds, were diagnosed of Schwarz sign and 25 patients had decreased hearing with 25-45 dB in 2000 and 4000 Hz frequency (Carhart's Syndrome).

The hearing test showed that bone thresholds was normal, air thresholds was 35, 4±15, 1 dB and bone-air gap was 25, 4±15, 1 dB for 11 people, bone thresholds was 2000 Hz and at 4000 Hz frequency decrease of 25-30 dB, air thresholds 45, 4±14, 1 dB, and bone-air gap 38, 4±13, 1dB for 21 persons, bone thresholds 2000 Hz, 4000 Hz, at 8000 Hz frequency hearing decrease of 30-80 dB, and bone-air gap 38, 4±14, 1 dB for 9 persons.

Patients were classified by hearing loss level and type: II level hearing loss 8, 7%, III level hearing loss 37, 4%, IV level hearing loss 4, 8% with hearing aid, II level 64%, III level 49, 7%, IV level 79, 0% sensorineural hearing loss and 12, 9%-33, 3% of all patients had mixed hearing loss, which showed the need for improving hearing (Chart No.4).

Specifically, stapedotomy was done for 11 patients, partial stapedotomy was done for 21 patients and full stapedotomy was done for 14 patients. After the surgery 25 patients did not have dizziness and vomitting symptoms and 14 patients did not have dizziness with movement after 12 hours, and for 4 patients all simptoms were disappeared after 24 hours.

As for the result from the hearing examination after 21 days of the surgery, bone conduction is normal, air conduction 15, 4±5, 1 db and bone-air gap 10, 4±4, 1 for 21 patients, bone conduction 2000 Hz and at 4000 Hz frequency 15-20 db, air conduction 20, 4±10, 1 db, bone-air gap 15, 4±3, 1 db for 8 persons, bone conduction 2000 Hz, 4000 Hz, at 8000 Hz frequency 25-45 db, air conduction 35-65 db and 20, 4±5, 1 db for 9 persons. This measurement shows the hearing improvement ($p<0, 01$) and all patients had no more dizziness and 4 patients had tinnitus simptoms.

After 120 days of the surgery, the hearing of 33 patients improved completely, bone conduction became 2000 Hz at 4000 Hz frequency 12-15 dB, average of air conduction 15, 4±10, 1 dB, bone-air gap 10, 4±3, 1 dB for 5 people, and bone conduction 2000 Hz-4000 Hz, at 8000 Hz frequency 20-40dB, air conduction became 25-45dB 10, 4±5, 1db for 9 patients and all patients had no hearing loss except for 4 people who still had tinnitus.

FP20-7 Surgical results of congenital stapes footplate fixation in Japan

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Stapes surgery is a well-established procedure in adults. However, stapes surgery in children is less commonly performed, primarily because of the risk of postoperative sensorineural hearing loss. Given the uncommon cause of hearing loss among Japanese, it is quite natural to adopt CO2 laser in stapedotomy to avoid intraoperative labyrinthine injury due to manipulation of the stapes footplate.

To describe the audiometric results after stapes surgery in a series of patients with stapes footplate ankylosis combined with or without another ossicular middle ear anomaly.

Eleven patients (7 women; 4 men) ranging in age from 7 to 29 years who underwent 12 CO2 laser assisted-stapedotomy with Teflon piston were enrolled in this study from January 2010 to May 2013.

Overall, a mean gain in air conduction of 28.8 dB (from 51.1 dB to 22.3 dB) and a mean postoperative air-bone gap (ABG) of 9.1 dB (mean preoperative ABG, 32.4 dB) were observed. The ABG closure was 20 dB or less in 100% of cases.

FP21-1 Bone destruction in chronic otitis media with cholesteatoma

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Cholesteatoma is a common middle ear disease associated with chronic otitis media.Morphologicaly, the main components present epitelial matrix and connective tissue containing granulation tissue with many inflamatory cells, as perimatrix.Clinically, cholesteatoma is destructive to the temporal bone and may cause various complications, such as labyrinthine fistula, facial palsy, brain abscess, and other intracranial complications in association of hearing loss. The role a different celular element in the pathogenesis of destructive effects of cholesteatoma has been investigated for many years.Many studied point out the role pressure by cholesteatoma, than a various biochemical factors as enzymes (phosphatase, collagenase, lysosomal enzymes), many imunological process and others. By using a new radiological methods for diagnosis of cholesteatoma (CT, MR) is possible to estimate a topgraphic distribution and bone lesion of cholesteatoma in the temporal bone.We prospectively studied patients with middle ear inflammation using CT and MRI scans.Our results indicated that inflammatory granulation tissue, cholesteatoma, and cholesterol granuloma can be differentiated by examination of the signal intensity. Howeve, it is not essencial to perform MRI in all cases of chronic otitis media. We suggest that MRI is vey usefull in cases in which the disease is not possible to differentiate on the basis of clinical and CT findings. Also, it is important to evaluate complication before deciding on the surgical treatment.

FP21-2 The efficacy of color mapped fusion images combined with CT scan in preoperatively evaluating the anatomical location of cholesteatomas using transcanal endoscopic ear surgery

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Cholesteatomas are typically treated using conventional microscopic ear surgery (MES). However, our group has developed a new procedure incorporating the endoscope called transcanal endoscopic ear surgery (TEES). TEES is less invasive procedure for the treatment of cholesteatoma through the ear canal without the need for a large, invasive retroauricular incision. However, TEES can only be used to treat cholesteatomas located in the attic and antrum. Therefore, preoperative evaluation of the anatomical location of a cholesteatoma is crucial in determining whether a patient is indicated for TEES. Diffusion-weighted imaging (DWI), a variation of conventional MRI, has recently been used to detect cholesteatomas. Non-EPI DWI has been reported to be more reliable in identifying cholesteatomas than EPI DWI. However, non-EPI DWI has a major drawback: the anatomical location is harder to identify because of lower image resolution. Therefore, we were able to better clarify the anatomical location of a cholesteatoma by combining a 1mm thin slice non-EPI DWI with MR cisternography. We also performed color mapping to enhance the visualization of the cholesteatoma. T1 weighted image (T1WI) was simultaneously performed to reduce false positives, and preoperative endoscopic examination was also performed to reduce false negatives. CT scan was successfully fused with this enhanced non-EPI DWI (Color Mapped Fusion Images: CMFI) for further better clarification of the cholesteatoma position within the temporal bone structure. The preoperative findings from CMFI were compared to the intraoperative findings. Both the positive predictive value (PPV) and negative predictive value (NPV) were also evaluated for each group. Both the PPV and NPV obtained from the CMFIs were over 90% in all areas of the middle ear, and CT-CMFI facilitated accurate detection of the anatomical location of cholesteatomas. The incidence of false positives was further reduced by performing T1WI to distinguish between cholesteatomas and cholesterin granulomas. The incidence of false negatives was further reduced by performing preoperative endoscopic examination to detect cholesteatomas without debris. We conclude that CT-CMFI is a reliable diagnostic modality for evaluating the anatomical location of cholesteatomas and determining whether TEES is indicated for treatment in such cases.

FP21-3 Comparison of petromastoid pneumatization growth curves in normal ears and cholesteatoma

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Introduction: There is a well recognized, but poorly understood association between poor pneumatization of the petromastoid bone and the development of paediatric middle ear disease, particularly cholesteatoma. Retention of mesotympanic amniotic fluid, Eustachian tube dysfunction and otitis media are hypothetical causes of poor pneumatization. A better understanding of the pathogenesis may lead to advances in prevention and care of chronic middle ear disease.

To date, the difficulty of accurate quantification of the volume of pneumatization and mucosal surface area within the petromastoid bone has prevented advances in understanding its relevance to disease processes and clinical care. The power of current computers and image processing software now allow semi-automatic quantification of petromastoid pneumatization from computed tomography (CT) scan images of the temporal bone.

Objective: To accurately quantify petromastoid pneumatization of the temporal bone in the normal pediatric population, and in children who have been diagnosed with cholesteatoma with the aim of improving understanding of its clinical relevance to the development of middle ear disease.

Study Design: A case-control study of the surface area and volume of pneumatization in temporal bones of children with and without cholesteatoma. In addition, inter-rater reliability was assessed to validate measurements.

Methods: A semi-automated process was developed to extract measurements of petromastoid bone volume, pneumatization volume and surface area, from a three dimensional (3-D) image that was reconstructed from temporal bone CT scans using Analyze 11.0 software. This process was applied to 40, high-resolution CT images of children, 20 with surgically confirmed cholesteatoma and 20 controls with no ear disease. Inter-rater reliability of measures was calculated using Pearson product-moment correlation coefficient. Demographic and measurement data were then compared between the two study groups using Mann-Whitney U and t-tests. A growth curve for development of pneumatization volume with age was plotted for control and cholesteatoma ears.

Results: The mean age at CT scan was 9.5 (SD 4.3) years, with no difference in age between the cholesteatoma and the control groups ($p = 0.39$). Pneumatization volume ($p < 0.0001$) and surface area ($p = 0.03$) were significantly lower among patients with cholesteatoma than controls but the size of the petromastoid bone was similar ($p = 0.64$). Intra-class correlation coefficients indicated agreement and reliability of measurements to be "almost perfect" (>0.8). For ears with cholesteatoma, the growth curve for pneumatization volume remains static and diverges from normal development by age 8 years.

Conclusions: Petromastoid bone volume, pneumatization and surface area can be measured objectively and reliably with this semi-automated process. These findings are consistent with less rigorous observations that poor pneumatization of the mastoid is associated with the development of cholesteatoma. Pneumatization in ears with cholesteatoma appears equivalent in volume to that of children under 8 years old. Therefore the development of pneumatization is either arrested before this age, or progresses more slowly in ears that develop cholesteatoma. Further application of this technique will refine details of the development of pneumatization and enhance understanding of the timing of the events that lead to impaired pneumatization and subsequently cholesteatoma.

FP21-4 Growth of secondary cholesteatoma versus primary cholesteatoma (pars tensa retraction type)

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Objective: To compare the growth of secondary cholesteatoma with that of primary cholesteatoma (pars tensa retraction type).

Methods: This study included 41 ears with secondary cholesteatoma (secondary group) and 54 ears with pars tensa type cholesteatoma (pars tensa group) that underwent primary tympanoplasty during a 6-year period. The ears were evaluated in terms of the following parameters: patient age at the time of tympanoplasty, otoscopic findings, hearing acuity, extent of ossicular destruction, and development of mastoid air cells.

Results: The size of the perforation varied, and the edge of the perforation was not smooth in most ears in the secondary group. The cholesteatoma matrix in the secondary group was mostly found around the malleus handle and was significantly limited to within the epitympanum, while that in the pars tensa group extended to the mastoid ($p<0.01$). Ossicular destruction of the incus and superstructure of the stapes was less frequently seen in the secondary group than in the pars tensa group. Development of mastoid air cells was significantly better in the secondary group than in the pars tensa group.

Conclusion: The two groups of patients showed significantly different clinical characteristics. Cholesteatomas in the secondary group tended to ascend to the surface of the ossicle. The cause of the abnormal proliferation of epithelial migration was unknown. Long-term recurrent infection and an episode such as trauma or tympanic tube insertion are not necessarily required for onset of cholesteatoma.

FP21-5 Practicality analysis of staging criteria of cholesteatoma: a multicenter, retrospective study

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Objective: To analyze the practicality of staging criteria of acquired cholesteatoma (2010) in Japan.

Methods: A total of 446 surgical cases of acquired cholesteatoma between 2009 and 2010 at six institutes were analyzed using staging criteria of acquired Cholesteatoma (2010) in Japan.

Results: All cases were classified as pars flaccida (325cases, 73%), pars tensa (100cases, 22%), or combined group (21cases, 5%) according to the eardrum status. Mastoid extension of cholesteatoma was seen in 79% of the pars flaccida group and 37% of the pars tensa group. In both groups, patients underwent trans canal atticotomy (TCA) or canal wall up tympanoplasty (CWU) in almost all cases of limited extension. In cases of mastoid extension, patients underwent CWU or canal wall down tympanoplasty with canal reconstruction (CWDR). The rate of CWU in the pars tensa group was higher than that in the pars flaccida group. The rate of postoperative air-bone gap (ABG) less than 20dB was 72% in the pars flaccida group, 64% in the pars tensa group, and 43% in the combined group. Those rates decreased with increasing the degree of cholesteatoma staging. The residual disease at second look peaked out 12 months postoperatively, those after single stage operation appeared 24~36 months postoperatively. The recurrences were distributed equally between 6 months and 36 months. Every type of recurrence increased in accordance with degree of staging.

Conclusion: The severity of staging is proportional to hearing results and recurrence rate. These staging criteria can be used not only as tools for collecting data from different sources, but also as a predictor of outcome.

FP21-6 Surgical management for middle ear cholesteatoma according to the staging

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Objectives: Surgical management of middle ear cholesteatoma is still controversial. Canal wall up surgery preserves the normal ear canal structure which prevents cavity problems such as erosion and crusting, although recurrence rate of the disease is high. Recently Japan Otological Society advocated the cholesteatoma staging consisting of I, II, and III stage. In this study, we indicate our surgical strategy of middle ear cholesteatoma according to the staging, and describe the surgery using movies.

Methods: 163 patients with middle ear chokesteatoma were operated on between 1998 and 2012. All patients were divided into the following three groups.

Stage I (n = 47) : Cholesteatoma is limited to the tympanic cavity. Canal wall up tympanoplasty including transcanal atticotomy were performed. The ossicular chain was occasionally removed due to cholesteatoma invasion and then reconstructed.

Stage II (n = 83) : Cholesteatoma extends over the ossicles and into the mastoid cavity. Planned staged canal wall up tympanoplasty was selected. The 1st-stage operation included scutum plasty and mastoid cortex plasty with bone pate following removal of cholesteatoma and ossicles involved. At the 2nd-stage operation after a year, the pathologic findings including residuals were investigated and treated. The ossicular chains were reconstructed using hydroxy apatite prosthesis and scutum reconstructed was revised with sliced auricular cartilage. Mastoid cavity obliteration was performed in case of the non-aerated mastoid cavity.

Stage III (n = 33) : Cholesteatoma is accompanied by complications such as large destruction of the ear canal, labyrinthine fistula, and facial palsy. Canal wall down procedure to eradicate the disease was done, and the complications were treated. The ossicular reconstruction was not required in severe cases.

Outcomes & Conclusion: Two temporary facial palsy cases were found although severe surgical complications were not encountered. In a long-term follow-up, no recurrence from the retraction pocket was seen but eight residual recurrence cases were found.

Our surgical management for middle ear cholesteatoma appears acceptable, and may offer a useful alternative to canal wall down surgery in stage II cases.

FP22-1 Clinical classification of middle ear anomaly: 109 cases in University of Miyazaki hospital

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Objective: The aim of this study was to evaluate two classification systems of middle ear anomalies.

Materials and Methods: One hundred and nine cases (131 ears) diagnosed by surgical findings as middle ear anomaly experienced at University of Miyazaki hospital from 1989 to 2012 were studied. Those who had severe external auditory canal stenosis or a history of recurrent medial otitis were excluded. Pathological conditions of anomaly were classified based on the two popular classification systems proposed by Funasaka (1977) and Teunissen (2000).

Results: The number of ears assigned according to Teunissen system was following: 1) congenital stapes ankylosis 13 ears, 2) congenital stapes ankylosis with another anomaly 38 ears, 3a) mobile footplate with ossicular discontinuity 46 ears, 3b) mobile footplate with epitympanic fixation 14 ears, and 4) oval/round window dysplasia/aplasia 15 ears. Several conditions such as malleus or incus ankylosis without epitympanic fixation (5 ears) were unable to classify into any categories of either Teunissen or Funasaka system. Isolated stapes superstructure fixation was found in 2 ears, which was categorized as incudostapedial joint anomaly in Funasaka system in spite of immobile stapes.

Discussion: Funasaka's and Teunissen's systems have been widely used in Japan as middle ear anomaly classification based on surgical findings. Although stapes superstructure fixation can be categorized into the same group with footplate fixation in Teunissen's system, this particular pathological condition should be distinguished from footplate fixation in Funasaka's system. Combination of subclassification system of congenital stapes ankylosis proposed by Nandapalan et al (1999) should be taken into consideration. Similar problems also exist in the malleus and/or incus fixation because they are defined as ankylosis with epitympanic wall in either system.

FP22-2 Politzer Prize Nominee (PP-6)

FP22-3 Management of Congenital Ossicular Chain Malformation

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Objective: To report the clinical manifestations, diagnosis, ossicular reconstructions and results of the isolated congenital malformation of ossicular chain with normal external ear.

Methods: Between 2000 to 2008, twenty one patients with isolated congenital malformation of middle ear were involved in this study. Not only the symptoms, pre-surgical hearing results, and the temporal bone high resolution computer tomography (HRCT) images, but also the surgical finding and the post-surgical hearing results were reviewed.

Results: Of this 29 patients, 9 were bilateral, 20 were unilateral, and one patient refuse surgery while another 3 accepted simple middle ear exploration without fenestration of foot-plate. The preoperational AB-Gap was ranged from 30 dB to 60dB, and 52.68±7.85dB in average. 16 malformation of the stapes (fixation, 7; total superstructure absence, 6; partial superstructure absence, 3), 14 deficiency of long process of incuses, 2 incudomalleolar joint fixations and 4 dysplasia of the malleus were identified in operation. Facial nerve tympanic segment canal deficiencies were found in 6 patients and one of them transform the middle ear under the oval window. Cholesteatomas were found in the attic compared with the abnormal ossicles in 4 patients. Results of the temporal bone HRCT were confirmed by surgical findings. 12 PORPs, 8 TORPs and 5 PISTONs were used to reconstruct the ossicular chain. All of the patients were followed up for 12-24 months, and hearings of these patients were satisfied improved 12 months after operation. The postsurgical AB-Gap of PORP, TORP and PISTON was 14.16±4.68dB, 23.75±6.25dB, 18±5.60dB respectively. Post-operational vertigo, temporally facial paralysis and slightly high frequencies sensor neural hearing loss were found in 3 different patients.

Conclusions: The conductive hearing loss which presented after birth immediately was the main symptom of the isolated congenital malformation of ossicular chain. Abnormal stapes and incuses are much more common than melleus in these patients and sometime anomalies facial nerve could be found in the operation. The temporal bone HRCT is very helpful in the diagnosis and treatment of the congenital malformation of the ossicular chain, for it's accuracy and reliableness. Different kind of ossicular prostheses could be used according to the situation, and the hearing could be improved satisfiedly.

FP22-4 Stapes fixation accompanied with abnormal facial nerve pathway

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Embryologically, the facial nerve is derived from the second branchial arch, and the middle and external ear are derived from the first and second branchial arches. It has been reported that an abnormal facial nerve pathway usually occurs in conjunction with congenital malformation of the middle and/or external ear, because they are formed at almost the same time. In this report, we describe a case with an abnormal facial nerve pathway that we encountered during surgery for otosclerosis.

The patient was a 52-year-old woman. She had been aware of her bilateral hearing loss since she was 20 years old. The hearing in her left ear started to deteriorate at the age of 49. Pure-tone audiometry showed a bilateral mixed hearing loss. The hearing levels for the right ear and the left ear were 52 dB and 68 dB, respectively. There were no remarkable findings in a computed tomography (CT) scan of the temporal bone. We suspected that she had otosclerosis, and an operation was performed on her left ear. When the incudostapedial joint (I-S joint) was exposed to investigate the movement of the stapes, a soft white band that ran under the superstructure of the stapes was noted. By using a nerve monitoring system, we confirmed that the white band was the bare facial nerve. The ossicular chain was normal, except for a malformed stapes due to the facial nerve, and the footplate of the stapes was fixed. Therefore, she was diagnosed as having otosclerosis with an abnormal facial nerve pathway. The malformed superstructure of the stapes was removed carefully. When the ectopic facial nerve was shifted to anteroinferior side, the oval window could be seen. Stapedotomy using a Teflon piston prosthesis was performed with no complications.

During stapes surgery for otosclerosis, we incidentally encountered an abnormal facial nerve pathway. An abnormal facial nerve pathway can exist even if there is no significant ossicular anomaly. Stapes surgery can be performed even if the round window is covered by the ectopic facial nerve.

FP22-5 A Case report on 9 years old male patient with Incus Hammer showing unilateral conductive hearing impairment

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Background and Introduction: The patients with congenital ossicular chain anormaly usually shows conductive hearing loss. We have experienced more than 10 cases in children in the past, but the unilateral cases are apt to be diagnosed at school ages because of public screeing at school.

Case Presentation: This time, we have experienced a very rare case of incus hammer with conductive hearing loss on the left side in 9 years old male patient. Otoscopic finding shows no abnormal finding of left ear drum. But pure tone audiogram shows conductive hearing loss (25dB) with no sensorineural hearing loss. Tympanogram shows type A pattern, and auditory reflex does no response on the left side (ipsilateral and contralateral stimulation). Temporal bone CT indicated no remarkable ossicular chain defect with a minimal abnormal findings, but exact diagnosis could not be confirmed preoperatively. We recommended his parents to undergo ear surgery to make sure the reason why he have got to have a conductive hearing impairment and suggical treatment if possible. At the operation, as shown in the following picture, we have found an abnormal hammer-like bony structure originating from annular ring bony wall at posterior part and connect to long process of incus, without any inflammatory changes in middle ear mucosa. Therefore, with an employment of endoscope-assisted ear surgery, we gently removed this attachment of bony structure from incus and annular ring bony wall at posterior part as well. Postoperatively pure tone audiometry much improved (8.8dB) and auditory reflex became normal and the patient had no tinnitus or vertigo afterward.

Coclusion: We have recently experienced a case of incus hammer with conductive hearing impaiaarment. So, in the presentation, we are going to address details of this case with videopresentation, if possible and have a brief literature review on these kinds of ossicular chain anomaly such as maleus hammer.

FP22-6 Ossicular anomalies accompanied by congenital glaucoma in two generations

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Introduction: It is known that hearing loss is accompanied by various abnormalities of eyes, but the hereditary hearing loss accompanied by congenital glaucoma has not been reported. We have experienced two female patients, a mother and a daughter, who had congenital glaucoma and hearing loss. Exploratory tympanotomy revealed ossicular chain anomalies in both patients.

Case 1: A 33-year-old woman presented with one year history of bilateral hearing loss. She had surgery of congenital glaucoma when she was two months old. In the family history, her daughter and her son had a moderate hearing loss and congenital glaucoma. Her bilateral eardrums were thin and pure tone audiometry showed bilateral conductive hearing loss (31.7dB in the right and 50dB in the left). Tympanograms were A type bilaterally, and stapedial reflex was absent. In temporal bone CT, long process of the left incus was not clearly seen. Exploratory tympanotomy of the left side revealed that the long process of the incus was replaced by the fibrous tissue and incudostapedial joint was fused. Type II tympanoplasty was performed and the postoperative left air conduction threshold was 26.3dB.

Case 2: 5 -year-old girl, a daughter of case 1, had surgery of congenital glaucoma three times and atrial septal defect was pointed out at the age of 5 months. Hearing loss was diagnosis at the medical checkup when she was three years old. Then she was fitted with a hearing aid. Eardrums were normal bilaterally. Pure tone audiometry revealed bilateral combined hearing loss. Air conduction thresholds of her right and left ear were 60dB and 55dB, respectively. Bone conduction thresholds of her right and left ear were 20dB and 26.7dB, bilaterally. Temporal bone CT showed missing incus long process bilaterally. Exploratory tympanotomy of the right side confirmed the missing incus long process and tympanoplasty (type IIIi-M) was performed. Postoperative air conduction threshold was 35dB.

Discussion: Ossicular anomalies accompanied by congenital glaucoma have not been reported. Hearing levels of the two patients varied by degree and ossicular morphology was different between the two. Thus, we should be careful to determine that the ossicular anomaly is hereditary. Moreover, congenital glaucoma and ossicular anomaly can be a coincidence. Although many points are unclear, the combination of congenital glaucoma and ossicular anomaly is valuable.

FP23-1 Politzer Prize Nominee (PP-5)

FP23-2 MRI and functional study in cochlear nerve deficiency. Decision making for implantation

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Introduction: Cochlear Implant (CI) is today the treatment of choice in cases with profound sensory-neural hearing loss. When the cause of hearing loss is associated with a cochlear nerve malformation an auditory brainstem implant (ABI) should be considered as a better therapeutic option.

Nowadays it is possible to study the nerves in the ear canal with MRI, but a study of the function of the auditory nerve has not been established. Nevertheless a cochlear nerve malformation on MRI does not always mean a total loss of auditory function and good results have been reported of cochlear implantation in patients with of cochlear nerve aplasia or hypoplasia.

We propose a making decision based on the use of brain stem response electrically elicited by cochlear electrical stimulation (BSREE), in order to evaluate the functional status of the auditory pathway.

Methods: A descriptive and retrospective study of the cases of aplasia or hypoplasia of the cochlea-vestibular nerve diagnosed with MRI in our Hospital in the last twelve years was done.

In all cases, a study with MRI of the cochlea-vestibular nerve was performed. The results were classified according with Casselman classification. A conventional evaluation of hearing, including BSER acoustically elicited was performed.

In cases with bilateral involvement and deafness, a study with evoked brainstem potentials by electrical stimulation of the round window, was made. According to the results of this test, making decision was established to indicate a cochlear implant or an ABI.

Results: 34 patients were studied by a diagnosis of aplasia/hypoplasia of the VCN. Twenty of them presented bilateral aplasia (13 ears type I, 14 type IIa, 9 types IIb and four type III) and fourteen unilateral (2 ears type I, 3 type IIa, 8 type IIb and one type III). The mean age of diagnosis was of 20, 5 ± 27, 0 months, with a range between 0 and 36 months.

The most frequent were unilateral IIb and bilateral I/I and IIa/IIa. Most of them had a normal cochlea and vestibule. When VNC dysplasia was associated Mondini malformation (IP type II) was the most common. 44, 1% were syndromic: Branchio-oto-renal (BOR) syndrome (14, 1%) was the most frequently associated.

Audiologic evaluation results showed the best results in type IIb and III and the worst in type I.

We performed round window electrical stimulation in 9 bilateral patients, presenting responses in six patients that were candidates to a cochlear implant. Patients with no response were treated with ABI.

Conclusions: Malformations of the auditory nerve, diagnosed with MRI, can preserve remnants of hearing conduction.

We propose in these cases a study with evoked brainstem potentials by electrical stimulation of the round window in order to evaluate the residual auditory function.

FP23-3 Cochlear Nerve Deficiency in Paediatric Cochlear Implantation: St Thomas' Experience

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Objectives: Previous literature has found generally a poor outcome for patients with hypoplastic nerves who go on to cochlear implantation. This study identified and ascertained the outcome of paediatric patients who have hypoplastic cochlear nerves within our hearing implant population.

Methods: This was a retrospective systematic analysis of St Thomas Hearing Implant database identifying patients with hypoplastic and aplastic nerves on magnetic resonance imaging (MRI) of their internal acoustic canals. Individual case notes were reviewed for management details, including cochlear or auditory implantation was compared to their hearing and language outcome. Patients were excluded if they were still under assessment, undergoing Bone anchored hearing aid assessment, had no MRI or report available or had non-diagnostic scans.

Results: Twelve out of 200 patients identified (6%) had hypoplastic or aplastic nerves. Four patients had severe abnormalities, such as aplasia or almost non-existent hypoplastic nerves, three of which have already had an auditory brainstem implant, the other being assessed for this. Two had thresholds too good for implantation, both having one hypoplastic and one normal nerve. Six had cochlear implantation with speech & language scores available between 4 and 11 years post-operatively. Two of these have poor speech intelligibility, one of which was explanted due to meningitis and each having a unilateral implant. The last four had bilateral implants with pre Categories of Auditory Performance (CAP) scores of 0 and post-operatively between 6 and 9. One had simultaneous implants and the last three had sequentials.

Conclusions: Hypoplastic cochlear nerves are not an absolute contraindication to cochlear implantation. Some patients can do very well post implantation and the presence of clearly identifiable but hypoplastic nerves on imaging should not delay cochlear implantation if the other criteria are met.

FP23-4 Cochlear implantation in deaf children with narrow internal auditory canal

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Objective: To investigate hearing rehabilitation results of implanted children with narrow internal auditory canal (IAC), and analyze whether the degree of IAC stenosis will influence auditory performance.

Methods: 6 implanted children who were diagnosed with IAC were retrospectively analyzed from July 2012 to January 2013 in our hospital, which included 3 males and 3 females, aged 1-7 years old. The cochlear nerve canal (CNC) and IAC diameter were measured on high-resolution computed tomography (HRCT), and the width of the auditory nerve (AN) and the facial nerve (FN) were measured respenctively on magnetic resonance imaging (MRI). It was diagnosed as stenosis IAC if the width of CNC was<1.8mm, or the width of IAC was<5mm, or the diameter ratio of AN / FN was <1. Surgery with lesser extent of stenosis were selected, and after six months their hearing threshold was evaluated and was compared with radiographic measurements.

Results: 1. After six months, one surgery had non-auditory responses, and the others hearing were improved, but the hearing rehabilitation results were different. The hearing threshold ranged between 50 dBHL and 80dBHL in six ears. 2. For the 6 patients, there was no significant correlation between auditory rehabilitation and the stenosis extent of internal auditory canal, as well as the value of AN / FN .

Conclusion: The hearing threshold of cochlear implantations with narrow internal auditory canal is less than implantations with normal anatomy; the stenosis extent of internal auditory canal, as well as the value of AN / FN can not be used to estimate early hearing rehabilitation.

FP23-5 Clinical Characteristics and Outcomes of Children with Auditory Neuropathy

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Background: Auditory neuropathy (AN) is a cause of congenital sensorineural hearing loss (SNHL) in which there is a dysfunction in the auditory pathway along the inner hair cells to the auditory nerve, sparing the function of the outer hair cells. The prevalence of AN in children with permanent hearing loss is as high as 15%, suggesting that AN is not as rare as previously thought. However, due to the complexity of the disease and its recent description by Starr et al. in 1996, there is a relative dearth in the literature on AN. As most studies on AN have focused on describing its risk factors, outcomes of these children have not been adequately assessed.

Objectives: Our study aims to present an overview of the clinical characteristics and outcomes of management for children diagnosed with AN in National University Hospital (NUH), Singapore.

Methods: We studied a retrospective cohort of 29 subjects below 18 years old who exhibited normal outer hair cell function (as evidenced by the presence of otoacoustic emissions and/or cochlear microphonics) with abnormal auditory brain stem responses. Data was retrospectively gathered from the subjects' medical records and audiological test results from 2004-2013. In our cohort, there was a median length of clinical follow-up of 23 months. The tests were either carried out under the Universal Newborn Hearing Screening program or were done after referral to our hospital for hearing difficulties. The study protocol was reviewed and approved by the National Healthcare Group Domain Specific Review Board (DSRB), Singapore.

Results: Out of 29 subjects with AN, 15 were male and 14 were female. The median age at diagnosis was 8 months. 17 subjects had bilateral AN while 9 had purely right-sided AN. The three main risk factors encountered in our study were neonatal jaundice requiring treatment (52%), Neonatal Intensive Care Unit (NICU) stay (42%), and prematurity/ low birth weight (38%). Of the known associated neurological comorbidities, the 3 commonest conditions in our cohort were global developmental delay (24%), cerebral palsy (17%), and seizures (10%). 70% of subjects took up hearing aids while 10% were treated with cochlear implants. In the evaluation of outcome, we excluded subjects with severe neurological comorbidities as they failed to develop any means of communication. 81% of subjects developed functional speech and 19% used sign language. 42% of subjects made it to mainstream schools while 58% went to special needs schools.

Discussion: The gender and age distribution of our subjects largely mirrored that of other reports. Neonatal pathological jaundice and other early-life complications were identified as risk factors for AN in our cohort. Therefore, clinicians treating such patients must be recommended to refer them for close monitoring of their hearing. We also noted that 25% of subjects had no significant risk factors, thus underscoring the importance of universal screening. Most subjects, especially those with unilateral disease, had fairly good outcomes with many developing speech and going to mainstream schools. Although the majority of subjects had good outcomes, most of those with poor outcomes had bilateral AN and reported inconsistent or no use of hearing aids.

Conclusion: Treatment modalities such as hearing amplification and cochlear implants, alongside relevant audiovisual rehabilitation programs, can help to improve outcomes in children with bilateral AN. Stronger efforts must be made to encourage uptake of these treatments so that favorable outcomes in these children may be maximized.

FP24-1 Does Air Bone Gap Predict Ossicular Discontinuity in Chronic Otits Media

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Background: Ossicular discontinuity may result from chronic otitis media and usually cannot be determined unless an operation is performed. If ossicular discontinuity can be predicted by pre-operative information, then the patient can be better informed about the prognosis of hearing and the surgeon can be better prepared before surgery.

Objective: To determine the relationship of preoperative pure tone audiometry and the status of the ossicular chain at surgery in chronic suppurative otitis media

Study Design: Prospective cohort study.

Setting: A tertiary referral center.

Methods: Between 2013 and 2014, patients aged 18 to 75 operated for the first time for non-cholesteatomaous chronic otitis media were included. Pre-operative pure tone audiometry was analyzed to measure frequency specific air-bone gap (ABG) cut-off values. At the time of operation ossicular chain integrity was carefully checked. Ossicular discontinuity was identified only if the discontinuity of the ossicular chain was confirmed. Logistic regression analysis was done to have a predictive model.

Results: 180 patients (202 ears) were included. Frequency specific ABG cut-off values can predict ossicular discontinuity namely: ABG at 500 Hz less than 25 dB predicts absence of ossicular discontinuity, likelihood ratio of 0.45 ($P<0.05$); ABG at 500 Hz > 40 dB, ABG at 2 KHz >30 dB, ABG at 2 KHz > 40 dB, and ABG at 4 KHz > 50 dB predict presence of ossicular discontinuity with likelihood ratio of 2.1 ($P< 0.05$), 2.3 ($P<0.05$), 3.4 ($P< 0.05$), 3.8 ($P<0.05$) and 9.9 ($P< 0.05$).

Conclusion: Preoperative audiograms can predict presence of gross ossicular discontinuity in chronic suppurative otitis media. Further studies can be done to strengthen further the correlation and its effect on prognosis.

FP24-2 PECULIARITIES OF MIDDLE EAR DISEASES AMONG POPULATION OF TAJIKISTAN

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Present work covers study of chronic middle ear diseases and forms of hearing loss among population of Tajikistan.

It is established that middle ear diseases fall on 8, 7 cases per 1000 people.

Having detected 580 people with hearing loss, study of unit weight of specific middle ear diseases was initiated. Tone threshold, sensation and speech audiometry in extended frequency band (10-20 кHz) was used, as well as ear ultrasound (80 kHz) and infrasound examination and impedometry.

It is established that unit weight of chronic otitis media is 49, 6% and adhesive otitis is 25, 8%. Among population of ethnically isolated population groups (Vorukh village of Isfara region) hearing loss encounters in 17, 2% of examined people caused by family marriages (family form of hearing loss). Unit weight of otosclerosis made 7, 4%.

Based on the following criteria one can predetermine the sensorineural hearing loss: descending type of audiometric curve with minimal bone-air interval, high threshold of hearing in frequencies 12, 5 and 15, 0 kHz, positive loudness acceleration phenomenon, increase of differential threshold of sound perception with changed indicators of acoustic reflexometry (hypo-, hyper- and areflexia of acoustic reflex).

It is found out that ratio of conductive component of hearing loss (69, 8%) in chronic purulent otitis media against sensorineural one (30, 2%) is as much as 2, 3 times; in adhesive otitis media conductive component (34, 0%) is 1, 9 times less than sensorineural one (66, 0%). In otosclerosis ratio of conductive component (19, 6%) as compared to sensorineural (80, 4%) was less than 2, 4 times. In patients (100) with hearing loss as a result of family marriage ratio of conductive component (29, 6%) as compared to sensorineural one (70, 4%) is 2, 4 times less.

Thus, chronic inflammation of middle ear affects not only the middle ear structure, but equally the receptor apparatus of auditory analyzer.

FP24-3 Evaluation of health related quality of life, anxiety and depression levels in children with CSOM

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Objective: It is known that children with chronic disease have an increased risk of psychosocial problems associated with diseases and treatments. Chronic suppurative otitis media (CSOM) is a disease resulted in severe sequelae such as hearing loss. Both severe sequelae and recurrent symptoms/signs may be effect the health related quality of life of children and parents. The aim of the study was to compare children (8-18 years) diagnosed with CSOM and controls in terms of health related quality of life (QoL).

Materials and Methods: Health-related quality of life assesed by using the Pediatric Quality of Life Inventory™4.0. Total (OTP), physical (FI), psychosocial health (PSTP) and emotional (DI), social (SI), and school (OI) functioning scores were compared between children diagnosed with CSOM and control groups. Therefore, child depression inventory (CDI) and state-trait anxiety inventory (STAI) were used to evaluate depression and anxiety levels between groups.

Results: OTP, FI, PSTP, DI, SI and OI levels of CSOM group (n=40) were significantly higher than the levels of control group (n=40) ($p<0.001$). Anxiety and depression scores were higher in CSOM group when compared to control group ($p<0.01$, $p<0.001$ respectively). In CSOM group, children with >40 dB hearing threshold had statistically significant lower QoL levels than children with >40 dB hearing thereshold ($p<0.05$).

Conclusion: In our study, it was determined that CSOM presents significant and negative impacts on psychosocial health, school, emotional and physical functioning. In this context, the recommendations related to CSOM can be formulated at three different levels. Firstly, the screening programs should be accelerated to prevent progression to chronicity in OM. Secondly, the educational interventions (for children and parents) focused on the disease should be increased to prevent the development of complications and sequelae associated with CSOM. Finally, management of CSOM should include to overcome not only biological but also psychosocial effects like QoL, anxiety and depression.

FP24-4 Otitis media with ANCA-associated vasculitis (OMAAV): A retrospective multicenter study in Japan -1) Clinical findings

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Introduction: ANCA - associated vasculitis (AAV) often involves initially middle ear and intractable otitis media is possible to be OMAAV. However, clinical characteristics of OMAAV have not been clarified yet. In this study, we aimed to describe a series of OMAAV patients and underline the difficulties involved in diagnosing and treating this challenging disease.

Method: In this multicenter study, we assigned 297 patients (86 males and 211 females) with OMAAV from 65 departments of otolaryngology in Japan. Their age were ranged from 13 to 89 years.

Results: The first manifestation was otitis media in 234 cases, otitis interna without otitis media in 12 cases, upper respiratory tract lesion except the ear in 15 cases and other organs lesion except the upper respiratory tract in 33 cases. Remaining three cases were started with otitis media in combination with other organ involvements; one of those cases had the upper respiratory tract lesion, and other 2 cases had the other organs lesion.

Ear symptoms such as hearing loss, ear pain, and/or otorrhea, which were resistant to treatments with antibiotics and tympanic tube, were observed in 275 patients. Two remaining cases were developed ear lesions after initial visit. The ear symptoms at the initial visits were hearing loss, tinnitus, otorrhea, earache and vertigo in 292 (98%), 140 (50%), 135 (45%), 99 (34%), and 74 (25%) patients, respectively. The affected organ at the initial visit were nose, lung and kidney in 95 (70%), 80 (27%) and 53 (18%) patients, respectively (Figure 1). The facial paralysis and the hyperplastic pachymeningitis, which are frequent in OMAAV, were detected in 54 (18%), 44 (15%) patients at the initial visit, which was increased to 94 (32%) and 70 (24%) patients during their clinical courses, respectively (Figure 1).

At the initial visit, granulomatous lesions in tympanic cavity and/or mastoid cavity were detected in 253 (89%) patients by CT scan. Serum PR3-ANCA and MPO-ANCA were positive in 76 (27%) and 169 (59%) patients, respectively. Definitive histological diagnosis was performed in only 54 (30%) patients.

The treatment was given by prednisolone (PSL) with an immunosuppressant drug, PSL only, an immunosuppressant drug only, and no treatment for 143, 135, 2 and 8 patients, respectively.

The recurrence was detected in 125 (43%) patients during their clinical courses. Although the ratio of both ears involvement was 63% at initial visit, it was increased to 74% throughout the course.

Eight (2.7%) patients died; 4 patients were dead by the disease death, other 4 patients were dead by treatment-related death. Table 1 shows the details of eight death cases. Among the death from disease, three patients had subarachnoid hemorrhage and one patient had ischemic enteritis. In the treatment-related death, pneumonia, heart failure and visceral dissemination of varicella-zoster infection were cause of death for 2 patients, 1 patient and 1 patient, respectively.

It is possible that OMAAV is different from GPA without the ear symptom. To elucidate that, we compared the characteristics of OMAAV to that of GPA without the ear symptom in our patients. Facial paralysis, hyperplastic pachymeningitis, and MPO-ANCA-positive were significantly detected more in OMAAV than in GPA without the ear symptom. On the other hand, nose lesions and PR3-ANCA positive were significantly seen in the GPA without the ear symptom compared to OMAAV. These findings show that the clinical characteristics are different between OMAAV and GPA without the ear symptom.

Conclusions: It is difficult to make definitive diagnosis of OMAVV at initial visit. We found that facial nerve palsy, hypertrophic pachymeningitis and MPO-ANCA positivity are characteristics in OMAAV.

FP24-5 Otitis media with ANCA-associated vasculitis (OMAAV): a retrospective multi-center study in Japan -2) Clinical differences according to ANCAs-

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Objective: Otological symptoms are one of the important sign of the disease during the course of antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV). Otitis media and hearing loss may occasionally be the initial manifestation of the disease. "Otitis media with ANCA associated vasculitis (OMAAV)" has been proposed as a new concept for this disease. Protenase 3 (PR3)-ANCA and myeloperoxidase (MPO)-ANCA is a sensitive biomarker for diagnosis and characterization of AAV. In the present study, we examined the clinical differences according to ANCA subtypes in the patients with OMAAV.

Methods: A total of 297 patients were enrolled in the nationwide surveys. In this study, we compared the characteristics among MPO-ANCA positive group (MPO group), PR3-ANCA positive group (PR3 group) and ANCA double negative group (DN group), in which ANCA double positive and ANCA status unclear patients were excluded. Clinical data were collected and compared among the three groups (Ryan's multiple comparison methods).

Results: Sixty-seven (22.6%) were positive for PR3-ANCA, 159 (53.5%) were positive for MPO-ANCA, and 52 (17.5%) were ANCA double negative. The mean age of PR3 group, MPO group and double negative group were 57.1, 69.3 and 58.3 years, respectively. The mean age of MPO group was 12.2 years older than those of PR3 group. Incidence of MPO was significantly higher in women and in the age over 60 years old. More than 80% of patients in each group had otitis media with the bone conduction threshold elevation. The major clinical symptoms on the initial visit were hearing loss, tinnitus, otorrhea, otalgia, headache and vertigo. The symptoms at initial visit were similar among the groups. Over the whole course of the follow-up period, PR3 group had significantly higher rate of the nose involvement (PR3: 65.7% vs. MPO: 26.4%, $p<0.0001$) (PR3: 65.7% vs. DN: 38.5%, $p=0.003$) and the lung involvement (PR3: 52.2% vs. DN: 23.1%, $p=0.001$), whereas DN group had significantly higher rate of hypertrophic pachymeningitis (PR3: 14.9% vs. DN: 44.2%, $p<0.0001$) (MPO: 20.8 % vs. DN: 44.2%, $p=0.001$). Rate of relapse was significantly higher in PR3 group (PR3: 53.7% vs. MPO: 36.5%, $p=0.017$).

Conclusion: Patients with MPO-ANCA consist mostly of this study. MPO-ANCA patients were more likely to be older than age 60 and female dominant. The patterns of organ involvement over the whole course differed among the groups, with more frequent nose and lung involvements in PR3 group, and more hypertrophic pachymeningitis in DN group. PR3 group had a significantly higher rate of relapse than MPO group. Classifying patients according to ANCAs is important for predict organ involvement and relapse during the clinical course. We recommend careful evaluation of general conditions and follow-up depending on each ANCAs.

FP24-6 Otitis media with ANCA-associated vasculitis (OMAAV): a retrospective multi-center study in Japan -3) Clinical differences according to initial and sequential involvements

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Introduction: Antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV) is characterized by systemic necrotizing vasculitis. Throughout the course of these diseases, almost all patients exhibit otolaryngological symptoms such as sinusitis, septal perforation, otitis media and subglottic stenosis. Recently, reports of otitis media with AAV (OMAAV) with bone-conduction hearing loss have increased and there is increasing recognition of OMAAV. Facial nerve palsy and hypertrophic pachymeningitis are symptoms that are frequently associated with OMAAV.

Objective: The purpose of this study was to investigate the clinical features of OMAAV, particularly facial nerve palsy and hypertrophic pachymeningitis. Additionally, we examined the characteristics of relapse cases.

Methods: We carried out a nationwide questionnaire survey of OMAAV at major hospitals in Japan. The collected data were used in this study.

Results: Of 297 cases, patients with facial nerve palsy numbered 94 (32%) and patients with hypertrophic pachymeningitis numbered 70 (25%). There were 125 cases (43%) with relapse in their clinical course. Concerning treatment, patients treated with steroid therapy without immunosuppressive drugs relapsed more than patients treated with steroid and immunosuppressive drugs.

Conclusion: Facial nerve palsy and hypertrophic pachymeningitis were relatively common symptoms in OMAAV. These findings might be key for the diagnosis.

Furthermore, it was revealed that OMAAV can easily relapse. Initial immunosuppression therapy that includes corticosteroid, cyclophosphamide or methotrexate is therefore essential for achieving long-term remission for OMAAV.

FP25-1 'Early' and 'Late' intraytympanic injection as a salvage treatment for sudden hearing loss

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Objectives: Intratympanic injection is an effective treatment for sudden sensorineural hearing loss. It is used as salvage treatment or concomitant treatment for sudden sensorineural hearing loss. However the standard treatment for sudden sensorineural hearing loss is oral steroid treatment if there are no contraindications for using oral streoid. Generally intratympanic injection is performed following the result of oral steroid treatment. If intratympanic injection would start after the oral steroid treatment, it has to be delayed from the onset of disease. We compared the results of 'early' (within two weeks from onset) and 'late' (after two weeks from onset) intratympanic injection as a salvage treatment for sudden sensorineural hearing loss in this study.

Methods: From Octorber 2010 through January 2015, total 154 patients received intratympanic steroid injection. Inclusion criteria were sudden sensorineural hearing loss case treated with oral steroid first and case which had pre- and post- treatment puretone audiogram. Ninety five patients were finally enrolled. A retrospective review of medical records was done.

Result: There were 33 cases in 'early' group and 62 cases in the 'late' group. The puretone average were 88.45±23.35 dB HL in 'early' group and 69.58±30.33 dB HL in 'late' group. If 15 dB in puretone audiometry had regarded as improvement, 54.5% (18/33) in 'early' group and 32.2% (20/62) in 'late' group showed impovedment. This result was statistically significant. According to the Siegel's criteria, criteria I/II/III were 1/2/15 in 'early' group respectively and 2/1/17 in 'late' group respectively.

Conclusion: The time point is important in intratympanic steroid injection as a salvage treatment for sudden sensorineural hearing loss. If the injection would be done within two weeks from onset, result will be better than the injection after two weeks from onset.

FP25-2 Needle study of the intratympanic injection

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Intratympanic injection is used to treat sudden hearing loss, Meniere's disease, and tinnitus. Before the injection, tympanic membrane was under anesthesia with local anesthetics. It takes several minutes and additional procedure before the injection. However some investigator insists that there is no difference in pain regardless of the anesthesia. The tympanic membrane is a thin structure with 0.1mm thickness. So more fine needle than used in transcutaneous injection can penetrate it. We compared the pain, hemorrhage, drug regurgitation, and tympanic membrane regeneration according to the gauge of the needles during the intratympanic injection. Prospective single-blind randomized study was done. We used 25G and 30G needle for the injection. Twenty patients were enrolled. The patients took 4 times of intratympanic injection with randomly selected needle. One experiment consisted of one 25G needle injection and one 30G needle injection. So total 40 experiments were carried out. Visual analogue scale was used for evaluation of subjective pain after intratympanic injection. Hemorrhage from the tympanic membrane, regurgitation of the drug, and healing status of needling scar were checked by two otologists. Paried sample T-test was used for statistical analysis. The pain was decreased when using 30G needle for intratympanic injection than 25G needle. (p=0.025) The size of needle affects the pain during intratympanic injection. More fine needle induces less pain.

FP25-3 Recommendation of amidotrizoate-test for therapeutic diagnosis of Stria vascular sudden deafness

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I would like to recommend the amidotrizoate- test (A test) at the first medical examination of sudden deafness, not for iodine hypersensitivity, but for diagnosis of Sria vascular sudden deafness (SVSD). If any conscious recovery signs in hearing or tinnitus are admitted after 30 minutes, then it is diagnosed as SVSD. If not, it is the other or unknown type of sudden deafness.

For the positive case of the test, Amidotrizoate-therapy (A-therapy) is continued until the recovery is over, usually for 10 days, with dose of 20 ml. A-therapy was discovered by a 54 years old patient as a typical serendipity in September 11, 1973, that was 44th day after the onset of the disease. He was injected 1.0 ml of amidotrizoate intravenously for the test of iodine hypersensitivity, because a cerebral angiography was planned for exclusion of infarction disease. After 30 minutes, he had admitted recovery of hearing and attenuation of tinnitus, and wont earnestly to make sure of recovery using audiometry.

As his hearing showed miraculous recovery of 20 dB, I had decided to try A test as a therapy of sudden deafness. The results obtained were excellent for the case of sudden deafness without vertigo, showing about 60 % of complete cure rates.

However, the pharmacological explanation of A therapy was impossible during 30 years. Therefor it was also difficult to spread widely the A therapy as specific medicine for SVSD. Fortunately, the molecular biological (by Torihara) and electro-physiological studies (by Sadanaga) of the Stria vascularis in our laboratory were remarkably developed and the action mechanism of A-therapy could be explained as follows.

In normal cochlea, the marginal and intermediate cells are charged cationic, and the capillary endothelial cells are charged anionic, composing the anionic charge barrier around the capillary. On the inner surface of the endothelial cells, there are numerous voltage sensitive Na^+ channel with polysialic acid glycoprotein, just like the generator of the electric eel, which are essential to keep the revel of endolymphatic DC potential, (EP) at 90mV.

In case of SVSD, the anionic barrier is broken and the anionic Na^+ channels are closed, and its channel sites changes passively into cationic state by the cationic intermediate cells. Then EP decreases to near 0 mV consequently.

In this condition, the injected anionic A molecules bind to the cationized Na^+ channels making a kind of pseud anionic barrier. Then, EP begins to recover and also the hearing recovers. When the caces of SVSD gathered enogh, the right etiology will be discovered.

Recently, almost all treatments of sudden deafness are on the deadlock, because of 30% of spontaneous recovery. However, I believe that the A-therapy is a strong enough to crush the deadlock.

FP25-4 Coagulation Markers and Outcome in Sudden Sensorineural Hearing Loss by Defibrinogenation Therapy

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Introduction: Regarding the pathophysiological causes of sudden sensorineural hearing loss (SSNHL), several mechanisms including viral infection, autoimmune processes, labyrinthine membrane rupture and circulatory disorders have been proposed. For this multifactorial disease, corticosteroid is the most widely used drug as the first line. However, it is not always effective for all cases. Intravenous infusion of the thrombin-like enzyme batroxobin isolated from snake venom has been developed for treating obstructive vascular diseases known as defibrinogenation (DF) therapy. With regard to the effective mechanisms of DF, batroxobin converts fibrinogen to des-A-fibrin monomer by releasing fibrinopeptides (Fp) A and reduces the fibrinogen level, resulting in lower blood viscosity and an increase in local blood flow. Cochlear blood flow is also reported to be increased by DF, suggesting a potential use of DF for SSNHL. In addition to this mechanism, we hypothesized that DF would induce a hyperfibrinolysis state to affect an occult thrombosis in inner ear. The aim of this study was to identify possible coagulation / fibrinolysis markers in peripheral blood that can predict favorable outcome in DF therapy for SSNHL.
Methods: During February 2010 to September 2011, 59 patients with SSNHL diagnosed by American Academy of Head and Neck Surgery (AAO-HNS) criteria were treated with intravenous infusion of batroxobin (total of 50 units) Mean of hearing levels by pure tone audiometry (PTA) at 500, 1000, 2000, 4000 Hz were compared before, during, and at least two months after the treatment. Status of recovery was divided into three groups, namely, no, partial, and complete recovery (AAO-HNS criteria) : Complete recovery is defined if it recovered within 10 dB of premorbid levels, partial recovery for hearing improvement within 50% of premorbid levels, and no recovery for less than 50% of recovery of premorbid levels. Responses of the coagulation / fibrinolysis markers to DF therapy including fibrinogen, fibrin/fibrinogen degradation products (FDP), plasminogen, α2 plasmin inhibitor (α2PI), soluble fibrin-monomer complex (SFMC) and plasmin-α2 plasmin inhibitor complex (PIC) was compared between no, partial, and complete recovery groups using Spearman's rank correlation coefficient and One-Way Analysis of Variance (ANOVA). Response to DF was evaluated by calculating the following ratio: values of one day after the batroxobin administration / before administration.
Results: In all groups, fibrinogen was decreased and FDP and D-dimer were increased after administration of batroxobin. Moreover, as a result of hyperfibrinolysis, several fibrinolysis markers including PIC and SFMC decreased after administration of batroxobin in all groups. There were no differences in response to DF between no, partial, and complete recovery groups, which is an unexpected result. However, in patients with complete recovery group, changing ranges in FDP, D-dimer, PIC and SFMC were significantly narrower compared to non-complete recovery group (no plus partial recovery groups).
Discussion: In treating the obstructive vascular diseases, it is recommended to keep fibrinogen levels as low as possible, indicating that lower fibrinogen-induced decreased blood viscosity followed by an increase in local blood flow is an effective point. However, there was no correlation between the hearing improvement and a response of fibrinogen level to DF therapy, suggesting that other mechanisms than an increase in local blood flow may account for the effective mechanisms of hearing improvement by DF therapy. In the present study, it was demonstrated that hyperfibrinolysis state was induced by batroxobin and that response to batroxobin was less in complete recovery group than no recovery group. It is suggested that hyperfibrinolysis has been already induced to some extent by the disease itself and that the administered batroxobin effectively affected the possible occult thrombosis in the inner ear.

FP25-5 Predicting SSNHL patients' glucocorticoid sensitivity by glucocorticoid proliferation inhibition

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Objective: Glucocorticoid (GC) is an efficient treatment for patients with sudden sensorineural hearing loss (SSNHL). However, some SSNHL patients show insensitive to GC. In the present study, we examined the correlation between PBMCs proliferation inhibition (PI) rate and PTA improvement after the treatment to investigate GC sensitivity.

Methods: GCPI in 36 patients who were received intratympanic methylprednisolone perfusion (IMP) from July 2013 to June 2014 in Nanjing Drum Tower Hospital, Medical School of Nanjing University, China, was analyzed in this study. Blood was collected from peripheral venous of each patient before IMP and used to isolate PBMC. PBMCs were cultured in 5% CO2 incubator for 24h at 37℃ in 3 conditions: A) 1640 Cell culture medium, B) 1640 + LPS (lip polysaccharide, 1g/ml), C) 1640 + LPS + dexamethasone (DEX) (10-6 M). Medium only was used as a blank control. Proliferation of the cells was observed by MTT assay using the absorbance in 490nm wavelength, which reflects cell proliferation inhibition. Hearing improvement was defined as a decrease of PTA (0.25 8 kHz). Linear correlation between PBMC proliferation inhibition rate and the hearing improvement after the treatment were examined. The patients were divided into GC sensitive group (PTA decrease 15 dB, n = 17) and GC insensitive group (PTA decrease15 dB, n = 19). PBMC proliferation inhibition rate and the time period from onset to IMP were also compared between the two groups. Multi-variable analysis was used to compare the patients' gender, affected side of ears (left or right), shape of audiometric curve and with or without vertigo between the two groups.

Results: Although PBMC proliferation inhibition was observed in all patients after culturing 24 hours, there was a great difference in the inhibition rates among the patients. There was a significantly positive correlation between PBMC proliferation inhibition rate and the hearing improvement (R = 0.663). However, time period from onset to IMP was negatively correlated to hearing improvement (R = -0.373). The average PBMC proliferation inhibition rate was 69.03% ± 21.32%, PTA before and after treatment was 85.26 ± 15.43 dB and 50.02 ± 22.89 dB, respectively, in the GC sensitive group. The average PBMC proliferation inhibition rate was 21.77% ± 20.54%, PTA before and after the treatment was 89.51 ± 11.67dB and 86.33 ± 11.62dB, respectively, in GC insensitive group. PBMC proliferation inhibition rate in GC sensitive group was much higher than it in GC insensitive group ($t = 5.74$, $P < 0.01$). Multivariable analysis indicated that factors like gender, affected side of ears side, shape of audiometric curve and with or without vertigo may not affect hearing improvement.

Conclusion: PBMC in vitro proliferation of GC inhibition test (IVPGCIT) may predict the sensitivity to GC of SSNHL patients and could be used to guide clinical individualized treatment of SSNHL in the future.

FP25-6 Idiopathic Sudden Sensorineural Hearing Loss in patient with Chronic Viral Hepatitis

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Purpose: Hepatitis B virus and Hepatitis C virus infection are one of the most prevalent infection diseases in Southeast Asia and Western Pacific regions. In the clinical practice, it's usual to come across idiopathic sensorineural hearing loss (ISSNHL) patients with chronic viral hepatitis. However, there is still no previous study providing clinical information about viral hepatitis carrier with ISSNHL.

Material: This retrospective cohort study is based on the patients who were diagnosed as ISSNHL in Chang Gung Memorial hospital, Taiwan.

Methods: The patients who were diagnosed ISSNHL then were separated into two groups, with and without chronic viral hepatitis. The characteristics of the hepatitis and non-hepatitis group, presentations of ISSNHL, audiometries, laboratory data, treatments, and the course of hearing recovery were identified. Recovery of hearing sensitivity was measured using standard audiometry and reported as change in Pure Tone Average. To evaluate the chronic viral hepatitis influence on ISSNHL, the initial audiometries of hepatitis carriers were also compared to those without. We performed the statistical analyses with the Statistical Package for the Social Sciences for Windows 10.0.7C version (SPSS Inc., Chicago, IL). The 95% confidence intervals of the coefficients were calculated and its considered to be statistically significant if $P < 0.05$.

Results and Conclusion: A total of 65 patients with chronic hepatitis and 160 without hepatitis with the mean age 51.75 ± 14.62 were enrolled in this study. The mean follow-up time is 223.48± 318.58 days. We will present more results and discussion at the conference.

FP26-1 Utility of three-dimensional cone-beam CT images for surgical decisions regarding reoperations

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Introduction: In modern otological practice, computed tomography (CT) of the temporal bone is indispensable for diagnosing ear disease. Images reconstructed using multi-planar reconstruction (MPR) and three-dimensional (3D) volume rendering techniques are very useful for making an accurate diagnosis. High-resolution cone beam CT (CBCT) has been developed to identify fine, minute bony structures and to reduce metal artifacts and radiation hazards. Recently, 3D CBCT images were reported to be more useful for verifying the position of the total ossicular replacement prosthesis (TORP) on the footplate, compared to two-dimensional (2D) CBCT images. This paper presents two cases in which the imaging was valuable for decision making regarding reoperations.

Case 1: A 9-year-old female underwent a staged tympanoplasty with TORP for a secondarily acquired cholesteatoma. When she was 19 years old, she was reoperated on because of a 55 dB airbone gap and malposition of the TORP. During surgery, the malposition was corrected.

Case 2: A 14-year-old male underwent a staged tympanoplasty with TORP for a primarily acquired cholesteatoma. Although a 25 dB airbone gap remained 4 years postoperatively and the TORP was in contact with the wall of the oval window niche, he was followed because the facial nerve protruded from the facial canal and hung over the oval window, as identified in the images and confirmed in the video of the surgery. Therefore, we thought restoration of the malposition was impossible.

Conclusions: These cases indicate that 3D CBCT images can provide more accurate information about the position and contact of the TORP on the stapes footplate, relative to the facial nerve. This information will help improve hearing outcomes following ossiculoplasty.

FP26-2 Role of CBCT in visualization of ear anatomy

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Purpose: In the last years, CBCT has been used in imaging of chronic ear diseases, but precise definition of advantages and limitations in visualization of the anatomy at a relevant number of patients is still missing.

Material: The data sets of the CBCT imaging of the middle ear of 228 patients were analyzed regarding the visualization of 23 different anatomic structures. All analyses were performed by in otology and radiology experienced surgeons.

Results: The bony coverage of the facial nerve could be evaluated completely at the mastoid part in 95%, at the tympanic in 40% and at the vestibular part in 98%. A precise evaluation of the middle ear structures was only possible in less than 50% of the cases (joint space incus-malleolus: 50%; joint space incus-stapes: 46%; head of the stapes: 28%; posterior crib of stapes: 20%; anterior crib of stapes: 17%). Bigger structures of the middle and inner ear could be detected in a more sufficient way (long process of incus: 96%; posterior semicircular canal: 99%; anterior: 97%; superior: 99%; jugular bulb: 98%). The bony coverage of the lateral skull base (middle ear as well as mastoid) could be determined in all cases in excellent way.

Conclusion: Even CBCT shows limitations in visualization of small structures of the middle and inner ear. Overall, CBCT seems to be better than conventional CT in daily routine, but comparative studies of both methods are still missing. In future, these should be performed by radiologists and otologist together.

FP26-3 Papercraft temporal bone in the first step education of the anatomy

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Objectives: (1) Compare the comprehension of temporal bone anatomy educated with or without a paperfraft temporal bone in students attending a speech therapy school (2) Explore the effect of a paperfraft for the understanding of the surgical approaches in first year residents

Methods: (1) One-hundred and ten students attending a speech therapy school were divided into 3 classes. The first class was educated with a lecture only. The second class received a lecture and papercraft modelling without instruction. The third class modelled a papercraft with instruction after the lecture. They were tested for the understanding of the temporal bone anatomy. (2) A questionnaire about the understandings of surgical approaches was obtained from 10 residents before and after the papercraft modelling. The modelled papercrafts were cut with scissors to simulate the surgical approaches. You can get the papercraft on-line (http://temporalboneanatomy.blogspot.jp/).

Results: (1) The average scores were 4.4/8 for the first class, 4.3/8 for the second class, and 6.3/8 for the third class. The third class made significantly better results than the other classes ($p < 0.01$, Kruskal Wallis test). (2) The average scores were 2.6/7 and 4.9/7 before and after the papercraft modelling and cutting. The numerical rating scale score significantly improved ($p < 0.01$, Wilcoxon signed-rank test).

Conclusion: The papercraft temporal bone model is effective at the initial step of learning the temporal bone anatomy and surgical approach.

FP26-4 The tympanic bone in lateral skull base approaches: Implications for surgery

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Objective: The temporal bone is the key to lateral skull base surgery of which the tympanic bone forms a vital structure. This study aims to describe the role of the tympanic bone in various approaches to the lateral skull base.

Study Design: Retrospective study

Methods: The charts of patients who underwent surgery using the lateral skull base approaches, including approaches passing through the otic capsule and those conserving the otic capsule were analysed. The significance of the tympanic bone in these approaches and the relevant surgical anatomy was studied.

Results: The Modified Transcochlear approach Type A, B and D involved drilling of the tympanic bone for exposure and rerouting of the facial nerve. The Infratemporal Fossa Approach Type A and few cases of Infratemporal Fossa Approach Type B involved drilling of the tympanic bone and base of styloid process for exposure of the lower lateral skull base for gaining control in the area of jugular foramen. The Transcochlear Approach Type D which combines the Petro Occipital Trans Sigmoid approach, also involved drilling of styloid process. For gaining control of the internal carotid artery in lateral skull base surgeries, the anterior and inferior tympanic bone was drilled in the Modified Transcochlear approaches. The tympanic bone removal was also done for approach to tumors in the upper neck and retromandibular region.

Conclusion: The tympanic bone forms an important structure, the anatomy of which is fundamental to adequate access in various approaches to the lateral skull base. The control of the internal carotid artery requires drilling of tympanic bone. Also the base of styloid process, which forms part of tympanic bone, is a key area to lateral skull base approaches.

FP26-5 Revisit to the intratemporal facial nerve tumor

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Introduction: Facial nerve tumor has been thought to be rare, but we have surgically treated 11 cases with intratemporal tumor during the past 16 years. In this paper these cases were reviewed on pathology, tumor localization, preoperative facial palsy, surgical procedures and outcome of the treatment.

Case Presentations: The patient's age ranged from 22 to 72. Tumors were located at the labyrinthine through tympanic segment in 5 cases. In the other 6, the tumor was located at the cistern through tympanic segment, internal acoustic canal to genu, internal acoustic canal through mastoid segment, labyrinthine segment to genu, tympanic to mastoid segment and tympanic segment down to the extratemporal bifurcation, individually. The facial palsy was present preoperatively in 7 cases, but absent in the other 4. Their severity was assessed as House-Brackmann's grade III in 1 case, IV in 5, and grade V in 1.

Results: Postoperative pathology revealed schwannoma in 8, hemangioma in 2, and neurofibroma in 1 case. Total resection with concomitant nerve reconstruction using the greater auricular nerve graft were performed in 8 cases, and hypoglosso-facial anastomosis was done in 1. Postoperative facial movement improved up to grade III/IV in 7 cases, but stayed in grade V in 2. Total decompression alone was introduced in two elderly cases, and their facial movement had not been unchanged.

Discussion: The major pathology of intratemporal facial nerve tumor was schwannoma. Kertesz recently reported the labyrinthine to genu was found to the most frequent site of tumor origin after MRI was introduced into diagnosis of this tumor. On the other hand, in the different report, the incidence of the schwannoma in the each segment of the facial nerve is 19 % in the cerebellopontine angle, 30 % in the internal acoustic canal, 42 % in the labyrinthine through genu, 58 % in the tympanic segment, 48 % in the mastoid segment, and 14 % of the extratemporal extension. Our series supported the observation of Kertesz.Schwannoma is slowly progressive, and a small tumor thereby causes neurological disorders less frequently. If the facial schwannoma grows intratemporaly and compresses the healthy nerve surrounding by bony canal, facial nerve palsy would be resulted in. On the contrary, uncovering the facial nerve by the tumor compression, especially in the tympanic segment, could release the pressure and facial paralysis recovers spontaneously. These may be the reasons that facial palsy can develop or recover depending on its growth pattern. There are extremely few recurrences of tumor when total resection is performed. It is usually hard to keep the main trunk of the facial nerve intact, and the reconstruction by the use of cable graft would be desirable. However, facial movement after this procedure would not be regained beyond H-B grade III and this result would not be promised. Therefore, decision-making on the total resection should be carefully considered based on the extension of tumor, grade of facial paralysis, other symptoms and the age of patients. Total decompression may be an alternative to prevent developing the facial palsy in cases without facial nerve paralysis and/or in elderly patients. A novel technique to regain the facial function would be greatly expected.

Conclusion: Eleven cases with intratemporal facial nerve tumor were presented. The major pathology was schwannoma followed by hemangioma and neurofibroma. One third of cases had no episodes of facial palsy. Total tumor resection with nerve graft was considered to be a primary treatment, but surgical decompression might be alternative in elderly patients.

FP26-6 Management for facial nerve schwannoma and functional outcome

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Objective: To describe the characteristics, diagnosis, management and outcomes of facial nerve schwannomas (FNSs).

Methods: 29 patients whose were diagnosed as facial nerve tumor in outpatient between 2002 and 2014 were studied. Clinical data (audiologic data, facial nerve [FN] function, and patient symptoms, tumor location on imaging data), preoperative data, and postoperative data were collected.

Result: Facial paralysis and hearing loss presented frequently in these patients. The FNS involved mostly the geniculate segment, following internal auditory canal. 23 patients underwent surgical tumor resection, 5 chose the follow-up (wait and scan), and another realized radiosurgery. Of 24 patients with surgical removal, 22 were performed total resection, and 2 subtotal resection. The translabyrinthine approach was performed in 13 cases, the middle fossa approach was performed in 6 cases of which 1 combined with transmastoid approach, and the transmastoid approach was performed in 3 cases. One-stage facial nerve repair was performed in 16 cases, of them 5 facial-hypoglossal nerve anastomosis and 11 sural nerve graft. These patients presented facial function at HB grade III-IV 1 year later. Partial tumor removal kept the facial function at grade II 2 patients lost follow-up, and other 3 patients showed slight tumor increasing in the first year but without facial function deterioration.

Conclusion: The symptoms of FNS are related to its location, the patients complained mainly facial paralysis and hearing loss. MRI is indispensable for the differential diagnosis, despite some FNS could be revealed only during the surgery. The tumor size and facial function were the main factor for the strategy of management. One-stage facial repair could engender a good FN outcome.

Key Words: facial nerve schwannoma, management

FP26-7 EFFECT OF INSULIN LIKE GROWTH FACTOR -1 ON RECOVERY OF FACIAL NERVE CRUSH INJURY

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Objective: Investigation of efficacy of locally applied insulin like growth factor-1 (IGF-1) on the recovery of facial nevre functions after crush injury in a rabbit model.

Study Design: Prospective, randomized, controlled animal study.

Method: Twenty male, inbreed, adult New Zeland rabbits were used for the experiment after obtaining permission from animal ethical comittee of university.Animals randomly divided into 3 groups.Right extratemporal facial nerves of group 1 animals dissected and clamped for 30 seconds with a bulldog clamp (negative control group) n group 2 animals(positive control group) after nevre crush injury, 3mg porcine skin gel (Sigma) soaked with saline solution applied around crushed facial nevre and left in situ.n group 3 animals after same procedure same amounth of porcine skine gel soaked with 1 ml GF- 1 solution (100 mg/ml mecasermin ncrelex) were put around crushed nevre and left in situ. All animals were kept under same envirionment with free access to food and water. A facial electromyography (EMG) conducted on 10th and 42 nd day on both sides of animals. All animals were sacrificed after second EMG and both crushed and non-crushed facial nerves of each animals were harvested. Parafilm sections were histopathologiccally investigated. EMG data was analyzed using Chi square test and Mann Whitney U test. Histopathologic findings analyzed using Chi square test.

Results: Electromyography proved that EMG amplitude of left sides of all animals were singnificantly higher for all animals on day 10. On day 42 in group 1 and group 2 animals amplitudes of crushed side not recovered and there were not any significant difference between 10th an 42nd day. However on day 42 EMG amplitudes crushed sides of group 2 animals were found to be closer to non crushed side ($p<0.05$)

On histopathological investigation in group 1 and group 2 animals axonal order were detoriated, myelinisation was decreased and proliferation of schwann cells were detected. Collegenisation and thinning of epineurium were also seen.n GF-1 treated group axonal order was not disturbed, myelinisation was not breaked and schwann cell proliferation was close to normal; epineurium was found to be intact and collagenisation was lesser than other groups. Difference were stastically significant

Conclusion: Local aplication of GF-1 in a slow releasing gel was found to be effective in recovery of fasial nevre crush injury in rabbits. Since this molecule is natural peptid and in clinical application it was found to be worthwhile to use in clinical studies on facial nevre injury cases.

P-01 Applications of biobanks in Otology

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Biobanks for biomedical research have gained enormous importance due to the biological sample value associated with that host. A biobank is necessary for research in ORL, if research projects requiring biological samples of human origin and if it is necessary to seek samples from patients in other external projects and cooperate with international research networks are started.
The Biobank is a way of collecting and sharing samples of biological origin which allows research complying with the law.
In Spain vs Biobank sample storage allows to respect the rights of donors and researchers:
Commitment to Donors: The requirement of informed consent
Informed Consent extended
Confidentiality of information associated with biological material.
Samples anonymized or dissociated
Commitment to the transfer of samples to researchers
Is donated NOT JUST FOR THAT PARTICULAR BUT STUDY FOR ALL THOSE RELATED TO THE PURPOSE OF BIOBANK
Biobanks ENT disease oriented study: epidermoid tumors, lymphoepitheliomas, schwannomas. Genetic markers of deafness, autoimmune, etc.
Its main objective is the search for biomarkers of disease and its main asset is the clinical context in which the sample is obtained and the research is conducted.

Conclusions: Biobanks are platforms supporting and promoting translational research, competitive quality ENT.
The creation and management of biobanks is very recent and is a result of the growing importance of information associated with the samples and the enormous importance that it has acquired in recent years to conduct biomedical research quality.
The new requirements have been forced to develop new regulatory frameworks and organizational biobanks that prioritize network structures and harmonization of procedure.

P-02 Eagle's syndrome: neglected etiology of referred otalgia

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Patients presenting with vague otalgia can lead to wide-ranging differential diagnosis. Elongation of styloid process (SP) should also be considered as one of the etiological factors for referred otalgia. Symptomatic elongation of SP or calcification of stylohyoid ligament is referred as Eagle's syndrome. The current study reviews three additional cases of Eagle's syndrome, highlighting the clinicopathologic and radiological features that distinguish Eagle's syndrome from other referred otalgia.

P-03 Correlation between OMENS vs Jahrsdoerfer Grading Scale and CT temporal bone scores in craniofacial microsomia

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Objective: To evaluate the correlation between the clinical findings using an OMENS score and temporal bone radiology using the CT temporal bone scoring system and the Jahrsdoerfer scoring system in craniofacial microsomia (CFM)

Materials and Methods: 148 patients who had been admitted to Chiang Mai University hospital between January 1st 2007 and July 31st 2014, with a diagnosis of CFM were possible candidates for the clinical evaluation and temporal bone radiologic studies.40 cases were recruited to the study. The patients' clinical manifestations were assessed by a single plastic surgeon using the OMENS scoring system. The radiologic studies were assessed by a single radiologist using the CT temporal bone scoring system and the Jahrsdoerfer scoring system. Demographic data was reported. The correlation between the clinical findings and temporal bone radiology was investigated.

Results: Of the 40 CFM patients recruited to the study twenty-two cases were male and 18 cases were female. Twenty-six cases affect unilateral side. The ears affected were 33 on the right and 21 on the left. The total OMENS scores showed a significant correlation with:
1) both total CT temporal bone scores (p value < 0.001) and total Jahrsdoerfer scores (p value < 0.001)
2) 5 of 7 parameters of the CT temporal bone scores. Namely the degree of hypoplasia or atretic in the middle ear (p value < 0.001), degree of abnormality of the ossicles (p value < 0.001), degree of pneumatization in the mastoid (p value = 0.019), degree of abnormality of the facial nerve (p value < 0.001) and degree of hypoplasia in the condyle of the mandible (p value = 0.004)
3) 8 of 9 parameters of the Jahrsdoerfer scores. Specifically the presence of a stapes (p value = 0.001), the width of the oval window opening (p value = 0.003), the width of the middle ear space (p value = 0.001), the course of the facial nerve (p value < 0.001), the presence of a malleus-incus complex (p value = 0.015), an incus-stapes connection (p value = 0.002), the size of the round window (p value = 0.001), and appearance of the external ear (p value = 0.002). The only specific parameter of the OMENS scores that showed a significant correlation with the total CT temporal bone scores and the total Jahrsdoerfer scores is the external auditory canal (p value < 0.001).

Conclusion: The total OMENS scores and the external ear parameter of the OMENS scores are the main clinical findings which predict the total CT temporal bone scores and the total Jahrsdoerfer scores. The CFM patients which have high scores of the external ear parameter of the OMENS score, the higher the chance they will have of having a higher total OMENS scores and higher total CT temporal bone scores, but will have lower total Jahrsdoerfer scores. Where there is limited availability of high resolution of the CT of the temporal bone or there is concern of an over exposure to high dose radiation, either high scores of the external ear parameter of the OMENS scores or high total OMENS scores can guide primary care clinicians in the need to refer CFM cases for CT of the temporal bone.

P-04 Relapsing polychondritis involving multiple otorhinolaryngologic area

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Relapsing polychondritis (RP) is a rare systemic disease characterized by recurrent, widespread chondritis of the auricular, nasal, and tracheal cartilages. Although the cause remains unknown, the etiology is suspected to be autoimmune. We describe a case of a 45-year-old man with a four-month history of bilateral auricular, and thereafter subsequently hump nose by nasal chondritis, bilateral vocal cord palsy. Infectious and neoplastic diseases were excluded by imaging and laboratory examinations. RP was diagnosed based on three McAdam's criteria. The patient was medicated with oral prednisolone with positive clinical response. In this case clinical history and detailed physical examination were fundamental in concluding the correct diagnosis and administrating the appropriate medication.

P-05 Surgical treatment of external auditory canal cholesteatoma - ten years' clinical experience

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Objectives: To describe the clinical manifestations of external auditory canal (EAC) cholesteatoma, and to evaluate the surgical outcome of obliterated reconstruction with inferior pedicled soft-tissue periosteum flap.

Materials and Methods: A total of 28 patients (9 male and 19 female: 30 surgical ears) were enrolled in a retrospective study at Kaohsiung Medical University Hospital in Taiwan between January 2004 and December 2013.

Results: The average age of 28 patients (30 ears) was 53.7 years (range 18-83 years). The most clinical manifestations were unilateral otalgia (19 ears, 63.3%) and otorrhea (14 ears, 46.7%). The frequent locations of EAC cholesteatoma with bony invasion were posterior-inferior (12 ears, 40%), inferior (9 ears, 30%), posterior (6 ears, 20%), posterior-inferior-anterior (3 ears, 10%) aspects. Based on Naim's staging systems of EAC cholesteatoma, twenty-six ears (86.7%) were stage III, four ears (13.3%) were stage IV. All patients received surgical management via a postauricular inlet, and the average length of post-operative follow up was 61.5 months (range 12-131 months). One surgical ear suffered recurrence after operation for 1 year 3 months.

Discussion: The bony canalplasty of obliteration with inferior pedicled soft-tissue periosteum flap was a reliable procedure for external auditory cholesteatoma.

P-06 Multi-layered Reconstruction for Surgical Management in the External Auditory Canal Cholesteatoma

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Objective: In the surgical management of EACC, it is generally agreed that bony meatoplasty with cartilage graft repair is effective in the definitive management as canalplasty of EAC. Nevertheless, cases that the cholesteatoma extensively involves the temporomandibular joint (TMJ) capsule and hypotympanicum space, it is conceivable that more rigid and sustainable EAC canalplasty is desirable than simple bony meatoplasty with cartilage graft repair. The purpose of the present study is to define the surgical management of EACC depends on the extension of adjacent structure around EAC.

Patients and Methods: Fifteen patients underwent surgical management for 23 EACC (8 males and 15 females; age from 9 y.o to 86 y.o.; 11 right and 12 left ears) treated at a tertiary referral center, from 2011 to 2014 was included in the retrospective study. All patients, who failed to conservative antimicrobial medical therapy prior to referral in stage III and IV according to the grading system prescribed by Naim et. al., underwent canalplasty using not only bony meatoplasty technique but also postauricular musculo-periosteal flap and autotransplantation.

Results: Our patients were all in advanced stages indicated that 8 patients in stage III with bone erosion and 15 in stage IV with infiltration into mastoid cells, TMJ capsule and hypotympanicum including jugular bulb. A canal plasty was performed by bony meatoplasty with cartilage repair fashion in 11 cases. In case with tympanic membrane erosion or mesotympanum involvement, tympanoplasty or myringoplasty was simultaneously performed (12 cases). Endaural approach was selected in stage III group and post auricular approach was done in stage IV group. In stage IV, exposed TMJ capsule was repaired and sealed with autocartilage using inlay technique that thin-sliced auto cartilage were stayed between anterior EAC bone and surface of the TMJ capsule. Particularly in cases with the epithelium was invaded into hypotympanicum immediately adjacent jugular bulb, more bony dissection was required to eradicate invaded cholesteatoma epithelia around jugular bulb and mulit-layered repair including bone paste, post auricular musculo-periosteal pedicle flap, auto cartilage and temporal muscle fascia was required.

Conclusion: Nonetheless a bony meatoplasty combined with cartilage repair is sufficient in stage III EACC, in an advanced stage, enlarged bony metaoplasy is required to eradicate epithelial involvement and a less volume material such as a simple autocartilage harvested from auricle could cause the cholesteatoma recurrence. Multi-layered reconstruction is practical to obliterate the bony defect and brought about self-cleaning dried canal.

P-07 A new external auditory canal measurement method for use in transcanal endoscopic ear surgery

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Purpose: To develop an objective method for measuring the external auditory canal (EAC) for use in procedures such as transcanal endoscopic ear surgery (TEES). The EAC has been evaluated, up until now, based on a subjective examination of a CT scan. We have developed an objective evaluation system using an image processing program and used it to retrospectively determine the minimum width of the EAC in past TEES patients.

Patients: We examined the EAC of 14 patients whom had undergone TEES using a 2.7 mm diameter endoscope (cross-section area: 5.73 mm2). The age of patients ranged from 3 to 77 years (mean 30.9).

Methods: We evaluated the bony portion of the EAC using sagittal cone-beam CT images. The EAC bony portion was defined as that bone which surrounds the canal. ImageJ was used as the image processing program. The minimum values of the cross-section area, minor axis and major axis of each patient were evaluated. The minimum and maximum Feret diameters were used as the EAC minor and major axis respectively.

Results: The cross-section area of the EAC ranged from 20.4 to 42.0 mm2 (mean 30.5). The minor axis ranged from 3.4 to 5.9 mm (mean 4.8). While the major axis ranged from 7.0 up to 9.5 mm (mean 8.2).

Conclusions: This image processing system provides objective data on EAC width and showed that TEES has been successfully performed on a patient with an EAC minor axis of 3.4 mm.

P-08 Ventilation Tube Applicator for Patients with Otitis Media with Effusion

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Otitis media with effusion (OME) is a public health problem worldwide. Limitations of current ventilation tube (VT) placement include risks relating to general anesthesia, costly instruments, less management flexibility for surgeons and health care team, and delayed treatment in underserved countries. We developed a novel, automated "point-click-insert" VT applicator allowing patients with OME to be treated in clinic settings.

The applicator consists of four main integrated components: micro-toolset assembly, sensing system, precise manipulation mechanism and motion control algorithm. The components are compactly assembled and controlled precisely and safely by programmable motion algorithm. Force sensor provides sensitive touch detection to initiate and orchestrate all motions timely and efficiently. Bench testing was performed using various mock ear models with artificial eardrum and harvested pig eardrums.

The applicator dimension is approximately 19.7cm (L)×4.3cm (W)×5.1cm (H) with a weight of about 200g. After positioning of applicator in the ear canal and system initiation by surgeon, myringotomy is created immediately after touch is detected by activated force sensor, followed by insertion of a pre-loaded VT at the cutting tip. Total VT insertion time is less than 0.5 second. Tests on artificial eardrums and ex-vivo pig eardrums using Mini Shah VT showed at more than 95% success rate.

The device showed precision, robustness and quick tube insertion in less than half a second. It potentially reduces dependency on huge health care team, simplifies the procedure and reduces trauma, rendering treatment without general anesthesia and making access of such procedure by underprivileged population possible.

P-09 Progression of Sensory Hearing Loss in Eosinophilic Otitis Media With Mucous Membrane Thickening

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Background: Eosinophilic otitis media (EOM) is highly associated with adult-onset bronchial asthma and with progressive sensory hearing loss. EOM is an inner ear disorder caused by bacterial infection but is also associated with eosinophilic inflammation. Despite steroids being given systematically and by intratympanic injection to treat this disorder, in some progressive cases of EOM the middle ear mucous membrane progressively thickens.

Objective: The purpose of the study was to clarify the relation between sensory hearing loss and mucous membrane thickening. We analyzed the factors possibly causing the thickening.

Methods: A total of 26 patients with bilateral EOM (total 56 ears) associated with bronchial asthma were included in this study. We analyzed age, body mass index (BMI), any hearing level change, and any changes in laboratory-conducted blood tests, including antigen-specific immunoglobulin E (IgE), eosinophil cationic protein (ECP), and the eosinophil percentage (%). Mucous membrane thickening was graded as follows: grade 1, no thickness of the middle ear mucous membrane; grade 2, confirmed mild middle ear mucous membrane thickening in the mesotympani; grade 3, severe middle ear mucous membrane thickening that extend to the external auditory meatus .

Results: Progressive sensory hearing loss (worsening 15 dB in bone conduction hearing level) was detected in 12 ears (21.4%). Ears with grade 1 thickening (none) showed no deterioration of bone conduction hearing level (P>05). Ears with grades 2 and 3 thickening showed significantly deterioration of bone conduction hearing level (P<0.05). Age and the patient's BMI were also related to the increased progression of bone conduction hearing level . After comparing the initial and the most recent laboratory results (antigen-specific IgE, ECP, eosinophil count), it was obvious that there were no statistically significant differences between any of the tests over time.

Conclusions: Mucous membrane thickening seems to be associated with progressive sensory hearing loss in patients with eosinophilic otitis media. Measurements of blood levels of antigen-specific IgE, ECP, and the eosinophil count do not predict the occurrence of mucous membrane thickening or the progression of sensory hearing loss.

P-10 Seven cases of otitis media with ANCA-associated vasculitis

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Anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitis (AAV) is an autoimmune disease characterized by systemic necrotizing vasculitis of small vessels. AAV includes granulomatosis with polyangiitis (GPA), microscopic polyangiitis (MPA), and eosinophilic granulomatosis with polyangiitis (EGPA). Patients with systemic AAV often present with otologic symptoms, hearing loss, otitis media, and facial palsy. These symptoms are collectively categorized as otitis media with ANCA-associated vasculitis (OMAAV) in Japan.

From 2007 to 2014, we treated seven cases of OMAAV. Among them (six women and one man; aged 3383 years), six patients were MPO-ANCA positive (85.7%), and one was ANCA-negative (14.3%). Progressive hearing loss was present in all cases, otitis media in five cases, and facial palsy in one case. The kidneys were involved in two cases, both diagnosed as MPA with OMAAV.

Treatment to induce remission was glucocorticoids (0.51.0 mg/kg/day) in three cases, methylprednisolone (mPSL) pulse therapy in one case, and combined mPSL pulse therapy and immunosuppression agents in three cases. Remission was achieved and hearing restored in all cases. Relapse occurred in three patients, who received glucocorticoids only without immunosuppression agents. Based on our experience, induction therapy with glucocorticoids and immunosuppression agents is required to avoid relapse after remission.

P-11 Clinical characteristics of chronic perforated otitis media in different age groups

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Purpose: To investigate the pre- and intra operative clinical characteristics of chronic perforated otitis media regarding an age factor.

Material and Methods: 133 patients who underwent 137 tympanoplasties for chronic perforated otitis media were included. Those with ear adhesions, cholesteatoma, or a previous history of tympanoplasty were excluded. Patients were divided into three groups: a younger group (aged 15-39 years), a middle group (40-64 years), and an elderly group (≧65 years). We investigated tympanoplasty technique (using the Wullstein classification), the mastoid air cell area measured by temporal bone computed tomography, mean preoperative hearing (at 500, 1000 and 2000 Hz), and the patch effect calculated by pre and post patch air-bone gap at frequencies 250 and 500 Hz. These were compared between three age groups.

Results: Type 1 tympanoplasty was undertaken most frequently in all age groups (88.0%, 89.1%, 72.9%, respectively); however, type 3 or 4 was performed significantly more often in elderly group ($P<0.05$). The mean mastoid pneumatization index in the young, middle, and elderly groups was 278.7 mm^2, 263.7 mm^2, and 183.5 mm^2, respectively, which was significantly lower in the elderly group ($P<0.05$). Preoperative air conduction hearing was 29.0 dB, 47.4 dB, and 57.9 dB in the young, middle and elderly groups, respectively ($P<0.05$), while bone conduction hearing was 7.3 dB, 22.2 dB, and 33.4 dB, respectively ($P<0.05$). There were no significant differences in the air-bone gap between the three groups. The mean patch effect at 250 and 500 Hz was 33.2, 22.3, and 19.4 dB, respectively. The mean patch effect was significantly better in younger group than in middle or elderly group ($P<0.05$).

Conclusions: The less pneumatized mastoid and ossicular diseases in elderly patients with chronic perforated otitis media suggest that the elderly had longer history and severer middle ear pathologies in childhood than younger patients.

P-12 Assessment of Eustachian tube function in patients with perforated chronic otitis media

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Objective: Eustachian tube function (ETF) was evaluated by saccharin test, sonotubometry and inflation-deflation test to examine the relationship between ETF and surgical outcomes.

Methodology: One hundred an twenty ears with perforated chronic otitis media underwent tympanoplasty between April 2011 and January 2015. Their ETFs were assessed by saccharin test, sonotubometry, and inflation-deflation test before surgery. Surgical outcomes of 99 ears were assessed 1 year postoperatively. ETF was classified into three types: normal, stenosis and patulous types according to results of sonotubometory and inflation-deflation test (RION JK-05AD). In saccharin test, Sweetex pallet was placed in the middle ear cavity through a perforation. Saccharin perception time (SPT) less than 20 minutes was defined normal, that between 20 and 45 minutes partial dysfunction, and that more than 45 minutes severe dysfunction. Regarding condition of the ear drum, retraction, adhesion and effusion were considered unsuccessful.

Results: In sonotubometry and inflation-deflation test, 91/120 ears (76%) showed normal type, 25/120 ears (21%) stenosis type and 4/120 ears (3%) patulous type. In saccharin test, normal SPT was found in 32/120 ears (27%), partial dysfunction in 58/120 ears (48%), and gross dysfunction in 30/120 ears (25%). In sonotubometry and inflation-deflation test, successful outcomes were obtained in 58/75 ears (77%) with normal type, in 15/21 ears (71%) with stenosis type and in 2/3 ears (67%) with patulous taype. In saccharin test, successful outcomes were obtained in 24/26 ears (92%) with normal SPT, in 31/46 ears (67%) with partial dysfunction and in 20/27 ears (74%) with severe dysfunction. There was no significant correlation between the results of sonotubometry and inflation-deflation test and surgical outcomes. When patients were divided into the normal SPT group and the dysfunction group, saccharin test showed the success rate was significantly higher in the normal SPT group ($p<0.05$ log-rank test).

Conclusion: There was significant correlation between the results of saccharin test and surgical outcomes. Saccharin test is useful for preoperatively evaluating surgical outcomes in patients perforated chronic otitis media.

P-13 Endoscopic autologous cartilage injection for Patulous Eustachian tube

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Objectives/Hypothesis: To evaluate the safety and efficacy of autologous cartilage injection technique in patients with patulous Eustachian tube.

Study Design: Retrospective case series

Methods: Thirty-three ears of twenty-five patients diagnosed with Patulous Eustachian tube (PET) underwent autologous cartilage injection under local anesthesia. Patients were evaluated postoperatively with nasal endocopic finding and interview about their symptoms. Successful treatment were defined as complete relief or significant improvement with satisfaction.

Results: There were no other complications were observed except temporary otitis media with effusion in one ear. Following autologous cartilage injection, successful treatment rate of subjective autophony symptom were 66.7% (22/33). The average follow-up periods were 25.2 months.

Conclusion: Autologous cartilage injection is minimally invasive technique and has been successfully for treating PET. This procedure has a good overall success rate without complications for a long term period.

P-14 Eustachian tube mucosa's inflammation scale validation based on digital video images

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Background: The most common cause for Eustachian tube dilatory dysfunction is mucosal inflammation. The aim of this study was to validate a scale for Eustachian tube mucosal inflammation, based on digital video clips obtained during diagnostic rigid endoscopy.

Material and Methods: A previously described four-step scale for grading the degree of inflammation of the mucosa of the Eustachian tube lumen was used for this validation study. A tutorial for use of the scale, including static images and 10 second video clips, was presented to 26 clinicians with various levels of experience. Each clinician then reviewed 35 short digital video samples of Eustachian tubes from patients and rated the degree of inflammation. A subset of the clinicians performed a second rating of the same video clips at a subsequent time. Statistical analysis of the ratings provided inter- and intra-rater reliability scores.

Results: Twenty-six clinicians with various level of experience rated a total of 35 videos. Thirteen clinicians rated the videos twice. The overall correlation coefficient for the rating of inflammation severity was relatively good (0.74, 95% confidence interval, 0.72-0.76). The intra-level correlation coefficient for intra-rater reliability was high (0.86). For those who rated videos twice, the intra-level correlation coefficient improved after the first rating (0.73, to 0.76), but improvement was not statistically significant.

Conclusion: The inflammation scale used for Eustachian tube mucosal inflammation is reliable and this scale can be used with a high level of consistency by clinicians with various levels of experience.

P-15 Assesment of Postoperative Pain between Transcanal Endoscopic Ear Surgery and Microscopic Ear Surgery

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Transcanal endoscopic ear surgery (TEES) is much less invasive than microscopic ear surgery (MES) in treating cholesteatomas because TEES requires a smaller skin incision and mastoidectomy. We compared TEES with MES in terms of postoperative pain. We compared and assessed postoperative pain between the TEES and MES groups. We used a pain numeric rating scale (NRS) and the number of times a non-steroidal anti-inflammatory drug (NSAID) was administered between postoperative days 1 and 7 as indexes to assess postoperative pain. We also examined the relationship between the extent of skin incision or mastoidectomy and postoperative pain. The average NRS score in the 7 days after surgery was significantly lower with TEES (0.81) than with MES (2.31) ($p<0.001$). The number of times a NSAID was administered in the 7 days after surgery was lower with TEES (1.33) than with MES (3.64) ($p<0.05$). In MES group the meatoplasty particularly intensified postoperative pain. In TEES group NRS scores did not increase in proportion to the extent of retrograde mastoidectomy.We showed that TEES was not only less invasive but was also superior in terms of postoperative pain. The low-level invasiveness of TEES should be considered when choosing a surgical procedure.

P-16 Surgery in patients with otogenic meningitis and facial nerve monitoring report of two cases

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Otogenic meningitis is serious intracranial complication of inflammatory diseases of middle ear and mastoids (in more than 50% of them) with high mortality rate. We present two clinical cases. First case was 58-years-old man with acute suppurative otitis media, acute mastoiditis, and secondary otogenic meningoencephalitis. Early surgical intervention of left mastoid was performed immediately after hospital admission followed by antibiotic treatment. First case had improved after operation and was discharged in good condition. Second case was 53-years-old woman with acute suppurative otitis media, acute mastoiditis and secondary otogenic meningoencephalitis. At that case surgical intervention of both mastoids was performed on the 10th day after admission in the hospital. Severe sepsis had experienced in that case followed by lethal outcome. Facial nerve injury is a potential complication of otologic surgery due to its dissection within the region of the tympanic and mastoid segments as an integral component of middle ear and mastoid surgery. During mastoidectomy, the descending portion of the facial nerve is at risk for iatrogenic injury. The use of intraoperative facial nerve monitoring during middle ear and mastoid surgery has been advocated as a means to reduce the surgical risk of facial nerve injury and we had performed that at here presented cases. We have compared similar clinical cases with identical surgical intervention that was conducted at a different stage of the treatment process. The different final result had shown the importance of the early surgical intervention for good outcome.

P-17 Transcanal Endoscopic Ear Surgery in Children

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Objective: To demonstrate the feasibility of transcanal endoscopic ear surgery (TEES) for middle ear disease in the pediatric population with a narrow external auditory canal.

Subjects: Thirty-one patients ranging in age from 2 to 13 years old (median: 7.6 years) with middle ear disease who underwent TEES between November 2011 and August 2014. Sixteen of these patients had surgery for cholesteatomas; eleven for chronic otitis media; and four for malformation of the middle ear.

Intervention: A preoperative CT scan was performed to evaluate the middle ear disease and the morphology of external auditory canal. The minimum values of anterior-posterior diameters and superior-inferior diameters of the bony parts of external auditory canal were measured based on the preoperative cone beam CT scan data. Transcanal endoscopic tympanoplasty was performed by rigid endoscopes with an outer diameter of 2.7 mm. Transcanal endoscopic retrograde mastoidectomy was also performed, as necessary, on some patients to access pathologies in the antrum.

Results: The smallest anterior-posterior diameters of the external ear canal ranged from 3.2 to 7.1 mm (5.0 ± 1.0 mm) and the smallest superior-inferior diameters ranged from 3.4 to 10.3 mm (5.9 ± 1.3 mm). TEES was successfully performed on each patient without an extra retroauricular incision.

Conclusion: TEES is feasible using rigid endoscopes with an outer diameter of 2.7 mm and is less invasive for pediatric patients with a narrow external auditory canal.

P-18 The recurrence rate of attic or tensa retraction cholesteatoma in children after surgery

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Objective: To investigate the cumulative recurrence rate of attic and tensa retraction cholesteatoma on new staging system established by Japan Otological Society (JOS).

Materal and Methods: This is a retrospective study and performed in a tertiary referral and academic center. A total of 56 children underwent surgery for attic or tensa retraction cholesteatoma between 1995 and 2013 (mean age: 10 years, range: 2-16). The attic or tensa retraction cholesteatoma was 28 ears in both groups. The patients were followed for at least one year postoperatively. The 5-year cumulative recurrence rate based on the JOS staging system was calculated using Kaplan-Meier survival analysis.

Results: The 5-year cumulative recurrence rate of attic cholesteatoma was 26.5% overall, 0% in stage I, 29.0% in stage II, 50.0% in stage III. The recurrence rate of tensa retraction cholesteatoma was 36.8% overall, 0% in stage I, 50.0% in stage II, 25.0% in stage III.

Conclusion: The JOS staging system for pediatric cholesteatoma reflected the prognosis not for tensa retraction cholesteatoma but for attic cholesteatoma. A common international staging system for cholesteatoma will be desirable in the future.

P-19 Surgical outcomes of 70 congenital chlesteatomas based on Potsic staging system

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Objectives: To investigate surgical outcomes of congenital cholesteatoma based on Potsic staging system.

Materials and Methods: Seventy congenital cholesteatomas operated on by a single surgeon between 1991 and 2014 were reviewed in this paper. Fifty-one cases (73%) were male and 19 cases (27%) were female. Based on Potsic staging system, 12 cases (17%) were included in Stage I, 6 cases (8%) in Stage II, 33 cases (47%) in Stage III, and 19 cases (27%) in Stage IV.

Results: The 5-year cumulative recurrence rate of congenital cholesteatoma was 0% in Stage I, 0% in Stage II, 13.8% in Stage III, and 28.6% in Stage IV. One-stage operation was performed in 92% of Stage I, 83% of Stage II, 15% of Stage III, and 0% of Stage IV.

Conclusions: Potsic staging system reflected the prognosis and indications of surgical methods. Congenital cholesteatoma should be diagnosed and surgically treated as soon as possible.

P-20 Two cases of post-operative cholesteatoma

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Objective: We report two cases of post-operative cholesteatoma.

Case Report 1: A 13-year-old girl suffered from headache before 6 months. She has received myringoplasty at the age of 6. Computed tomography and magnetic resonance imaging revealed a cholesteatoma in the right mastoid cavity. The ear canal was intact, though the mass was closed to the ear canal. We performed mastoidectomy after admission. Cholesteatoma was localized at mastoid cavity, and bony defect was observed at the posterior wall of ear canal. After the removal of cholesteatoma the cavity was filled with temporal muscle flap.

Case Report 2: A 21-year-old man was admitted to our patient clinic suffering from the ear-plugged sensation in his left ear. He performed tympanoplasty for the chronic otitis media at the age of 13. The tympanic membrane was not observed for the swelling of posterior wall of ear canal. Computed tomography showed the soft tissue density mass in the mastoid cavity. The aeration of tympanic cavity was preserved. The operative findings revealed a cholesteatoma.

Conclusion: In these presented two cases, the previous surgeries were performed at another hospital in their childhood. Therefore, we could not confirm the previous surgical findings. Mastoid type of congenital cholesteatoma is very rare. Therefore, we reported the cases as the post-operative cholesteatoma.

P-21 A case of recurrent huge petrous apex cholesteatoma with difficult management

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Petrous apex cholesteatoma (PAC) are rare entities with the slow growing epidermoid cysts arising from squamous cells in the petrous part of the temporal bone. There is a risk of involving other vital soft tissue structures such as the internal carotid artery (ICA), sigmoid sinus, jugular bulb and facial nerve, and otic capsule. Surgical management sometimes extends to the middle cranial fossa dura, posterior fossa dura and clival portion, therefore, lateral skull base skills are required. Particularly in cases of the epithelium invasion extend to the clivus, there are two representative route to the petroclival region, one is anterolateral/transpetrosal approach which is frequently used among the general neurosurgeons and the other is lateral/subtemporal approach which oto-neurosurgeon prefer. Even using such approach, manipulation in a region from horizontal part of the IAC to the cavernous sinus is still challenging. We present a case of giant PAC and it recurred several times against some surgeries of the petrous apex. A 54-year-old male, who had a past history of hemi-facial palsy on the right due to middle ear cholesteatoma and underwent staged surgeries at another hospital 27 years before. He consulted our hospital for the first time 3 years ago with a chief complaint of increasing otorrhea. CT examination revealed bony destruction from the petrous apex to clivus over the middle line and PAC was suspected with otoscopic findings. The initial surgery was performed via transpetrosal approach, however, residual cholesteatoma was found around a portion of the ICA. To salvage the residual cholesteatoma, one and half year after the initial surgery, subtemporal approach assisted with endoscope was done. Thus to eradicate the residual epithelium under endoscopy, translabyrinthine bony dissection was performed, however, cerebrospinal fluid leakage prevents us from obtaining enough view and we could not achieve complete removal of the residual epithelium. Although effusion was observed from the wound site in the immediate postoperative period, it has continued during a routine follow-up in a clinic considering patient's wishes. Nevertheless the follow-up MRI showed persistent recurrences again, we planned subtotal petrosectomy via transotic approach and attempted to remove residual epithelium in the petrous apex and the clivus. The extension of epithelium was seen from horizontal part of the IAC to just under the cavernous sinus, particularly the residual epithelium was noticeable where is medial to vertical part of the ICA. Moreover tissue adhesion around the ICA and the petro-clival portion were severe and adequate view could not be obtained through microscopy in the medial part of the genu of the ICA and the lower part of the clivus. In such region, epithelial removal was achieved via endoscopic assisted maneuver to achieve eradicate cholesteatoma epithelium as much as possible. No otorrhea and effusion were seen from the wound 6 months after the last surgery, and the latest MRI revealed no recurrence. Nonetheless careful periodical follow-up is crucial for the possibility of micro-epithelial residue.

P-22 Cholesteatoma a rare complication of cochlear implant surgery: a case report

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Introduction: Cochlear implantation is now a widely accepted method of treatment for severe and profound bilateral hearing loss. The cochlear implant has well-known benefits but also carries with it possible risks and complications that may occur during surgery or after. This presentation aims to give an overview of the complications related to cochlear implants, and to present one case of chronic otitis media with cholesteatoma associated with cochlear implantation.

Materials and Methods: This study is a case report of a cochlear implant patient who developed a retraction pocket on the implanted ear, which then became a cholesteatoma. A surgical intervention was performed, the electrode was extracted, the cholesteatoma was removed, the implant was reinserted and the ear was reconstructed in a single operation.

Results: The postoperative results were good, with the telemetry showing values within normal limits on all the electrodes. The patient continued to use the audio processor without noticing significant differences between pre- and postoperative auditory perception. One year after surgery the ear was dry without cholesteatoma, and the audiogram showed PTA values between 15 and 25 dB.

Conclusions: In order to prevent complications and to treat them as early as possible when they do occur, the periodic follow-up of implanted patients is very important. We found this to be the case not only during the first year following implantation, but also in the subsequent years.

P-23 Imaging analysis of sinonasal cavity in patients with chronic otitis media and cholesteatoma

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Objective: To analyze the impact of anatomical features related with sinonasal disease in patients with chronic otitis media including acquired middle ear cholesteatoma.

Study Design: Retrospective review from 2005 to 2013.

Patients: Total of 122 patients including 28 cases with chronic otitis media (COM), 53 cases with acquired middle ear cholesteatoma (AMEC) and 41 cases with chronic sinusitis (CS) who underwent ear or endoscopie sinus surgeries at Yokohama city university hospital between April 1, 2005 and March 1, 2013 were analyzed in this study. All patients received high-resolution CT imaging examination before surgeries. For the control, 43 consecutive adult patients who obtained high-resolution CT imaging of their skull bone at our institution for any reason were selected. Degree of maximal septal deviation, peripheral eosinophil ratio, modified Lund-MacKay score, modified Glicklich-Metson stage, the diameter of paranasal sinuses (except for the frontal sinus) and Vidic classification (the postnatal development of sphenoid sinus) were assessed according to results of CT scan imaging for patients with COM, AMEC, CS and control group. In this study, modified Lund-Mackay score and modified Glicklich-Metson stage were used, since frontal sinus images were not available for control patients on high-resolution CT scan.

Results: AMEC group showed significant higher score in modified Lund-Mackay score compared to control group (3.3 vs. 1.16, $P<0.001$) and lower score compared to CS (3.3 vs. 8.17, $P<0.001$). AMEC group also showed significant narrow saggital diameter of sphenoid sinus and low score in Vidic classification compared to control group (24.2 vs. 26.6, $P=0.001$) and lower score compared to CS (3.13 vs. 3.72, $P<0.001$), respectively. There was no significant difference in degree of maximal septal deviation, the diameter of the other sinuses and peripheral eosinophil ratio among the four groups.

Conclusion: Our result suggests that chronic sinusitis is more prevalent in patients with acquired middle ear cholesteatoma.

P-24 Historical development of Ceromer and Adoro materials for ossicular chain reconstruction

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During the recent 15 years, there is certain stagnation in the development of various materials for ossicular chain reconstruction. Nowadays tantalum, platinum, gold, hydroxyapatite, a variety of cements and other new biomaterials give way to titanium which has proved superior and thus preferred to them when creating the new partial and total ossicular replacement prostheses (PORP and TORP). The application of the memory biomaterials is restricted to stapes prosthesis only. In 1999, we started in Varna the comparative examinations of the biocompatibility, biotolerance and biostability of a variety of materials applied within the guinea-pig middle ears. Our own gold and hydroxyapatite prostheses presented with an excellent biocompatibility. However, Ceromer was characterized not only with good biotolerance and biostability but also with sufficient density and strength. Our prostheses possessed the weight necessary for the restored ossicular chain preventing its disbalance. Several years later, Ceromer was renamed Adoro.

During the period from 2002 to 2014, we applied these materials in 279 patients. There were 149 males and 130 females aged between 17 and 44 years at a mean age of 27, 2 years. PORP was implanted in 70 patients while TOPR was done in 209 ones. Our audiologic results demonstrated a hearing improvement by more than 15 dB in 112 patients (in 40, 14%) but by more than 10 dB in 88 ones (in 31, 54% of the cases). There was a less expressed hearing improvement by 5-10 dB in 49 patients (in 17, 56%) and by 1-5 dB only - in 18 ones (in 6, 45% of the cases). TORP implantation resulted in hearing improvement in 202 patients (in 96, 65%) but PORP one did in 65 ones (in 92, 86% of the cases). There was ossicular prosthesis extrusion in seven patients with TORP and in five ones with POPR due du accompanying diseases such as inflammation of medium-ear mucosa and/or Eustachian tube dysfunction. Although our experience gained with Adoro was relatively small, the short- and long-term results were successful. The ossicular prostheses made of these materials presented with an excellent biocompatibility and biostability.

P-25 The effectiveness of homologous costal cartilage in CWD mastoidectomy

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Objectives: To evaluate the usefulness of homologous costal cartilage as a graft material of mastoid cavity obliteration for preventing the cavity problem after canal wall down (CWD) mastoidectomy.

Methods: Six patients who have undergone CWD mastoidectomy with tympanoplasty type I and mastoid obliteration with homologous costal cartilage from 2011 to 2014 were enrolled. Costal cartilages were harvested from 6 patient's mother and prepared 2 weeks before transplantations. After 2 weeks' preparation, CWD mastoidectomy with tympanoplasty type I was performed and mastoid obliteration was done with homologous costal cartilage. Hearing results were evaluated according to the "hearing result report guideline in chronic otitis media surgery" of Korean Otologic Society. Postoperative complications were checked in the frame works of postoperative dehiscence, persistent otorrhea, ear drum perforation and reabsorption of mastoid obliteration material.

Results: Among 6 patients, 5 (83%) patients were diagnosed as cholesteatoma and 1 patient was chronic otitis media. The mean duration of follow-up was 26 months, with a range of 5-34 months. All cases, Post-operative air-bone gaps (ABG) were improved than preoperative ABG. The mean improvement in air-bone gap was about 18.3dB, and the mean improvement in air-conduction was about 32.7dB. Follow-up computed tomography showed well kept mastoid, ear canal and healthy middle ear space. Post-operative complication was not apparant during the follow-up period

Conclusions: Using homologous costal cartilage from their mother in children with chronic otitis media was promising surgical technique in the frameworks of hearing result and postoperative complications.

P-26 Palisade cartilage tympanoplasty: A systematic review and meta-analysis

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Background: Cartilage tympanoplasty has been advocated as surgery of choice for revision tympanoplasty and challenging tympanic membrane perforations.The palisade technique has become popular due to its perceived high success rate to close a perforated tympanic membrane. This is the first systematic review and meta-analysis of cartilage palisade tympanoplasty.

Objective: To evaluate the effectiveness of the palisade cartilage tympanoplasty technique.

Design: Systematic review of the literature and meta-analysis.

Data Sources: PubMed, EMBASE, and Cochrane databases were searched for "palisade", "cartilage", "tympanoplasty" and "perforation" and their synonyms. The search was carried out on September 26, 2014; no language restrictions were applied.

Study Selection: The initial search yielded 188 articles: a total of 13 articles met our inclusion criteria (i.e., > 6 months follow-up, hearing outcomes reported, overall success rate reported). Patients undergoing combined mastoidectomy, ossicular chain reconstruction, and or other middle ear surgery were excluded.

Data Extraction: The methodologic quality of included studies was assessed by examining the study design, level of evidence, outcome measures, and adequacy of outcome reporting. The overall success rate, complication rate, and change in pure-tone average before and after intervention were extracted.

Data Synthesis: Overall 95% percent of the patients had successful repair of tympanic membrane perforation beyond 6 months. The overall complication rate was low (<3%) and satisfactory hearing outcomes were achieved for majority of patients.

Conclusion: Cartilage palisade tympanoplasty results in excellent rates of closure of tympanic membrane perforations and is associated with low complication rates.

P-27 Usefullness of anterior-based periosteal (Palva) flap for obliteration of mastoid cavity in canal wall down mastoidectomy

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Objectives/Hypothesis: To observe the usefulness of anterior based periosteal (Palva) flap for mastoid cavity obliteration in canal wall down tympanomastoidectomy and review its efficacy in producing a dry, low-maintenance, small mastoid cavity.

Study Design: Retrospective study of a consecutive series of procedures from 2012 to 2014.

Methods: Sixty one consecutive procedures for active chronic otitis media with a minimum follow-up of 6 months (mean, 21 mo; range, 640 mo).

Results: 45 ears of cholesteatoma and 11 ears of adhesive otitis media were enrolled this study, and others were chronic otitis media (4 ears), adenoma of middle ear (1 ear). 52 ears (85.2%) maintained a small, dry, healthy mastoid cavity. 3 ears (4.9%) had intermittent otorrhea easily controlled by topical treatment, 2 ears (3.2%) had persistent otorrhea. 3 ears (4.9%) had showed reperforation of tympanic membrane. There were 1 ears of residual or recurrent cholesteatomas. Outcomes remained stable over progressively longer follow-up, up to 40 months.

Conclusion: Obliteration of a canal wall down mastoid cavity by a postauricular periosteal flap is a reliable and effective technique that results in a dry, trouble-free mastoid cavity in 85.2% of patients with active chronic otitis media.

P-28 ANATOMICAL VARIATION OF THE SUPRATUBAL RECESS: A CONE-BEAM CT STUDY

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Purpose: Supratubal recess (STR), also termed anterior epitympanic recess, is located anterior to the epitympanum and superior to the bony Eustachian tube is clearly demarcated by a bony partition, described by Hoshino and Suzuki as the anterior attic bony plate and by Sheehy as a "cog" referring to its unique shape. Several anatomical studies on the STR have shown a considerable variation even among normal adult temporal bones. The purpose of this study is to observe and measure this anatomical compartment using a cone-beam computed tomography (CBCT).

Materials and Methods: CBCT images of 50 patients who underwent CBCT for various ear diseases in University of Miyazaki Hospital and Kagoshima city Hospital between 2011 and 2014 were used for evaluation of the STR. The width and depth of the STR were measured using axial and double oblique images. We also used 11 cadaveric temporal bones for the same mesurements.

Results: The width and depth of STR in clinical subjects was approximately 2.8 mm and 3.8 mm, respectively. Neither of them showed any relationship with age.

Discussion: Owing to the sagittal projection obtained with double oblique CBCT images, we could clearly identify the STR for anatomical measurements which were not possible either with axial or coronal projection. Our measurement data were almost compatible with the results of previous histological study.

Conclusion: CBCT is a useful tool for the anatomical classification of the STR in both cadaveric and clinical temporal bones.

P-29 A new simple clinical scoring system classifying the tegmen of the mastoid: a radiological study

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Objective: To create a scoring system that evaluates the height of the tegmen as it relates to the lateral semi-circular canal.

Design: Radiographic observational study correlated with anatomical model.

Setting: Tertiary referral center for otology and neuro-otology.

Patients and Methods: Computerized tomography studies of temporal bone were collected from patients undergoing workup for hearing loss. Mastoid dimensions were measured out in the coronal, axial, and sagittal planes relating to the lateral semicircular canal. A perpendicular line from the lateral canal to the tegmen was then taken in coronal and sagittal views. Histograms and quantile-quantile (Q-Q) plots were generated for each measurement and compared to the normal distribution. The radiographic data was used to generate four classes of tegmen variability. This model was then applied to cadaveric temporal bones. MRIs of children undergoing workup for sensioneural hearing loss were then compared to this model to evaluate the difference in tegmen height in abnormal MRI studies.

Results: 143 individual temporal bone CT scans were reviewed. Tegmen height dimensions relating to the lateral semicircular canal in the coronal and sagittal views are 4.76mm and 5.45mm respectively, with standard deviations of 2.82 and 2.71. Q-Q plot generation with decile analysis demonstrated four distinct modes of distribution of tegmen height which was maintained in cadaveric measurements.

Conclusions: Previous attempts at classification systems have been difficult to translate into the clinical setting. Simple scoring systems of tegmental height of the mastoid have not been previously described using the lateral semi-circular canal as the main landmark. Delineation of these four patterns of tegmen height allows the surgeon to be aware of the potential for dural injury when performing mastoid surgery, to plan the surgical approach and predict the likelihood of preserving the canal wall in mastoid surgery.

P-30 The benefit of oblique sectional view after 3D reconstruction of temporal bone CT using personal computer

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Objectives: Temporal bone CT (TBCT) is one of the standard preoperative study in the otologic field. It is usually shown in axial or coronal view. Sagital view is checked as well. These 90-degree angled views successfully present anatomical variations of the patient, however they are different from the real view during the surgery. Nowadays, Navigation system is useful to check the position during surgery, however they are still expensive. This study was to evaluate the benefit of the oblique sectional view after 3D reconstruction of TBCT done by surgeons themselves using personal computer.

Methods: Original images were taken by Discovery CT750 high definition scanner (General Electric) or SOMATOM definition flash dual source CT (Simen). About 50 slices were obtained in 0.6~1 mm thickness in order to contain the entire temporal bone. We used uncompressed original data that were transferred by PACS. 3D reconstruction and oblique section were done with IMARIS (Bitplane) program by the operating surgeon using personal computer. Temporal bone structures of the normal healthy subject, chronic otitis media, cholesteatoma, external auditory canal (EAC) atresia, temporal bone fracture patients were checked. We evaluated the status of tegmen, mastoid, cavity, course of facial nerve, lateral semicircular canal and jugular blub.

Results: About 10 minutes were needed to finish 3D reconstruction. With the oblique image, the level of tegmen was easily seen. We could see positions of the tegmen, EAC posterior wall, sigmoid sinus in more surgical view. Tympanic and mastoid segment of the facial nerve were seen in the entire length. The degree of obliqueness was freely changeable even during the surgery. There were no benefit in finding the dehiscence of lateral semicircular canal or facial nerve compared to conventional images.

Conclusion: Oblique views and 3D reconstruction of temporal bone images were quite easily and quickly obtained. Oblique view had no benefit for determining the existence and nonexistence of a lesion. However, it can provide more surgical view and can be easily adjustable even during the surgery. It can be a useful guide for beginners in the otologic surgery.

P-31 Southeast Asian Otosclerosis: Radiological features and correlation with audiometry and surgical outcome

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The incidence of otosclerosis in Southeast Asian patients is low and preoperative diagnosis can be challenging.

Objectives: The aim of this study was to evaluate computed tomography (CT) findings in otosclerosis and determine their correlation with audiometric findings and surgical outcome in a multi-racial community.

Methods: We retrospectively reviewed 20 patients from August 2011 to August 2013 with surgically confirmed otosclerosis and preoperative high resolution CT scans. These patients underwent pre and postoperative audiometric evaluation. Otosclerotic foci were identified on the scans. The density ratio of these foci were calculated and compared to pre and postoperative audiometric parameters (air conduction, bone conduction and air-bone gap).

Results: Four patients (20%) had normal CT scans. 1 patient with Paget's disease was excluded from the study. Hypodense lesions were detected in the remaining 15 (75%) patients and the region of interest (ROI) mapped out. The density ratio was obtained between the hypodense area and adjacent normal labyrinthine bone. There was no statistically significant correlation between the density ratio and any of the audiometric parameters tested ($P>0.05$).

Conclusion: The diagnosis of otosclerosis in non-endemic areas is challenging. A preoperative CT scan can be useful when otosclerotic foci are present. However, the density ratio of the otosclerotic foci did not correlate with audiometric parameters or surgical outcome.

P-32 Clinical analysis of auditory ossicular malformations

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We reviewed 42 ears of 37 patients (median age 21-years-old, range 5-58) with auditory ossicular malformations treated surgically from April, 1999 to December, 2013 at the Department of Otolaryngology, Yamaguchi University Graduate School of Medicine. We classified the auditory ossicular malformation into 3 types on the basis of the classification by Funasaka et al. Type I is a defect of the incudostapedial joint (n = 14). Type II is a fixation of the malleus and incus (n = 4). Type III is a fixation of the stapes (n = 12). Type I and II malformation were simultaneously occurred in 2 ears, and type I and III, type II and III malformation were occurred in 1 ear. We employed ossicular reconstruction by type I tympanoplasty (n = 4), modified type III tympanoplasty (n = 15), modified type IV tympanoplasty (n = 2), and stapes surgery (n = 18). Exploratory tympanoplasty without ossicular reconstruction was performed in 3 ears. According to the guidelines for reporting hearing results for middle ear and mastoid surgery (2010) proposed by the Japan Otological Society, postoperative hearing improvement was achieved in 36 of 39 ears (92.3%). In 42 ears, 19 adult cases existed. We performed further analysis in these adult cases. The adult cases were divided into two groups; (1) subjectively fixed hearing impairment level (n = 11), and (2) subjectively progressive hearing impairment level (n = 8). In group (2), defect of incudostapedial joint and/or defect of crus-footplate were observed in all cases. While, in group (1), fixation of malleus and/or incus and/or stapes were observed in 9 of 11 ears (82%). These data indicate that progressive hearing impairment in auditory ossicular malformation in adults may be due to the vulnerability of the ossicular chain.

P-33 Two adult cases of cerebrospinal fluid-middle ear effusion

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Spontaneous cerebrospinal fluid (CSF) leakage, such as rhinorrhea or otorrhea, in adults, is a rare case except for inner ear anomaly. We report two cases of CSF leakage from the defect of temporal bone.

Case 1: A-43-year-old man consulted our department complaining recurrent cerebral meningitis and hearing loss. The patient had a history of traffic injury and ear surgery at 5 and 15 years old, respectively. Otomicroscopic examination revealed a normal both tympanic membrane and canal. A high resolution computed tomography (CT) scan of the temporal bones showed a soft tissue mass located on the attic of the tympanic cavity and mastoid. Bone defect at middle cranial fossa and cochlea were also founded. Because he had a complain of watery rhinorrhea, endoscopic examination was performed, but no evidence of cerebrospinal fluid rhinorrhea. Cisternal scintigraphic test revealed the leakage of cerebrospinal fluid at temporal bone and discharge at epipharinx. To detect the leakage, we performed the mastoidectomy and found the leakage of CSF from the bony part of external acoustic meatus. This surgical findings suggest multiple fistula of dura mater.

Case2: A-44-year-old previously healthy man referred to our department by leakage of watery otorrhea after tympanostomy. We suspected the fluid was CSF, because glucose was measured by dipstick. CT scan of the temporal bones showed a shadow in tympanic space and mastoid, however, there was no obvious bone defect of the lateral part of the middle cranial fossa. The first surgery was performed to treat the CSF. The surgery revealed a bony defect in the mastoid tegmen and the defect had been closed with the periosteum. Three weeks after the consultation the second surgery was performed. The surgery revealed another bony defect in the epitympanic tegmen. The defect was closed by pedicled temporal muscle.

Late onset CSF leakage, such as rhinorrhea or otorrhea, is a rare complication of closed head injury. Case1 was delayed CSF leakage more than 20 years after head injury. The generally accepted explanation for delayed leakage is that the dural defect becomes plugged with brain tissue or granulation tissue or that sinus mucosa seals off the CSF leakage but does not provide a barrier against the spread of infection.

Second case showed spontaneous CSF otorrhea, which was considered to have been caused by enlarged arachnoid granulation with bone erosion of the middle cranial fossa.

In both cases, surgical treatments were performed using intradural approaches, and the dural defects were closed with viable pedicled flaps.

P-34 Do eyeglasses and palatal prosthesis effect on results of Weber test?

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Objective: To analyze the possible effects of eyeglasses and palatal prosthesis on the results of Weber tuning fork test.

Study Design: This study was performed on patients who has diagnosed unilateral conductive type hearing loss in adults between ages 18 and 65 years. 50 adult patients who has unilateral diagnosed conductive type hearing loss and wearing eyeglasses were included to group 1, 50 adult patients with palatal prosthesis and using palatal prosthesis constituted group 2, All of the patients were applied Weber tuning fork test with and without their prosthesis and results were compared. The Weber tests were performed using a 256 Hz and a 512 Hz tuning fork.

Results: There were no statistical difference in the results of both groups ($P>0.05$ and $P>0.05$ respectively).

Conclusion: Using eyeglasses and palatal prosthesis did not have statistically significant effect on results of Weber test.

P-35 A case of facioscapulohumeral muscular dystrophy showing bilateral hearing loss and bilateral facial palsy

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A 3 year-old male visited outpatient clinic with the complaint of bilateral hearing losses and bilateral facial palsies. The newborn hearing screening test showed bilateral failures. Four months after birth, ABR thresholds were right 45dB and left 55dB. Sixteen months after birth, he started to use hearing aids bilaterally. Bilateral facial palsies were detected first 23 months after birth and progressive. On physical examination, no neurologic deficit except for hearing loss and facial palsy was found. Temporal bone CT and IAC MRI also showed no inner ear anomalies. On facial EMG test, terminal latencies of bilateral facial nerves were delayed and CMAP amplitudes were decreased. Pure tone audiometry showed bilateral sensorineural hearing loss of ski-slope pattern with residual hearing. He was diagnosed with facioscapulohumeral muscular dystrophy. Despite use of bilateral hearing aids well, he showed low speech recognition scores and sequential cochlear implantations (Nucleus 422) were performed for both ears. We present his clinical findings and rehabilitation results after surgery.

P-36 The follow up result of infants who referred unilaterally on the new born hearing screening test

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Objective: Children with unilateral hearing loss cannot express their symptoms but also even their parents cannot easily notice whether they have unilateral hearing loss or not. This is the reason why screening tests for hearing loss have to be done as soon as possible. However, Until now there has been insufficient study about the prognosis on infants who were referred on the newborn hearing screening test unilaterally, Our objective of the study is to analyze the prognosis of those who were referred by short term follow-up.

Methods: From July 2010 to February 2014 at Haeundae Paik hospital, a total of 1789 newborns received newborn hearing screening with automated auditory brainstem response (AABR). Newborns who were referred had follow-up auditory brainstem response (ABR) tests after 3, 6, 9, 12 months and was confirmed at the 12th month.

Result: The eighty seven of the 1789 newborns were referred and among them 37 (2.06%) newborns had bilateral hearing loss and 50 (2.79%) newborns appeared to have unilateral hearing loss. After 12months, five (0.28%) patients were confirmed to have bilateral hearing loss and 3 (0.13%) patients were confirmed to have unilateral hearing loss.

Conclusion: Only 6% of the infants who were referred after the newborn hearing screening test were confirmed to have unilateral hearing loss whereas the majority showed recovery. Even though referred at the newborn hearing screening test we should do a regular follow-up and wait for recovery for an adequate short period rather than immediate diagnosis and intervention.

P-37 Wildervanck Syndrome - case report

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Background: Wildervank syndrome is a condition with multiple congenital anomalies associated, including the triad: fused cervical vertebrae, abducens paralysis and deafness (cervico-oculo-acoustic syndrome). This rare genetic disorder affects almost exclusively females.

Methods: We present a 5 years old girl diagnosed with Wildervanck Syndrome with Klippel Feil anomaly (fused cervical vertebrae), Duane Stilling Turk syndrome (bilateral abducens palsy) and congenital deafness.

Results: ABR testing indicated profound sensorineural hearing loss. The CT scan shown bilateral agenesis of the cochlea and internal acoustic canal and revealed major malformations of the brain and calvarium including the petrous part of both temporal bones; internal. As in other previous literature reports, the child also presents spina bifida cervicalis and cleft palate.

Discussions: In most cases, Wildervanck syndrome appears to occur randomly for unknown reasons but it also has been described in one family with affected members through 5 generations. Previous reports describe in addition to the triad bilateral lens subluxation, facial paralysis, atrial septal defect, scoliosis or cholelithiasis. This case could not benefit from cochlear implantation due to the agenesis of the cochlea and internal acoustic canal.

Conclusions: Despite all these brain malformations, the psychological development of the child is almost normal, allowing her to be able to learn a usable non verbal communication.

P-38 Hearing loss related to MARVELD2 gene is not syndromic in human

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Mutations in MARVELD2 gene are known to cause early onset autosomal recessive sensorineural hearing loss in Pakistani population and Central European Roma. Hearing loss in these patients was previously thought to be nonsyndromic. However, recent study on knockin mouse model showed a broader phenotype spectrum in the mutant mice, which included pathological changes in the thyroid and salivary glands, cardiomyocytes, olfactory epithelium and increased weight of several organs, indicating a syndromic deafness. Apart from evaluation of hearing loss, additional clinical investigations of the affected members of MARVELD2 families focused on extraauditory pathologies have not been performed yet. The current observations of broader function of tricellulin in animal model led us to a detailed characterization of disease phenotype in our patients. The aim of current study was to clinically reexamine the members of MARVELD2 families to reveal any yet unreported disorder associated with known mutations in this gene. Detailed clinical history was obtained for two MARVELD2 families (one of Pakistani and one of Roma origin) with particular emphasis on neonatal course, developmental delays, and signs of polyuria, polydipsia, goiter and hypotonia. We also conducted several screening clinical tests (general physical, audiometric, vestibular, biochemical, hematological, cardiological, and imaging investigations) to evaluate morphology and function of selected organs. The results of these clinical studies did not reveal any functional abnormality, which would cosegregate with hearing loss. This suggests that deafness due to MARVELD2 gene is non-syndromic in the subjects examined. The other abnormalities (microtia, microdontia) found in several members of the Slovak Roma family likely have different but also probably genetic cause. Nevertheless, we can not completely rule out the possibility of late onset of other clinical manifestations, as the oldest affected individual evaluated in this study was only 22 years old. In contrast to the Marveld2 mutant mouse, the function of tricellulin seems to be dispensable in most of the human tissues, except of the inner ear.

P-39 Identification of a novel mutation in the CHD7 gene in a patient with CHARGE association

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A 19-year-old Japanese woman was referred because of her hearing loss since early childhood. Examination revealed coloboma, heart defects, choanal atresia, mental retardation, genital hypoplasia, and deafness diagnosed CHARGE association. Cochlear implantation was done with transmeatal approach because of the venous malformation of the temporal bone area. A novel mutation c.6405_6406delAG in CDH7 gene was identified by next-generation and Sanger sequencing analyses. We present the clinical findings, technique of the transmeatal cochlear implantation, postoperative speech perception results and genetic analysis of the CDH7 gene.

P-40 Analysis of 69 hearing loss associated genes in adulthood-onset hearing loss patients using next generation sequencing

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Introduction: Genetic causes of nonsyndromic hearing loss are quite heterogenous. There are tens of genes responsible for this disorder. Mutations in GJB2 gene are prevalent, however mutations in other genes are rare, responsible for only a minority of cases.

Patients and Methods: Eight patients with adulthood onset hearing loss (4 patients from one family and 4 nonrelated patients) were included into the study. A panel of 69 genes associated with autosomal recessive, autosomal dominant of X-linked hearing loss was designed. NimbleGene sequence capture method (SeqCap EZ Solution-based enrichment) was used with subsequent nextgeneration sequencing at the Illumina platform.

Results: No clearly pathogenic mutation was found in any of the patients. Several variants of potential pathogenicity were found in various genes, that will be further studied.

Conclusion: We suppose existence of so far unknown genes responsible for monogenic nonsyndromic hearing loss. Besides that multifactorial origin of many cases of genetic hearing loss is very probable, with cummulation of multiple risk allelles in various genes.

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P-41 Bilateral hearing impairment as the initial symptom of sympathetic ophthalmia

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Importance: Sympathetic ophthalmia (SO), a rare bilateral panuveitis following penetrating ocular trauma or ocular surgery to one eye, shares a strikingly similar ocular pathology to that of Vogt-Koyanagi-Harada disease (VKH). Audiovestibular dysfunction is a major extraocular manifestation of VKH; however, to date, only a few cases of sympathetic ophthalmia associated with hearing loss have been reported from ophthalmologists, but not otolaryngologists. Accordingly, little is known about the audiovestibular findings in patients with SO. We herein present two cases of SO with preceding bilateral hearing loss.

Observations: The patient in Case 1, an 80-year-old female, experienced acute bilateral hearing loss. Five days after the onset of hearing loss, she presented with sudden bilateral blurred vision. In Case 2, a 32-year-old female noticed acute bilateral hearing loss and also experienced acute bilateral blurred vision the subsequent day. Patient 1 had a history of a penetrating injury to the right eye 25 days before the onset of hearing loss, while patient 2 had previously undergone right vitreous surgery twice for the treatment of a myopic macular hole and retinal detachment 36 and 43 days prior to the current symptom onset. Both cases were diagnosed as SO based on ocular findings of bilateral panuveitis and the history of ocular insult. Patient 1 carried HLA-DR4, HLA-DR15, HLA-A33, HLA-A24, HLA-B44 and HLA-B52, and patient 2 carried HLA-DR4. Audiograms showed bilateral mild to moderate sensorineural hearing loss in both cases, with a normal auditory brainstem response and deteriorated distortion product otoacoustic emission amplitude. In addition, the significant recruitment phenomenon observed in case 1 suggested a cochlear origin of the hearing loss. Both patients received steroid therapy, and the cochlear signs and symptoms recovered within one month.

Conclusions and Relevance: This is the first report to describe the comprehensive audiovestibular findings in patients with SO. In the present study, acute bilateral hearing loss developed a couple of days prior to the onset of bilateral visual loss and auditory examinations suggested a cochlear etiology in both cases.

P-42 Severe-Profound Hearing Loss from Cryptococcus Meningitis with Spontaneous Recovery

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Introduction: Sensorineural hearing loss is a common complication of Cryptococcal meningitis, with a documented incidence of 27 to 30.8%. Various mechanisms in cryptococcal meningitis that contribute to sensorineural hearing loss include the invasion of the temporal bone, destruction of the spiral ganglion and cochlear nerve fibers as well as cryptococcal meningeal infiltration with arachnoiditis.

Case summary: A 52-year-old man with cryptococcal meningitis presented with bilateral severe-profound sensorineural hearing loss and vestibular dysfunction.He was initially being evaluated for cochlear implantation. However, he had showed significant spontaneous recovery with his hearing returning to baseline in his right ear and with remnant mild- moderate hearing loss in the left ear. He no longer required surgery and was able to cope with daily activities without the use of a hearing aid.

Discussion: The mechanism of hearing loss in patients with cryptococcal meningitis is different from that observed in bacterial meningitis. Typically, cochlear implant surgeries are performed with some urgency in patients with hearing loss post-bacterial meningitis due to the risk of labyrinthitis ossificans . However, this process has yet to be described in patients with cryptococcal meningitis. Furthermore, patients with hearing loss from cryptococcal meningitis have shown varying degrees of improvement. In addition, the retro-cochlear mechanism of damage also limits the efficacy of cochlear implants . As such, in this case report, hearing loss from cryptococcal meningitis are compared with that from bacterial meningitis and the need for cochlear implantation in patients with cryptococcal meningitis is further discussed.

Conclusion: Sensorineural hearing loss is a common complication of cryptococcal meningitis. However, due to its unique features of potential reversibility and retrocochlear involvement, it should be managed more conservatively than bacterial meningitis.

P-43 Postmeningitic cochlear fibrosis due to incomplete partition anomaly on the controlateral ear

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Introduction: Bacterial meningitis is the most common cause of acquired postnatal sensorineural hearing loss especially in children.
The cochlear aqueduct is the most likely pathway. Other possible pathways are the cochlear modiolus (via the internal auditory canal) and the hematogenous route. Incomplete partition type I (IP-I) anomaly is defined as; the cochlea is lacking the entire modiolus and cribriform area, resulting in a cystic appearance. This is accompanied by a large cystic vestibule. It is a developmental abnormality of the inner ear that may cause hearing loss, cerebrospinal fluid (CSF) leakage, and bacterial meningitis.
The labyrinth can be damaged by inflammation, fibrosis then ossification. The ossification process obliterates endolymph and perilymph. Literature has evidenced the poor sensitivity of high-resolution computed tomography (HRCT) to detect early phases of ossification so that Magnetic Resoance Imaging (MRI) is the choice of imaging in postmeningitic hearing loss.
In this presentation we want to discuss a case with incomplete partition anomaly on one side and cochlear ossification due to bacterial meningitis on the controlateral side.

Case: 21 year old woman who have right sided congenital sensorineural hearing loss because of incomplete partition anomaly type 1. She got through pneumococcal meningitis due to this inner ear abnormality. 5 months later, she suffered from bilateral sensorineural hearing loss. On her HRCT; IP type 1 with enlargement of the vestibular aqueduct is seen.MRI shows decline in the cochlear fluid which indicates early fibrosis in T2 weighted images on the controlateral ear. Urgent CI to the left side was performed without any problem.

Discussion: Cochlear anomalies are the most frequent anomaly type associated with CSF leaks originating in the temporal bone. An abnormal connection between the subarachnoid space and middle ear may result in meningitis which is also associated with hearing loss.
Bilateral deafness can occur immediately or several months after bacterial meningitis, regardless of the responsible micro-organism. Labyrinth ossification is the most serious complication after bacterial meningitis.
Reduction of the T2 signal on MRI indicates replacement of endolymph by solid tissue. Particularly, T2-weighted images can help detect the presence of early fibrosis, which occurs prior to ossification from the absence of intracochlear fluid. The ability to accurately assess the presence and extent of cochlear involvement on MRI is important for diagnosis, surgical timing, side selection and prognosis, as well as type of cochlear implant to be used.
Early bilateral cochlear implantation is recommended in the presence of ossification.It is well known that ossification can make cochlear implantation challenging and in many cases leads to a partial electrode array insertion.
It is difficult to establish a direct correlation between MRI findings and the difficulty of surgical insertion of the cochlear implant electrode array.

Conclusion: Meningitis due to a cochlear anomaly in one ear can cause cochlear ossification on the controlateral ear. In postmeningitic deafness, MRI must be performed urgently to detect endolymph inflammation or ossification. Early cochlear implantation to the normal ear is the treatment of choice in such cases.

P-44 The Role of AceytlLCarnitine Against Ototoxicity due to Cisplatin and Radiotherapy: Nrf2 and Targets

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Aim: Concomitant application of cisplatin (CDDP) and radiotherapy (RT) is known to have synergistic effects in oncology practice. CDDP is known to induce many side effects such as ototoxicity. RT also can cause ototoxicity if it is applied to head and neck region. In both modalities oxidative stress may be blamed for this side effect. Combination of these two modalities has an additive toxicity. Nuclear factor erythroid 2-related factor 2 (Nrf2) is a transcription factor and it has antioxidant properties. Aim of this study is to evaluate the protective effect of Aceytl-L-Carnitine (ALC) via Nrf2 and target genes against CDDP chemotherapy and RT induced ototoxicity.

Material and Methods: House Ear Institute-Organ Corti I (HEI-OC1) cochlea cells were kindly obtained from F. Kalinec. Cells were maintained in DMEM containing 10% FBS at 33C and 10% CO2 conditions. Cells were incubated with CDDP, RT and ALC and combinations for 24, 48 and 72 hours. Cell viability was measured with WST-1 test. The LD50 doses of CDDP, RT, ALC and combinations were detected by viability assay. Nrf2, Hem Oxygenase I (HO-1), Glutathione S Transferase (GST), Glutathione Peroxides (GP), NAD (P)H: Quinone oxidoreductase 1 (NQO1), Glutathione Reducates (GR), Superoxide dismutase (SOD) II, Superoxide dismutase (SOD) III, Catalase and Glutamate Cysteine Ligase (GCL) gene expressions analysis were performed with RT-PCR. Gene expressions results were compared with controls and each other. The significance gene expressions cut of level is considered as >2 fold changes. $p<0.05$ was accepted to be statistically significant.

Results: CDDP (50 M) and RT (5Gy) decreased the viability of cells 50 % at 72 hours. ALC (50 M) protected the cells from CDDP and RT induced cell death.
CDDP mainly decreased the expressions of SODII (-9.8 fold) which is one of the targets genes of Nrf2 ($p<0.05$).
The expressions of GST (-2 fold) decreased with RT alone but GPx (2.08 fold) and SODIII (2.09 fold) expressions were increased slightly. CDDP-RT induced Catalase (2.54 fold), SODII (2.52 fold), SODIII (2.64 fold) and HO-1 (3.95 fold) gene expressions sligthly.
ALC-CDDP combinations significantly increased the level of expressions of GST (39.41 fold) and Nrf2 (9.75 fold) genes ($p<0.05$).
ALC-RT combinations induced the SODIII (3.54 fold) and NQO1 (2.53 fold) gene expressions.
ALC-CDDP-RT combinations increased almost all gene expressions of Nrf2 (2.19 fold), GR (2.27 fold), SODII (2.49 fold), Catalase (2.66 fold), GPx (5.48 fold), and mainly NQO1 (11.6 fold), SODIII (11.82 fold), HO-1 (30.77 fold) and GST (64.53fold) genes except GCL($p<0.05$).

Conclusion: ALC protected cochlear cells from toxic effects of CDDP and radiotherapy combinations. This protection was mostly due to increased expressions of Nrf2 and target genes.

P-45 Ototoxicity of cisplatium and trials of it's reduction, experiences of our laboratory

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Cisplatinum (CDDP) has some side effects, such as ototoxicity, renal toxicity and myelo-supression. The ototoxicty sometimes causes a reason to stop chemotherapy. We have tried to suppress this toxicity from the points of free radicals and apoptosis. We report these results.

The roles of inducible nitric oxide synthase (iNOS) in the CDDP injected cochlea of the guinea pigs and NOS inhibitor (N^G-nitro-L-arginine methyl ester, L-NAME) were examined electro- and immunohistochemically in this study. The auditory brain stem responses (ABR) were measured prior to and 3 days after the injection. After 3 days, the cochleas were offered to immunohistochemical studies for iNOS. iNOS was expressed in the CDDP and L-NAME/CDDP treated cochlea. The threshold shift of ABR became significant in the CDDP group, whereas it was decreased in the L-NAME/CDDP group.

The modified Bcl-xL, exhibits the stronger activity to inhibit cell death. CDDP is also known to cause apoptosis. The fusion protein PTD-modified Bcl-xL of the HIV/Tat protein transduction domain (PTD) and modified Bcl-xL can enter into the cell body. PTD-modified Bcl-xL was s.c. injected 2 hours before the injection of CDDP. CDDP was i.p. injected into the mice (C57/BL6). 7 days after the injection, ABR was recorded and animals were sacrificed. CDDP also injected the tumor carrying mice and measured the tumor growth. When CDDP were i.p. injected into mice, the survival rate was 57 %. On Day 7, all of the survived mice exhibited the elevation of ABR threshold. The elevation of ABR threshold was reduced in the CDDP/modified Bcl-xL group. And CDDP inhibited an increase in the volume of tumor, when injected into tumor-carrying mice.

Our results indicate that suppression of free radicals and apoptotic pathways are very effective for the protection of ototoxy of CDDP.

P-46 Utility of WHODAS 2.0 (Quality of Life Assessment) in detecting Changes in Quality of Life in Hearing Disability

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Introduction: There have been previous studies which have used WHODAS 2.0 as a health-related Quality of Life (QoL) assessment to detect changes in QoL with hearing loss severity This was also studied to be a useful measure for outcomes of hearing aid intervention for adults. However, the studies have been limited and have not been assessed in our local context. The objective of this study is to relationship of pure tone audiogram (PTA) score, screening questionnaire and quality of life assessment via World Health Organisation Disability Assessment Schedule 2.0 (WHODAS 2.0) in our Singaporean population

Methods: A retrospective review of 56 participants who were recruited for hearing screening held in a Singaporean Tertiary General Hospital from 29-30th May 2013 was done. Information recorded include general demographics, self-perception of hearing level, Hearing Handicap Inventory for Elderly Screening (HHIE-S) for participants >60 years old, Hearing Handicap Inventory for Adults (HHIA) for participants <60 years old, a quality of life assessment using WHODAS 2.0 as well as a PTA (0.5, 1, 2, 4 kHz) done by an experienced audiologist. WHODAS 2.0 was measured as a total global score (maximum: 100) as well as specific domain scores for 6 domains: Cognition, Mobility, Self-Care, Getting along, Life activities and Participation.

Results: The mean total WHODAS score was 42.3 (Range: 32-96, SD: 14.5). Mean specific domain scores include: Cognition at 8.9 (Range: 6-19, SD: 3.6), Mobility at 6.6 (Range: 5-17, SD: 3.02), Self-Care at 4.4 (Range: 5-12, SD: 1.53), Getting along at 6.1 (Range: 5-17, SD: 2.49), Life activities at 5.14 (Range: 4-14, SD: 2.54).

There was no significant correlation found between total WHODAS score and PTA score of better ear ($p=0.322$) and between domain specific WHODAS score and PTA score, except for the Getting Along domain ($r=0.26$, $p=0.031$). There was also no significant correlation found between HHIA or HHIE and any WHODAS score (all $p>0.05$).

Discussion and Conclusion: WHODAS 2.0 may not be sensitive enough in detecting quality of life change in hearing-related disability. Future study with larger population may be required to better determine utility of WHODAS 2.0 in hearing disability.

P-47 Hearing loss and Hearing Handicap Inventory, role of smoking

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Introduction: Hearing impairment in adults is one of the common chronic health conditions. Based on epidemiological study comprising significant large number of respondents to assess the number of people with the hearing loss in an industrial region (comprising 280 thousand residents) with respect to gender, related to age, to compare the subjective perception of auditory disorders detected by using a shortened version of the questionaire Hearing Handicap Inventory (HHI), with the threshold detected by tone audiometry. The study aimed at describing smoking habits in a population living in an industrial area and at determining whether there was a direct relationship between hearing loss and the number of cigarettes smoked.

Methods: The respondents were persons aged 18 or more who visited an ENT specialist in the industrial region and underwent otoscopy, pure tone audiometry and tympanometry. The required data are collected by dialogue with respondents using the questionaire. The respondents filled out the HHI screening form. The obtained data were used to calculate the Brinkman Index (BI). The prevalence of smoking with respect to gender, education and age was assessed by χ regressions; gender, smoking and age factors potentially related to headaches and tinnitus were analyzed.

Results: The sample included 12000 persons aged 18 to 102 years were examined, among whom non-smokers prevailed. Hearing loss is getting worse with age. With the increasing severity of hearing loss, the severity of hearing disability is increasing. The results indicated that pure-tone sensitivity was most highly correlated with the HHI. Between 40 and 69 years of age, auditory threshold impairment was only noted at the highest frequencies, that is, 6,000 and 8,000 Hz. The auditory thresholds were statistically tested for two age categories (5059 and 6069 years) as in these individuals, two risk factors affecting the auditory threshold may be assumed, namely age and smoking. The mean BIs in females and males were 192.9 and 257.7, respectively.

Conclusion: The audiometric testing is time-consuming, expensive and it needs the qualified staff for examination. The HHI questionaire could then easily indentify the individuals who have some emotional and social difficulties associated with hearing loss and those people 2 would then be sent to a specialized examination and be proposed further treatment. In the present study, smoking was more prevalent in males. Increasing age was associated with lower rates of smokers. Tinnitus was more frequent in females and the rates increased with age. There was a direct relationship between ex-smoking and tinnitus. In both genders, an increase in age was associated with an exponential rise in perceptive hearing loss. Increases in smoking duration and the number of cigarettes smoked were found to be associated with auditory threshold impairment at 4,000, 6,000 and 8,000 Hz. The study results partly confirm the association between auditory threshold impairment and the number of cigarettes smoked. Decreasing both active and secondhand smoking rates in the current population may contribute to auditory threshold improvements, particularly in elderly persons.

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P-48 The Association of Insulin Resistance and Metabolic Syndrome with Age- Related Hearing Loss

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Objectives: Metabolic syndrome (MetS) is a complex metabolic disease characterized by central obesity, impaired glucose metabolism, dyslipidemia, arterial hypertension, insulin resistance, and high-sensitivity C-reactive protein. Some factors associated with MetS may increase the risk of hearing loss; we hypothesized that cases with MetS would have an acceleration of hearing loss compared to those without MetS. The purpose of this study was to analyze the association of insulin resistance and MetS with hearing impairments and to prove our hypothesis.

Methods: This study was a retrospective study performed in a medical center. The subjects in this study were the employees from a single company. Homeostasis Model Assessment for Insulin Resistance (HOMA-IR) was used as the index of insulin resistance. The pure tone audiometric data of a 10-year-period were retrieved from the computerized database. The 10-year shifts of average hearing levels, including conventional frequencies (0.5, 1, 2 kHz) and high frequencies (4, 6, 8 kHz), were used to analyze the correlations with HOMA-IR and MetS. Linear regressions were used to estimate the coefficients of age, sex, HOMA-IR, and metabolic syndrome to hearing level shifts. The level of statistical significance was set as $p<0.05$.

Results: Data from169 cases, including 162 men and 7 women, were analyzed in this study. Age was the most relevant factor to hearing loss. After adjusting for age and sex, HOMA-IR was found to be associated with a high-frequency hearing level shift (coefficients=0.156, p=0.035), while HOMA-IR was not found to be significantly associated with conventional frequency hearing loss. However, MetS was not found to be significantly associated with either conventional or high frequency hearing level shifts.

Conclusions: Insulin resistance is associated with the acceleration of age-related hearing loss, while MetS is not shown to increase the risk of hearing loss. Based on the findings of this study, agents that help lower insulin resistance may play a role in the deceleration of age-related hearing impairment.

P-49 Metabolic Syndrome Increases The Risk of Sudden Sensorineural Hearing Loss in Taiwan

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Objective: Sudden sensorineural hearing loss has been reported to be associated with diabetes mellitus, hypertension, and hyperlipidemia in previous studies. The aim of this study was to examine whether metabolic syndrome increases the risk of sudden sensorineural hearing loss in Taiwan.

Subjects and Methods: We retrospectively investigated 181 cases of sudden sensorineural hearing loss and 181 controls from the Department of Otorhinolaryngology, Kaohsiung Medical University Hospital in southern Taiwan from 2010 to 2012, comparing their clinical variables. We analyzed the relationship between metabolic syndrome and sudden sensorineural hearing loss. Metabolic syndrome was defined according to the National Cholesterol Education Program Adult Treatment Panel III with Asian modifications. The demographic and clinical characteristics, audiometry results, and outcome were reviewed.

Results: Subjects with metabolic syndrome had a 3.54-fold increased risk (95% CI= 2.00-6.43, p<0.01) of having sudden sensorineural hearing loss compared those without metabolic syndrome, after adjusting for age, sex, smoking, diabetes mellitus, hypertension, and hyperlipidemia. With increases in the number of metabolic syndrome components, the risk of sudden sensorineural hearing loss increased (p for trend <0.01). Vertigo was associated with a poor outcome (p= 0.02; 95% CI= 1.13~5.13, adjusted odds ratio 2.39). The hearing loss pattern may influence the outcome of sudden sensorineural hearing loss (p<0.01).

Conclusion: These results suggest that metabolic syndrome is an independent risk factor for sudden sensorineural hearing loss in Taiwan. Vertigo and total hearing loss were indicators of a poor outcome in sudden sensorineural hearing loss.

P-50 Expression of Toll-Like Receptor Genes in Leukocytes of Patients with Sudden Sensorineural Heairng Loss

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Objectives/ Hypothesis: Sudden sensorineural hearing loss is a disease entity that could be caused by multiple etiologies in which the innate immunity status of the patients might be involved. The aim of this study is to investigate the expression of Toll-like receptor genes in peripheral blood leukocytes of sudden sensorineural hearing loss patients.

Study Design: This is a basic research.

Methods: We examined the expression of six Toll-like receptor genes in the peripheral blood leukocytes of sudden sensorineural hearing loss patients and normal controls using real-time quantitative reverse transcriptase-polymerase chain reaction.

Results: We found significantly higher expression of Toll-like receptor 2, 3, 4, 7, 8 and 9 genes in sudden sensorineural hearing loss patients as compared with normal controls ($P<0.05$). Higher expression of Toll-like receptor 2 gene was found in patients with profound hearing loss compared with those with less severe hearing loss ($P<0.05$). The result was validated by the positively stained leukocytes for Toll-like receptor 2 protein in sudden sensorineural hearing loss patients using the immunocytochemical study. In addition, percentage of $CD14^+$ monocytes expressing Toll-like receptor 2 in sudden sensorineural hearing loss patients was higher than normal controls by flow cytometry and significantly correlated with the hearing thresholds of affected ear ($P<0.05$).

Conclusion: Our study implies a role for Toll-like receptors in sudden sensorineural hearing loss and the expression of Toll-like receptor 2, in particular, correlates with the severity of the disease.

P-51 The Efficacy of Varied Oral Steroid Doses on the Treatment of Sudden Sensorineural Hearing Loss

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Objective: This study aimed to compare the efficacy of oral prednisolone prescribed to admitted patients in two ways: full-dose prednisolone(continuous maximum tolerable doses of prednisolone) and tapering doses of prednisolone (steadily reduced doses of prednisolone).

Materials and Methods: Fifty-four sudden sensorineural hearing loss (SSNHL) patients, admitted to our hospital between January 2012 and April 2013, were enrolled as the study subjects. Based on the specialists' clinical experience, 27 patients received full-dose prednisolone (Group I). The other 27 received a tapering dose of prednisolone (Group II). We analyzed the efficacy of the two management groups by assessing the patients' hearing recovery after 6 months of treatment.

Results: After 6 months, the average absolute hearing gain and recovery rate in Group I were 23.94 dB and 74% respectively, which was better than the 19.83 dB and 63% in Group II. However, there was no statistically significant difference in the efficacy of treatment between the groups. One patient in Group I developed the side effect of acute closed-angle glaucoma. The other 53 patients were free from severe side effects.

Conclusion: Prescription of a tapering dose of prednisolone is highly recommended as routine management for patients with sudden sensorineural hearing loss. Compared with full-dose treatment, it has equivalent efficacy while reducing the risk of severe side effects.

P-52 Repetitive systemic steroid therapy as salvage treatment for sudden sensorineural hearing loss

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Objectives: 1) To analyze the efficacy of multiple consecutive courses of steroid injection for idiopathic sudden sensorineural hearing loss (SSNHL) and 2) to determine the factors affecting the hearing outcomes.

Materials: We conducted a retrospective study of unilateral idiopathic SSNHL patients who underwent inpatient care at our institution from June 2005 to October 2014. SSNHL was defined as sensorineural hearing loss of 30dB or more, occurring in each of the three frequencies, 500Hz, 1000Hz, and 2000Hz. The term sudden was interpreted as hearing loss occurring within 3 days. Those who had multiple episodes of hearing loss, past surgical history of the affected ear, or a history of steroid usage before presentation were excluded from the study. Patients underwent either 1 or 2 courses of systemic steroid injection therapy. The second course of steroid injection was conducted immediately after the first course when the patient expected to receive repetitive treatment. Audiometry was performed between 1 to 24 weeks after the treatment course has finished.

Methods: The difference of Pure Tone Average (PTA) before treatment and at the final evaluation (dPTA) was calculated for each patient. To evaluate hearing levels after the first course of steroid therapy, we used PTA recorded around 12 days after the treatment has started. Patient records were organized by age, time since onset, method of steroid usage, prostaglandin E1 (PGE1) usage, and presence of tinnitus, dizziness, diabetes, hypertension, and dyslipidemia. As univariate analyses, Pearson's correlation coefficient was calculated between each of these factors and dPTA. As multivariate evaluation, multiple regression analysis was conducted. $P < 0.05$ was considered as statistically significant.

Results: A total of 139 patients were evaluated. The average hearing outcome was 56.0dB, while 45 (32.4%) patients attaining a PTA of 40dB or better. Hearing improvement of 30dB or more was accomplished in 79 (56.8%) of 139 patients. Patients with 2 courses of systemic steroid therapy did not have a significant difference compared to patients with a single course in PTA hearing levels before, between, and after treatment. With univariate analyses, higher age ($p = 0.0233$) and presence of diabetes ($p = 0.0359$) showed statistically significant negative correlation with dPTA. Presence of dizziness showed a tendency towards worse dPTA ($p = 0.117$). Method of steroid usage did not have a correlation with dPTA ($p = 0.775$). Multiple regression analysis revealed the presence of dizziness as the only factor significantly influencing dPTA ($p = 0.0228$).

Conclusions: A second, consecutive course of systemic steroid injection did not have influence on the prognosis of idiopathic SSNHL. As mentioned in prior studies, the presence of dizziness indicated a poor prognosis.

P-53 Amidotrizoate therapy for sudden hearing loss

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In sudden hearing loss (SHL), most common treatment involves the use of steroids. It was widely indicated that earlier initiation of treatment was associated with better hearing outcome. We studied the usefulness of amidotrizoate for SHL patients who failed to recover with initial steroid treatment.

Between May 2013 and Dec 2014, there were 10 patients undergoing steroid therapy in other 7 facilities had been introduced us for the amidotrizoate therapy without hearing improvement. Treatment of the previous physician, steroid oral and intravenous drip injection was performed in each five cases. The average duration of treatment of them was 8.5 days.

We used the indications of hearing of grade and improvement based on the diagnostic criteria of the Committee of the Japanese Ministry of Health, Labor and Welfare. Hearing levels at the time of their visit to our clinic were Grade 4 (90 dB nHL or worse) 2 cases, Grade 3 (60~90 dB) 7 cases and Grade 2 (40~60 dB) 1 case. We treated them by amidotrizoate therapy more than 7 days.

Results of the amidotrizoate therapy showed 3 patients with a complete recovery, 2 with a marked improvement, 3 with an improvement and 2 with no change.

If there is no effect on steroid as standard therapy, other therapies are considered. This time, we have experienced in half an SHL cases amidotrizoate therapy was useful. These results suggest that require re-examination as one of the choices of treatment and we should check the hearing level at the one week of the initial steroid therapy. The amidotrizoate therapy could be an effective therapy as a salvage treatment for the cases not recover with initial steroid treatment.

P-54 Relationship of intra-annual distribution of sudden hearing loss versus meteorological parameters

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Background and Objectives: The influence of specific meteorological conditions, such as temperature, wind velocity, fine dust and their covariation on the incidence of idiopathic sudden sensorineural hearing loss (ISSHL) has been rarely investigated. Aiming at better predictions of the seasonal variation of ISSHL, we investigated variations in the monthly incidence of ISSHL and meteorological parameters.

Subjects and Method: One hundred five patients who had been diagnosed with ISSHL were analyzed. Monthly incidence counts were analyzed for incidence distributions throughout the year. The incidence counts were investigated according to age groups and hearing recovery. The relationship of intra-annual distribution of ISSHL versus meteorological parameters was compared.

Results: The highest of monthly incidence was found in march and april. Intra-annual distribution of ISSHL was well correlated with daily temperature range, wind velocity and fine dust. The incidence of ISSHL was significantly correlated to fine dust. The distribution of age group and hearing recovery of ISSHL in march and april were not different with the rest of the year.

Conclusion: We concluded that ISSHL incidences are significantly related to seasonal variation and the highest is found in march and april. This provides valuable information for clinicians, creating an awareness of periods of potentially increased risk.

P-55 Impact of Better Contralateral Hearing on Sudden Deafness: from the Perspective on Tinnitus

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Background: We aimed to evaluate the prognostic factors on the new onset tinnitus associated with unilateral idiopathic sudden sensorineural hearing loss (ISSNHL) and assess the relevance between these factors and final recovery.

Methods: We enrolled a total of 770 patients with unilateral ISSNHL by retrospective medical chart reviews. Patients were classified into two groups according to presence of new onset tinnitus at initial visit. Patient characteristics and the results of pure tone audiometry were compared between two groups.

Results: 70.9% (n=546) of patients had tinnitus at initial visit. There was no significant difference in mean hearing thresholds of the affected ear irrespective of accompanying tinnitus. On the contrary, patients having tinnitus in the affected ear tended to have better mean hearing thresholds in the non-affected ear ($p<0.05$). Logistic regression analysis also revealed that better mean hearing thresholds in the non-affected ear alone increased the possibility of accompanying tinnitus ($p<0.05$). These better hearing thresholds in the non-affected ear as well as younger age, absence of dizziness, low-tone hearing loss and combined intra-tympanic dexamethasone injection were also associated with final recovery ($p<0.05$). However, tinnitus was not an independent risk factor for final recovery.

Conclusion: Better contralateral hearing was associated with both increase in frequency of accompanying tinnitus and better final recovery. However, tinnitus was not related to final recovery.

P-56 Temperament and character traits in patients with tinnitus

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Objectives: The connection between personality and tinnitus had not been adequately studied. Personality consists of genetically determined temperament and character that can be changed by education or experience. The aims of this study is to describe the temperament and character traits in tinnitus patients and difference in these traits according to the severity of tinnitus.

Methods: Ninety seven patients affected by tinnitus were recruited between January and December 2014. Audiology test of pure tone audiometry and tinnitogram was done. Patients underwent the tinnitus questionnaire battery, including Visual analogue scale, tinnitus handicap inventory (THI) and Temperament and character inventory (TCI).

Results: Most common temperament subtype was methodical/obsessional trait (13.4%). And rigid/patient and hyperthymic traits were second most (8.2%, 8.2%). Selfish traits of character subtype was mostly identified in tinnitus patients (11.3%). According to the THI score, subjects were categorized into "non-severe tinnitus, n=79" and "severe tinnitus, n=20". In the temperament analysis, score of "novelty seeking" was significantly lower in severe tinnitus group than in non-severe tinnitus. However, other parameters of temperament, including "harm avoidance", "reward dependence" and "persistence" or character traits of "self-directedness", "cooperativeness" and "self-transcendence" were not significantly different according to the severity of tinnitus.

Conclusions: Decreased scores of novelty seeking was evident in patients with severe tinnitus. There might be a connection between tinnitus and temperament trait which is genetically or biologically determined.

P-57 Pulsatile Tinnitus Secondary to a Dural Arteriovenous Fistula

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A 60-year-old man presented with a 3-month history of persisting unilateral pulsatile tinnitus. He has no history of trauma. Otoscopic examination, audiometry, and tympanometry showed normal finding. An initial magnetic resonance imaging with angiography (MRA) demonstrated ill-defined left sigmoid and transverse sinuses margin. Such MRA findings was suggestive of a dural arteriovenous fistula, and a catheter angiogram was obtained revealing abnormal vasculature along the left transverse sinus and early filling of the left sigmoid sinus confirming the diagnosis of arteriovenous fistula. Although endovascular embolization may be a good treatment option, we decided to wait until the fistula could be occluded spontaneously.

We herein report a case of pulsatile tinnitus from dural arteriovenous fistula of multiple branches of posterior and middle meningeal artery, basal tentorial artery to transverse-sigmoid venous sinus.

P-58 13 Year Review of First-time Hearing Aid Users from a Singapore Tertiary General Hospital

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Background: This study aims to describe the characteristics as well as to understand the associations between age or gender with hearing loss, self-reported hearing aid usage and hearing aid characteristics of first-time hearing aid users seen in Tan Tock Seng Hospital from January 2001 to December 2013.

Material and Methods: A retrospective study of 1103 patients was carried out on existing audiometric records (ranging from January 2001 to December 2013) from the Otorhinolaryngology Department, Tan Tock Seng Hospital. The following variables were also collected: demographic data, baseline average pure tone audiometry thresholds (PTA0.5, 1, 2, 4 kHz), onset of hearing loss (sudden vs chronic), type of hearing loss (conductive, sensorineural, mixed), hearing loss severity and hearing aid characteristics. Hearing aid characteristics include type of hearing aid used, side of hearing aid fitting as well as cost of hearing aid.

Results: General Demographics

The mean age of 1st fitting is 70.2 years (Range: 10-109, SD: 13.1). 51% were males and 49% were females. The majority were Chinese (86.9%), with 4.5% Malays, 6.1% Indians and 2.5% other races.

Hearing Loss: 97.5% had gradual onset while 2.5% had sudden onset. For type of hearing loss, 0.3% was conductive, 75.3% was sensorineural, while 24.3% was mixed. The mean PTA score for the right was 64.3 (Range: 4-120, SD: 19.0), while the mean PTA score for the left was 64.1 (Range: 10-120, SD: 18.4). 5.7% had mild, 28.9% had moderate, 36.9% had moderate-severe, 19.9% had severe and 9.3% had profound hearing loss.

Hearing Aids: 69.2% used Behind-the-ear type, 6.5% used In-the-ear type, 11.4% used In-the-canal type, 10.8% used Completely-in-canal type, 0.4% used open fit type while 1.6% used canal-receiver-technology. 82.4% fitted one ear while 17.6% fitted both ears. The mean cost of hearing aids per person was $2133.97.

Discussion and Conclusion: This review sheds light on the profile of hearing aid users in our hospital and the needs of our patients, providing new insights on our patients to improve management of hearing.

P-59 Factors Affecting Hearing Aid Satisfaction in a Singapore Population

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Objective: To explore the satisfaction of Hearing Aid (HA) users in Singapore and the factors affecting the level of satisfaction.

Material and Methods: A retrospective study was carried out and 643 subjects were identified from audiometric records from Otorhinolaryngology Department, Tan Tock Seng Hospital. Demographics (age, gender, race), pure tone audiometry average (PTA0.5, 1, 2, 4 kHz), HA laterality (unilateral, bilateral) and pre- and post-fitting scores of hearing-disability questionnaire were collected. The questionnaire was a locally-modified version of Hearing Handicap Inventory for the Elderly Screening (HHIE-S) which assessed eight locally-relevant communicative situations affected in hearing loss. The eight communicative situations in questionnaire were: Difficulty with 1:1 conversation in quiet, Difficulty with group conversation in quiet, Difficulty hearing in noise, Difficulty hearing over the telephone, Needs to increase volume of TV/radio, Hearing loss affects job, Family member feels frustrated, Hearing loss limits social life.

Results: Patients had a mean age of 73.1 years (range: 22-113 years old). There were 327 males and 316 females. Race proportion was Chinese 87.9%, Malay 4.2%, Indian 5.8%, others 2.2%. More than 80% of patients experienced difficulties in the all of the eight respective communicative situations before fitting of HA. The situation where patients reported most disability is when hearing in noisy environment (76.4%). After fitting of HA, 51.6% of patients experienced an improvement in six or more situations out of eight. The communicative situation which showed most improvement was group conversation (82.6%).

Factors found to correlate with the HA user satisfaction were: age, gender, HL severity and HA laterality. Patients older than 75 were twice as likely to experience improvements in 1:1 or group conversations respectively ($p=0.013$; $p=0.023$ respectively). Women were 1.5 times more likely to report improvement for group conversation than man ($p=0.029$), but men were 2.5 times more likely to report improvement in workplace than woman ($p=0.011$). The odds of experiencing an improvement in 1:1 conversation was 5 times higher for patients with moderate-severe HL compared to mild HL ($p<0.001$). Finally patients with bilateral HA were 6 times more likely to experience an improvement in workplace than unilateral HA users ($p=0.011$) and 2 times more likely to feel an improvement in social life ($p=0.013$). Race and frequency of HA usage were not found to correlate with satisfaction.

Conclusion: HA greatly improves the quality of life in patients with hearing loss. Elderly patients with severe hearing loss and those who fit bilateral HA benefitted the most from HA usage.

P-60 Factors That Affect the Degree of Hearing Loss at Presentation and Hearing Aid Usage

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Objective: This study analyzes factors that affect severity of hearing loss (HL) at presentation and hearing aid usage pattern among the Singapore hearing aid users.

Material and Methods: A retrospective study was carried out and 643 subjects were identified from audiometric records from Otorhinolaryngology Department, Tan Tock Seng Hospital. Demographics (age, gender, race), Pure Tone Audiometry average (PTA0.5, 1, 2, 4 kHz), HA laterality (unilateral, bilateral), HA type and daily usage duration (<4hours, 4-7hours, >7hours) were collected. Severity of HL was classified as mild HL (21-40db), moderate (41-70db), severe HL (>71db).

Results: Patients had a mean age of 73.1 years (range: 22-113 years old). Patients presenting with mild HL were significantly younger than those with moderate-severe HL (64.1years vs 73.5years, $p<0.001$). There were 327 males and 316 females, and gender did not influence severity of HL at presentation.

Race proportion was Chinese 87.9%, Malay 4.2%, Indian 5.8%, others 2.2%. Less Malay patients sought help for HL (only 4.2% compared to national proportion of Malays 13.9%) but this proportion was similar to the proportion of Malays visiting the hospital (5.1%).

Amongst the Malay patients, 48.1% of them had severe HL, which was the highest proportion within an ethnic group compared to 26.7% of Chinese 26.7%, 37.8% of Indian and 7.1% of other races; $p=0.001$. This suggested that Malay patients usually presented late for their hearing problems. Mean age of Malay patients is younger than that of non-Malay patients (70.3years vs 73.2years, $p=0.235$).

Lastly the more severe the HL, the longer the duration of daily HA usage. Most (45.8%) of the patients with severe HL use HA for more than 7 hours daily (vs 25.3% for 4-7hrs, 22.5% for <4hrs, $p=0.016$). Unilateral HA was more popular than bilateral HA in all degree of HL.

Conclusion: Younger patients presented with milder degree of hearing loss. Though less Malay patients sought treatment for HL, they mostly presented with greater hearing loss severity at a younger age. Severity of hearing loss led to longer daily usage of HA.

P-61 Changing Profile of First-time Hearing Aid Users Over the past decade

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Background: We aim to study the trends and profile of first-time hearing aid users over the last decade.

Methods: Existing audiological records from our hospital were analysed retrospectively. 1064 first-time hearing aid users were stratified into 4 cohorts by the year of first fitting. (Cohort 1: 2003-2008 n=217, 20.4%, 2: 2009-2010 n=283, 26.6% 3: 2011-2012 n=351, 33.0% and 4: 2013 n=211, 19.9%)

Results: Over the past decade, hearing aids were first fitted at a mean age of 69.8±13 (median 72.0, range 0-109) and at a mean pure tone audiometry (PTA0.5, 1, 2, 4kHz) of 63.0±14dB (median 62.5, range 10.0-120) with majority (69.7%) falling into the moderate hearing loss category (41-70dB). Gender distribution was approximately equal. 78.5% presented with sensorineural hearing loss and 17.8% were fitted bilaterally.

The following trends are observed over the past decade:
1. More users were being fitted with hearings aids over the years as the absolute number of users increased by 45.5% from 2009 to 2013 as opposed to a population increase of only 8.2% during the corresponding period. There was also a strong positive correlation between year of fitting and number of users (spearman's rho 0.982, p<0.001).
2. The mean age of users generally increased (67.7 to 71.1 to 70.1 to 69.9, p=0.047), especially marked from cohort 1 to cohort 2 (67.7 to 71.1, p=0.003). Subsequent changes in the mean age were not statistically significant. In addition, the age ranges of users also widened across the cohorts (24-90 to 11-109 to 10-95 to 0-92).
3. There was a general decreasing trend in the mean PTA0.5, 1, 2, 4 kHz threshold over the years (61.6 to 64.1 to 64.6 to 60.3, p=0.047), particularly significant in recent years from cohort 3 to cohort 4 (64.6 to 60.3, p<0.001). This was despite the increase in mean age over the years since age correlated positively with hearing thresholds (Spearman's rho 0.115, p<0.001). The lowest threshold at which hearing aids were fitted dropped (35.0 to 22.5 to 21.3 to 10.0) with increasingly higher proportion of users being fitted with mild (21-40dB) hearing loss (2.8% to 3.5% to 4.0% to 6.2%, p=0.009).
4. Increasingly higher proportions of users were fitted bilaterally (11.5% to 9.2% to 21.9% to 28.4%, p<0.001). More users chose behind-the-ear designs (51.1% to 72.8% to 76.4% to 62.1%, p<0.001) but this proportion dropped significantly in recent years from cohort 3 to cohort 4 (76.4% to 62.1%, p<0.001).
5. After adjusting to 2014 Singapore consumer price index, users were spending more on hearing aids (S$1096 to $2212 to $2594 to $2728, p<0.001) with the average cost being S$2379.

There were no statistically significant trends associated with the change in proportion of gender or race as well as the type of hearing loss over the decade.

Discussion & Conclusion: Increasingly older patients are being fitted with hearing aids and this could be reflective of the ageing population in Singapore. In spite of the increase in elderly users who generally present with more severe hearing loss, the mean hearing threshold on fitting has decreased over the years. There is an increasing trend of users with less severe hearing loss seeking hearing aids. Users are willing to spend more on these devices or be fitted bilaterally on the first fitting.

P-62 Prevalence and reasons for defaulting hearing aid clinic in a tertiary care centre

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Aim: To investigate factors influencing acceptance and compliance with hearing aid amongst elderly Singapore population

Material and methods: In a tertiary care settings, nave patients who were referred to the audiologist but defaulted their first hearing aid evaluation appointment were recruited. A set of questionnaire was administered to the patients and /or their next of kin. The data was subjected to statistical analysis.

Results: Tabulated

Discussion and conclusion: 30% of newly diagnosed presbyacusis patients do not attend their audiology appointment. Denial/ non acceptance of handicap, social stigma, cost, lack of motivation and unavailability of accompanying personnel were identified as main reasons. The study results are being used to review processes and implement measures to improve compliance with hearing aid in order to enhance quality of life of the aged in preparation to face silver tsunami in this era of increasing life expectancy

P-63 Value of Hearing Questionnaire in Predicting Hearing Impairment

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Introduction: Hearing loss is a significant chronic medical condition in Singapore, and it's prevalence is expected to increase in view of aging population. Formal diagnosis of hearing loss is tedious, requiring pure tone audiogram (PTA) done in a sound-proof room by an experienced audiologist. Screening tools such as the Hearing Handicap Inventory for the Elderly (HHIE-S) and Hearing Handicap Inventory for Adult (HHIA) questionnaire were formulated to facilitate screening. However, currently in Singapore, such screening tests are not used for hearing loss screening as the efficacy of these screening questionnaires have yet to be evaluated in our local context.
The objective of the study is to evaluate sensitivity and specificity of HHIE-S and HHIA questionnaires in screening for hearing impairment in Singapore.

Methods: A review of 91 participants at screening events organised by a Singaporean tertiary hospital in 2010 and 2013 was done. Information recorded include general demographics, HHIE-S results for participants >60 years, HHIA results for participants <60 years and PTA at 0.5, 1, 2, 4kHz done by an experienced audiologist. Both screening questionnaire results were totalled, and subdivided into 3 major groups: Scores of 0-8 suggests no hearing handicap, 10-24 suggests mild-moderate hearing handicap and 26-40 suggests significant hearing handicap. Conventionally, moderate and high scores (10-40) are considered strongly suspicious of hearing impairment.

Results: 22% of the participants were male, while 78% were female. The mean age of the participants was 56 (Range: 25-82, Standard deviation: 11.8). The mean PTA on the left ear was 26 (Range: 8-71, Standard deviation: 12.5), while the mean PTA on the right ear was 27 (Range: 9-106, Standard deviation: 15.9)
55 participants filled the HHIA questionnaire, while 36 participants filled the HHIE questionnaire.

HHIA Questionnaire: Defining hearing impairment as PTA average >25dB in the better hearing ear (mild hearing loss), the HHIA questionnaire yielded a sensitivity and specificity of 54.5% and 63.6% respectively The positive predictive value of the test is 27.2% and negative predictive value is 84.8%
If defined as >40dB(moderate hearing loss), it yielded a sensitivity and specificity of 100% and 61.1% respectively. The positive predictive value of the test is 4.5% and negative predictive value is 100%

HHIE-S Questionnaire: Defining hearing impairment as >25dB, the HHIE S questionnaire yielded a sensitivity and specificity of 47.6% and 46.2% respectively. The positive predictive value of the test is 61.1% and negative predictive value is 33.3%
If defined as >40dB, it yielded a sensitivity and specificity of 75.0% and 53.1% respectively. The positive predictive value of the test is 16.7% and negative predictive value is 94.4%

Conclusion: Despite having cultural influences in which the initial HHIE-S and HHIA questionnaires were created under, the results from our studies are very supportive in showing its value of screening even in a Singaporean context.
Findings show that HHIA and HHIE-S questionnaires are poor predictors for mild hearing loss. The value of its sensitivity is too long, representing that a significant population of mild hearing loss patients will be missed if the test was administrated for hearing screening.
However, it can be useful for screening for moderate to severe hearing loss due to its high sensitivity, with lower rates of false negatives. As specificity is low, all patients with high scores need formal audiogram to confirm hearing levels.

P-64 Utility of Self-Perception of Hearing Loss in Predicting Hearing Impairment

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Introduction: Prevalence estimates indicate that 1 out of 11 people in the general population are hearing-impaired in Singapore. This prevalence is expected to increase in future due to the ageing population. Formal diagnosis of hearing loss is time-consuming and requires pure tone audiogram (PTA) to be done in a sound-proof room by an experienced audiologist. There have been patients visiting clinics with primary complaint of self-perceived hearing loss and were accurate in their own assessment, being diagnosed formally after PTA was done. In view of the importance of early detection as well as anectodal evidence of utility of self-perception, the objective of this study is to determine usefulness of self-perception of hearing loss as a screening tool for hearing loss amongst the general population in Singapore.

Methods: A retrospective review of 56 participants who were recruited for hearing screening held in a Singaporean Tertiary General Hospital from 29-30th May 2013 was done. Information recorded include self-perception of hearing questions and PTA (0.5, 1, 2, 4kHz) done by an experienced audiologist. For self-perception of hearing, 2 main questions were posed to partipants: 1) whether they perceive themselves to have hearing impairment, 2) what level of hearing impairment do they perceive themselves to have (mild, moderate, severe). The questions were posed to participants prior to PTA test to ensure reliability of results. The questionnaire results were then compared with the gold standard PTA result to determine the utility of self-perception in screening for hearing loss.

Results: The mean PTA score for the better ear was 23.1 (Range: 7.5-66.3, Standard Deviation: 11.5). 30.4% of participants perceived that they had abnormal hearing, of which 17.9% perceived mild impairment, 7.1% perceived moderate impairment and 5.4% perceived severe impairment. There is no statistically significant difference of mean PTA score between those who perceive to have normal hearing and those who perceive to have abnormal hearing (p=0.129). When comparing amongst perceived severity of impairment, those with perceived severe hearing impairment (mean PTA: 50.0) was found to have higher mean PTA score than those with perceived mild hearing impairment (mean PTA: 21.9) (p=0.001)

If hearing loss is defined as >25dB in the better ear, self-perception question has a sensitivity of 22.2% and specificity of 63.9%. The positive predictive value is 23.5% while the negative predictive value is 62.2%.

If defined as >40dB in the better ear, the sensitivity is 75% while the specificity is 72%. The positive predictive value is 21.4% while the negative predictive value is 97.3%.

Discussion and Conclusion: Our study has shown that though self-perception of hearing loss is not sensitive in identifying patients with mild hearing loss, it may have its utility in screening for moderate to severe hearing loss due to its relatively high sensitivity. This is further compounded by the result that the specificity is high, suggesting that the false positive rates will be low and hence increase its accuracy in picking up patients with true hearing loss.

However, self-perception of severity does not associated well with severity of hearing loss based on PTA results, suggesting that self-perception of severity have lower utility value in determining level of hearing loss.

P-65 Pharmacological action of steroids on spiral nerve axon of the cochlea: a hypothesis based on basic and clinical evidence

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Glucocorticoids are widely used as a therapeutic reagent for sensorineural hearing loss (SNHL). The mechanism of action of glucocorticoid in the cochlea is tentatively regarded to involve immunosuppressive and anti-inflammatory effects, but animal studies have shown beneficial effects of glucocorticoids on SNHL due to variety of causes such as noise trauma, ischemia and ototoxic drugs. We present basic and clinical evidence that implicates a pharmacological action of glucocorticoids on the maintenance of spiral nerve axon.

In our experiments using mice[1], mass spectrometry-based shotgun proteomics identified that intratympanic dexamethasone significantly ($p<0.01$) upregulates cochlear expression of deafness-associated proteins Myelin protein zero (Mpz) and Neurofilament medium polypeptide (Nefm) at 12 hours after the dexamethasone administration. Mutations in *Mpz* and *Nefm* are directly and indirectly associated with auditory neuropathy in Charcot-Marie-Tooth (CMT) neuropathy[2, 3] in humans. Immunohistochemistry revealed that Mpz is localized to the efferent and afferent processes of spiral neurons in the cochlea. Mpz is a structural protein of the myelin sheath. In a mouse model of acute SNHL, in which mice were exposed to 120dB SPL octave band noise for 2h, Mpz expression was downregulated at 6 (0.786±0.053, $p<0.05$, of the control levels without noise exposure) and 12 hours (0.471±0.103, $p<0.05$) post-cochlear trauma without dexamethasone administration, as shown by western blotting. Intraperitoneal dexamethasone was injected immediately after the noise exposure in this SNHL model. Intraperitoneal dexamethasone significantly upregulated cochlear Mpz expression (1.870±0.201, $p<0.01$, of the timed-saline injected control) at 6 hours post-cochlear trauma.

These experimental data demonstrated that dexamethasone regulates cochlear expression of an auditory neuropathy (CMT)-associated protein, Mpz. We also report a clinical case of steroid-dependent sensorineural hearing loss in a patient with CMT disease showing auditory neuropathy[4]. An 8-year-old boy with a diagnosis of CMT disease at the child neurology department was referred to our otolaryngology department complaining of hearing loss and tinnitus. The patient repeated 3 episodes of acute exacerbation of hearing loss and hearing recovered for each times within 2 weeks after prednisolone administration. An audiological diagnosis of auditory neuropathy was confirmed by auditory brainstem response and distortion-product otoacoustic emissions. The pathophysiology of the present steroid-dependent sensorineural hearing loss is clearly confined to a peripheral auditory neuropathy within the cochlea, therefore raises the possibility of pharmacological action of glucocorticoids on the spiral nerve ending in this clinical case.

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P-66 Temporal control of the endocochlear potential by optogenetics in mice

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The cochlea of the mammalian inner ear receives various frequencies and amplitudes of sounds with different temporal and spatial sensitivity. An endocochlear potential (EP) of +80 mV, which is observed in the K+-enriched endolymph, is essential for hearing. Loss of the EP results in deafness. To understand the mechanism underlying the regulation of the EP, its artificial manipulation in living animals are mandatory. For such purpose, genetic ablation and pharmacological blockage of the proteins involved in the formation of the EP have been used. However, since it is difficult for these techniques to control the perturbation temporally and spatially in the cochlea, the relationship between the EP and the aforementioned unique properties of this organ has remains uncertain. To address this issue, in the present study we have applied the optogenetical approach. In the cochlea of young rodents, the proteolipid protein (PLP) strongly occurs in stria vascularis, an epithelial tissue that maintains the EP. We therefore genetically engineered PLP promoter to drive the expression of channelrhodopsin-2, a light-gated non-selective cation channel, in mice. Measurement of auditory brainstem response showed that hearing threshold of the transgenic mice, when their cochlea was exposed to blue light, significantly increased. In parallel, the EP recorded by a glass microelectrode was significantly reduced by 15 mV in 3 minutes. These phenomena were recovered in 3 minutes after cessation of light exposure. Accordingly, the novel deaf mice we report here have permitted us to control the EP with high time-resolution. In the mice, we may be able to dysfunction the stria vascularis at a particular area by focusing the light. These analyses will provide crucial information to elucidate the function and pathophysiology of the EP.

P-67 Evaluation of Hearing and Speech Thresholds in Cochlear Implant Users

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Purpose: The purpose of this study is to evaluate hearing and speech recognition as well as awareness thresholds in the postlingual cochlear implanted patients before with hearing device and after the operation.

Patients and Methods: The study included 22 adults with very advanced senserineural hearing loss. The average age of the patients was 33 (15-68). Half of the patients received cohlear nucleus implant (Male 4, female 7) while other half of the patients was implanted with MedEL (Male 8, female 3). Pure tone hearing thresholds and speech awareness as well as recognition thresholds were determined before implantation with hearing aids and 6 months after the operation with cochlear implant. For determination of pure tone hearing threshold at frequencies between 125-4000 in a sound field environment, warble tone stimuli was used. For determination of frequency specific speech awareness and recognition thresholds, /ba/, //, /s/ stimuli and list of 3 syllable words were used.

Results: Responses to warble tone stimuli in the patients with bilateral hearing aids were 68 dB at 250 Hz, 72 dB at 500 Hz, 74 dB at 1000 Hz, 78 dB at 2000 Hz and 81 dB at 4000 Hz by sound field audiometry. Average speech recognition threshold (SRT) was 74 dB. For the evaluation of speech awareness thresholds (SAT), responses to /ba/, // and /s/ stimuli were received at 67 dB, 70 dB and 74 dB, respectively.

Responses to warble tone stimuli in the patients with 6 months after cochlear implant activation were 32 dB at 250 Hz, 33 dB at 500 Hz, 32 dB at 1000 Hz, 36 dB at 2000 Hz and 38 dB at 4000 Hz by sound field audiometry. Average speech recognition threshold (SRT) with cochlear implant use was 33 dB. For the evaluation of speech awareness thresholds (SAT) with cochlear implant use, reliable responses to /ba/, // and /s/ stimuli were received at 20 dB, 25 dB and 30 dB, respectively.

Conclusion: Cochlear implantation provides much better hearing thresholds in all patients. Significant progress has been obtained in the cochlear implanted patients 6 months after the device activation in terms of pure tone hearing thresholds and speech awareness as well as recognition thresholds. Word and sentence recognition tests are warranted in future.

P-68 Usher Syndrome Type 3 (USH3) patients with Cochlear Implant

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Usher syndrome (USH), an autosomal recessive disorder with combined visual and progressive hearing loss and varying vestibular symptoms, is the most common genetic cause of combined hearing and vision loss. It was first described by Scottish ophthalmologist Charles Usher (1865-1942). The prevalence of USH is 3-6 / 100 000. The USH types 1 and 2 account for the most of the syndrome worldwide, type 3 being rare. However, in Finland, as well as in other Scandinavian countries, 40% of USH patients are of type 3.

In all types of USH retinitis pigmentosa leads to impaired dark adaptation, progressive visual field constriction, and reduction of visual acuity. The visual impairment may even lead to blindness. The USH type 1 shows congenital profound hearing loss and vestibular areflexia, type 2 patients have moderate to severe hearing loss and intact vestibular responses. Type 3 Usher (USH3) patients show variable type and degree of progressive sensorineural hearing loss as well as variable vestibular responses.

We present four USH3 patients operated on for cochlear implants (CI) in Helsinki University Hospital 2013. The diagnoses of USH3 were confirmed using genetic test for USH3A gene, Clarin 1, and were all positive.

There were three women, aged 18, 33, and 34 years and one man, aged 39 years at the time of the operation. The youngest of the patients had severe visual loss, all the others only minor retinitis pigmentosa changes and visual field constrictions. The only man in our series complained of dizziness, although his head impulse test results were near normal. The three women did not complain of balance difficulties. PTAs before operation varied from 90 dB to deaf on the right ear and 82 - 108 dB on the left. All patients had used conventional hearing aids for years without much benefit during the last years. All CIs used were Medel FLEXI+ 28 model.

Sound fields were 30-40 dB in all patients three months postoperatively. Finnish matrix sentence test, the first sentence test in noise for the Finnish language, which became available in 2014, was also done. This test gives an accurate measure of speech intelligibility in noise. For normal hearing adults the SRT range is -9.7 + 0.7 dB SNR. Our patients had SNR of -5.2 to -4.9 dB, which is a good result with a CI. The two older women got their second CIs autumn 2014 and the male patient is waiting for a second CI. The youngest patient, although having benefited from her CI, is hesitant about the second one.

Conclusions: All four patients are constant users of CIs, speech being the main communication method, which is especially important in this patient group since their vision is bound to weaken gradually. With the Finnish matrix test it's also possible to show the benefit of a CI in surroundings resembling normal hearing environment. The CI has had a positive effect on our USH3 patient's quality of life enabling them to conduct normal life-style. Implantation has had no effect on balance.

P-69 The new classification of cochleovestibular malformations

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Objective: The aims of this study were to introduce the new classification of cochleovestibular malformations (CVMs) and to investigate the factors which determine the outcomes of cochlear implantation (CI) in children with CVMs.

Methods: Sixty-four children with CMVs who had used a cochlear implant over 3 years were included. CVMs were classified into 4 subtypes based on the morphology of cochlea and modiolus; normal cochlea and intact modiolus (type A, n=18), malformed cochlea and partial modiolus (type B, n=33), malformed cochlea and no modiolus (type C, n=6) and no cochlea and no modiolus (type D, n=7). Speech perception test scores were compared among the subtypes of CVMs using analysis of covariance with post-hoc Bonferroni test. The multivariate regression analysis was employed to investigate the significant prognostic factors determining speech perception test scores.

Results: The speech perception test scores of children with CVM type A and B were significantly better than those of children with CVM type C and D, and were not significantly different from those of the implanted children with normal inner ear morphology. Multivariate regression analysis revealed that the age at CI and cochlear nerve size were significant factors that determine the speech perception test scores in implanted children with CVMs. Significant trend was observed in the prevalence of cochlear nerve deficiency from CVM type A to type D.

Conclusions: The new classification of CVMs based on the morphology of cochlea and modiolus was simple and easy to apply, and well correlated with post-CI performance and cochlear nerve status. The new classification of CVM using TBCT is helpful in the preoperative evaluation of children with CVM.

P-70 Cochlear implantation in the patient with congenital muscular dystrophy

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The congenital muscular dystrophy is a devastating condition characterized by progressive loss of muscle tissue. The patients with congenital muscular dystrophy are at high risk of serious complications of general anesthesia including malignant hyperthermia and respiratory failure. The congenital muscular dystrophy is sub-classified on the basis of the presence or absence of structural involvement of the central nervous system. Fukuyama congenital muscular dystrophy, Walker-Warburg syndrome and Muscle-eye-brain disease are the subtypes of congenital muscular dystrophy associated with structural abnormalities of the brain, severe mental retardation, and seizures. Fukuyama congenital muscular dystrophy has an autosomal recessive pattern of inheritance. In this study, we report a case with Fukuyama congenital muscular dystrophy presenting bilateral severe sensorineural hearing loss detected by newborn hearing screening. The 2-year-old girl was referred to our hospital for cochlear implantation. The patient showed early onset of muscle weakness and mental retardation, and was diagnosed with Fukuyama congenital muscular dystrophy. Computed tomography showed no significant findings in inner ear. The bilateral profound sensorineural hearing loss was confirmed by auditory steady-state response and auditory brainstem responses. We performed cochlear implant operation under general anesthesia. The patient was successfully treated with cochlear implantation.

P-71 Criteria for selecting an optimal device for the contralateral ear of children with a unilateral cochlear implant

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Objective: The aim of the study was to compare the benefits from contralateral implant and hearing aids in children with unilateral cochlear implant (CI), and to identify clinical criteria for selecting the aiding device for the contralateral ear of children with a unilateral cochlear implant (CI).

Methods: Sixty-five children, including 36 bilateral CI users and 29 bimodal users, participated in the study. A speech perception test (monosyllabic word test) in noise was administered. The target speech (65dB sound pressure level) was presented from the front loudspeaker, and noise (10dB signal-to-noise ratio) was presented from three directions: from in front of the child and 90° to the child's right and left sides. The test was performed using the first CI alone and under bilateral CI or bimodal conditions. The binaural benefits to speech perception in noise were compared between bilateral CI users and bimodal users.

Results: Significant benefits in speech perception in noise were evident in both bilateral CI users and bimodal users in all three noise conditions. In bimodal users, the low-frequency hearing threshold in the nonimplanted ear affected the binaural benefit. Bimodal users with a low-frequency hearing threshold <90 dB hearing level (HL) showed significant binaural benefit in all three noise conditions except for noise presented to the hearing aid side in children with a low-frequency hearing threshold <70 dB HL. By contrast, bimodal users with a low-frequency hearing threshold >90 dB HL showed no significant binaural benefits in all three noise conditions.

Conclusions: Bilateral CI and bimodal listening provide better speech perception in noise than unilateral CI alone in children. The contralateral CI is better than bimodal listening for children with a low-frequency hearing threshold >90 dB HL. A hearing threshold at low frequencies of ≦1 kHz may be a good criterion for deciding on the type of device for the contralateral ear of children with a unilateral CI.

P-72 Investigations into candidates with severe high-frequency hearing loss for cochlear implantation of electric acoustic stimulation (EAS)

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Objectives: New systems of cochlear implant which consist of a short electrode and combine electric and acoustic stimulations (EAS) has been developed since 2000. EAS is applied for patients with residual hearing at lowmiddle frequency and severe hearing loss at high frequency, so-called "ski-slope type" hearing loss. In Japan, cochlear implantation of EAS has been covered by medical insurance since 2014. In this study, we investigated the audiological backgrounds of candidates for EAS.

Materials and Methods: In 4, 758 patients with hearing loss who were diagnosed from 2011 to 2014 in our departments, subjects showing "ski-slope type" audiogram configurations were selected.

Results: In Pure Tone Audiometry, 59 subjects (1.24%) satisfied the audiometric conditions as candidates for EAS. The subjects were 32 males and 27 females, 286 (65.2 ±17.8) years old. Pathologic causes of their hearing loss were idiopathic 33, congenital 4, internal factors 16 (chronic otitis media, autoimmune disease, hydrops, etc.), and external factors 15 (drug-induced, head trauma, noise-induced, etc.). In 64 ears of 32 subjects who were repeatedly examined in pure tone audiometry, 23 ears (35.9%) showed progressive deteriorations of hearing levels. In Japanese Speech Intelligibility Test, 46 ears of 23 subjects showed scores of 580% (47.1±18.9%).

Conclusion: Several candidates for EAS indicated progressive deteriorations of hearing level at lowmiddle frequency in clinical course. Even for them, a device of cochlear implant should be carefully decided whether conventional type or that of EAS. On the other hand, candidates for EAS indicated various scores in Speech Intelligibility Test. Consequently, EAS would be expected to be the device improving hearing perceptions for patients with low speech intelligibility, in place of a hearing aid.

P-73 Clinical anatomy of mastoid emissary vein for bone work of implantation

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Introduction & Object: Mastoid emissary vein (MEV) complex is one of the superficial venous systems of posterior neck. It could be a potential source of bleeding during flap elevation or might be an obstacle to bone work for hearing device surgery. The objective of this study is to evaluate the morphometric analysis of MEV complex using 3-d reconstruction of temporal bone CT.

Materials & Method: From the normal adults TBCT aged from 20 to 60, twenty identifiable MEV cases without history of head trauma, otitis media, neurological disease, and skull surgery including mastoid surgery were evaluated. Morphometric parameter of MEV angle from sigmoid sinus, the length of MEV from the branch of sigmoid sinus to the bony aperture mastoid bone, distance from mastoid tip to the bony aperture of MEV, distance from asterion to the bony aperture of MEV, distance from asterion to mastoid tip, perpendicular length from bon aperture of MEV to the imaginary line which pass asterion and mastoid tip, perpendicular length from bon aperture of MEV to the imaginary temporal line.

Results: Mean MEV angle from sigmoid sinus was 49.0°. The length of MEV from the branch of sigmoid sinus to the bony aperture mastoid bone was 16.1mm. The mean distance from mastoid tip to the bony aperture of MEV, distance from asterion to the bony aperture of MEV, distance from asterion to mastoid tip was 27.5mm, 25.0mm 34.6mm each. The mean perpendicular length from bony aperture of MEV to the imaginary line which pass asterion and mastoid tip, perpendicular length from bony aperture of MEV to the imaginary temporal line were 11.7 mm, 8.0mm each.

Conclusions: Preoperative evaluation of MEV is recommended for the retrosigmoid bone work or periosteal flap elevation. Three dimensional reconstruction of MEV might helpful for the imaginary information for the surgeon.

P-74 fMRI as diagnostic tool for patients with indications to partial deafness treatment (PDT)

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Aim: The aim of work was to evaluate nowadays possibility of diagnostic patients with residual hearing by fMRI.

Material and Methods: 25 patients qualified to Partial Deafness Treatment according to Skarzynski PDT classification were diagnosed in Bioimaging Research Center at International Center of Hearing and Speech, Kajetany, Poland. All patients went fMRI procedure with 3T Magnetom TRIO TIsM manufactured by Siemens before cochlear implant surgery. Minimal age 7 years old. Method of analyse BOLD.

Results: First results have shown decrease activity according to area responsible for receiving appropriate frequency. Also we observed changes on auditory pathway.

Conclusions: fMRI is useful element of diagnostic in patients with some doubt about auditory pathway. We observed decreased signal in appropriate anatomical areas.

P-75 Guided Auditory Neuron Growth on Topographically Modified Nanocrystalline Diamond

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Cochlear implants (CI) have successfully been used for several decades in patients with profound hearing loss. Nevertheless, results vary between individuals and resolution of fine structures in the acoustic signal is generally poor. The bottleneck problem is the ability to deliver independent stimulation signals to the auditory neurons. Electric stimulation using phased channels could be a plausible alternative. However, this method requires significantly more and closer neuron - electrode contacts with ordered re-growth of the regenerated axons, which current CI technology cannot provide.

Diamond is well known for its chemical inertness, high mechanical strength, wear resistance and extraordinary electrical properties. Recently, surface modification technologies made it possible to guide cellular adhesion and cell migration. Here, we demonstrate the potential application of specific textured nanocrystalline diamond (NCD) surface as one novel candidate in otological implants. Such textured NCD surfaces, consisting of micrometer-sized nail-head-shaped pillars, are fabricated by a sequence of micro/nano-fabrication processes including sputtering, photolithography and plasma etching.

Murine spiral ganglion explants were attached to the patterned NCD surface without the need of extra-cellular matrix protein coating. Scanning electron microscopy and confocal laser scanning microscopy revealed explants adhesion and neural growth path specifically along the nail-head-shaped NCD pillars in an ordered manner, rather than those unmodified areas.

In conclusion, our data demonstrate that NCD pillars have strong affinity to auditory neurons and can be used to guide neurons growing into a defined network. In addition, NCD pillars also provide a stop signal and prevent further migration of neurons into non-structured areas. Together with its anti-bacterial and electrical properties, patterned NCD surface may provide an optimal neural electrode interface, a fundamental basis for independent electric stimulation signals in CIs.

P-76 A new animal model for intratympanic treatment

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It is well known that drugs administered intratympanicaly pass through the round window membrane and spread among the inner ear. There were small number of studies that show distribution of these drugs. They all have limitations like cerebrospinal fluid contamination.

Our purpose is to establish a new model to measure the amount of the drugs in the different parts of the inner ear.

Ten albino guinea pigs were used in the experiment. Dexamethasone (4 mgr/ml) were applied intratympanicaly left ears of the subjects. Right ears were selected as a control group. The experiment was terminated at two different time period. Group A (5) were sacrificed 0.5 hours later. Group B (5 animals) were sacrificed 2 hours. Later.

The temporal bones dissected quickly. The antrum and middle ear cavity were washed with the %09 NaCl for contamination. Cochlea and surrounding bone separated from the temporal bone, covered with aluminum folio and then put into the liquid nitrogen tank for 5 minutes. The frozen specimens were divided into 4 parts quickly, stored in refrigerator with Eppendorf tubes at -5°C. The four parts were basal turn, second turn, apex and vestibule.

The specimen were weighed, prepared and measured with UV spectrophotometry. The highest drug concentration was in the vestibule (11.01 ± 12.17) at 0.5 hour while it was basal turn of the cochlea (11.57 ± 20.72) at 2 hours.

It is possible to measure exact drug concentrations with this method. The limitation of this model is to show the total amount of drug in the three scalas (Tympani, vestibuli and media) together.

P-77 Idiopathic benign paroxysmal postional vertigo: a long-term follow-up study

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Background: Benign paroxysmal positional vertigo (BPPV) is one of most common peripheral vestibular disorders. The aim of this study was to identify recurrence in the long-term follow-up of patients with idiopathic BPPV after successful canalith repositioning maneuvers, and to determine which factors contribute to recurrence.

Methods: The authors reviewed the medical records of 202 consecutive patients with idiopathic BPPV during the period January 2002 to December 2004 and investigated 112 patients with idiopathic BPPV treated over the same period. Finally, 71 patients were enrolled in this study. The estimated risk of recurrence used a Kaplan-Meier analysis.

For a long-term follow-up, patients were contacted by telephone and hospital visit every 6 months by two experienced doctors.

Results: A total of 71 patients with idiopathic BPPV fulfilled the inclusion criteria. Forty-two patients had posterior semicircular canal-BPPV and 29 patients lateral semicircular canal-BPPV. Recurrence rates in the posterior semicircular canal- and lateral semicircular canal-BPPV were 43% (18/42) and 41% (12/29), respectively ($p>0.05$). Recurrence following successful treatment during a long-term follow-up period was 25 out of 30 patients within 1 year, 3 patients between 1 and 3 years, 1 patient at between 3 and 5 years, respectively.

Conclusions: The authors found no significant difference between the posterior semicircular canal- and lateral semicircular canal-BPPV regarding recurrrence. Recurrence mostly occurred within the first 3 years (93%) following successful canalith repositioning procedure.

P-78 Analysis of dizzy patients with high depression and anxiety index

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Objectives: Some patients with dizziness often show psychological distress. However, the association of vestibular deficit with psychological symptoms remains controversial. Thus, we investigated the incidence of high depression and anxiety index in the patients who complained the dizziness, their dizziness severity and the distribution of disease to induce dizziness.

Methods: In 106 patients with dizziness, dizziness and the psychological distress of all patients were measured using the Korean versions of the Dizziness Handicap Inventory (DHI), the Beck Depression Inventory (BDI), and the Spielberger State-Trait Anxiety Inventory (STAI). We examined the incidence of patients to have high depression and anxiety using cut-off value (BDI21, STAI 57) and analyzed the changes of DHI, BDI, and STAI scores after management in the patients.

Result: The incidence of high depression and anxiety scores were 11.3% and 13.2%, respectively. In patients with high depression and anxiety index, all scores other than STAI score after treatment were decreased significantly. However, The incidence of high depression and anxiety using the cut-off points didn't show the significant difference after treatment

Conclusion: Of the patients with dizziness, about one tenth have serious psychological distress and they also have various vestibular disease and more dizzy symptoms. Thus, we should keep in mind the psychological factor in dizzy patients and necessity of the psychological support in the patients.

P-79 Corrective saccades in positive video head impulse test (vHIT)

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Purpose: Video head impulse test (vHIT) is a simple and very useful method to detect the peripheral vestibular loss. Findings of vestibular loss are low gain and occurrence of corrective saccades which are covert saccade and/or overt saccade. The occurrence mechanism and clinical significance of corrective saccade are not well known. The purpose of this study is to find out the occurrence pattern of corrective saccade and the factors related to the occurrence of corrective saccade in dizzy patients whose vHIT was positive (abnormal).

Method: 44 ears from 43 patients, who vHIT was positive and bithermal caloric test was performed, were included. The vHIT was performed by quickly turning the head 20 times in each direction randomly to right and left on the horizontal plane using ICS impulse (Otometrics, Denmark). Calculated VOR gain below 0.8 which is below the two standard deviation of average gain from our normative data, or the occurrence of corrective saccade (covert or overt) was decided as positive. Occurrence rate of overt saccade was calculated by dividing the number of overt saccades, which occurred during the repeated tests, by total repeated number of tests. vHIT was repeated without visual target in 18 patients, and repeated in fixed direction of head turning in 20 patients. For the caloric test, open water irrigation was used and the canal paresis (CP) more than 25% was decided as abnormal.

Result: Among the 44 ears of positive vHIT, only gain was low without corrective saccade in 2 ears, only overt saccades occurred in 2 ears, both of covert saccades and overt saccades occurred in 40 ears, and there was no case which only covert saccade occurred. Occurrence rate of overt saccade was 85.5±23.8% without covert saccade and was 49.1±40.9% with covert saccade. Among the 38 ears with canal paresis (>25%), covert saccades occurred in 36 ears and overt saccades occurred in 38 ears. Among the 6 ears without canal paresis, covert saccades and overt saccades occurred in each 4 ears. Occurrence of corrective saccade was not significantly related with degree of gain (p=0.035). Covert saccades and overt saccades disappeared when vHIT was performed without visual target in 8 ears out 15 ears and in 7 ears out of 14 ears respectively. Without visual target, gain was lower in ears with covert saccade (0.36±0.13) than in ears without covert saccade (0.66±0.16). There was no difference in occurrence of corrective saccades between the tests performed in random direction and in fixed direction.

Conclusion: The most common pattern of positive vHIT is mixed occurrence of covert saccades and overt saccades, and the occurrence of covert saccades reduce the occurrence of overt saccades. The occurrence of corrective saccades is related to canal paresis and the presence of visual target, but not to the directional expectation of head turning.

P-80 The symptoms and prognosis of traumatic pneumolabyrinth by air location

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Objectve: The Pneumolabyrinth is a rare condition in which air is present in the inner ear due to abnormal pathways between the middle ear and inner ear. This condition can be caused by congenital reasons, middle ear surgery, head trauma. The cases of traumatic pneumolabyrinth is increasing due to the high resolution CT. But Symptoms and prognosis of traumatic pneumolabyrinth is not clarified yet and needs further investigation.

Methods: We reviewed 149 cases of head trauma Patients who underwent temporal bone CT between Jan 1st 2012 to Jan 1st 2014. Review of records was done according to the factors: temporal bone fracture, otic capsule involvement, location of air bubble, symptom improvement.

Results: Ten patients showed pneumolabyrinth with symptoms of dizziness and hearing loss. Dizziness which is related to air bubble in the vestibule showed symptom improvement in all 10 cases. While hearing loss followed by air bubble in the cochlea (5 cases) did not show symptom improvement. No correlation was found between Symptom improvement and otic capsule involvement.

Conclusion: In cases of traumatic pneumolabyrinth there are a few factors that can be considered to predict the prognosis. Location of the air bubble appears to be the key factor to predicting the prognosis of traumatic pneumolabyrinth.

P-81 Implantation of ventilation tubes for Meniere's disease

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Implantation of ventilation tubes for Meniere's disease: the relationship between efficacy and Eustachian tube function.

Objectives: Meniere' disease is considered to be a multifactorial disease, and eustachian tube dysfunction is one of the risk factors. As a treatment for patients with Meniere's disease, implantation of a ventilation tube in tympanic membrane was carried out, and the relationship between efficacy and Eustachian tube function was analysed.

Methods: The seventeen affected ears of fifteen patients (seven males and eight females, mean age 51.8 years old) with Meniere's disease were inserted with ventilation tubes. The eustachian tube function was measured by Sonotubometry. Postoperative changes in the hearing level were investigated and the relationship between efficacy to the hearing level and Eustachian tube function was analysed.

Results: Of the seventeen ears, the hearing level of four ears was improved after the treatment. Four ears were diagnosed with "a stenotic tube type" and nine ears were diagnosed with "a patulous tube type" in the measurement of Eustachian tube function with Sonotubometry. There was significant relationship between the implovement healing level and the observation period in the "a patulous tube type" cases.

Conclusions: Exact explanation for the effect of ventilation tubes in tympanic membrane is vague and its therapeutic effect was limited. However, this treatment might represent an effect for the improvement of healing level in some Meniere's disease patients with a patulous eustachian tube and so it might become a treatment option because of its simple and less-invasive procedure.

P-82 Clinical characteristics of acute vestibular neuritis according to the involvement site

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Objectives: Acute vestibular neuritis (AVN) mostly involves the superior portion of the vestibular nerve and labyrinth. Inferior vestibular neuritis (IVN) is a relatively minor subtype of vestibular neuritis. This study aimed to investigate the clinical course and characteristics of AVN according to its involvement sites.

Methods: We retrospectively reviewed 133 patients with AVN between January 2012 and January 2015, which were diagnosed on the basis of symptoms and laboratory findings including caloric test, cervical vestibular evoked myogenic potential (cVEMP), video head impulse test (vHIT). All patients were classified into three groups: (1) TVN group who showed unilateral canal paresis in caloric test and ipsilesional cVEMP weakness; (2) SVN group who showed unilateral caloric canal paresis only; (3) IVN group who showed unilateral cVEMP weakness only. We analyzed the clinical course and characteristics between the three groups. Also, we studied the correlation of vHIT results with caloric test and cVEMP in AVN patients.

Results: Of the 133 patients with AVN, TVN group was 53 (39.9%) and SVN group was 64 (48.1%) cases. 16 (12.0%) patients were classified as IVN. But, down beating spontaneous nystagmus (SN) were observed only 3 (18.7%) in IVN group. The days to remission of SN in IVN (10.2±7.9) group was significantly shorter than with TVN and SVN (21.0±33.3, p=0.042 and 21.5±26.8, p=0.007, respectively) group. Duration of hospitalization and follow up period of IVN group (3.6±1.6, 31.3±40.6 days, respectively) were shorter than those of SVN (4.6±1.5days, p=0.029 and 63.7±83.6 days 0.035, respectively) and TVN group (4.6±1.6days, p=0.045 and 59.0±79.9, p=0.078 days, respectively). The CP value between TVN and SVN group (76.5±28.5, 81.7±25.5, respectively) had no statistical difference. The amplitudes of SN in IVN group (5.1±3.8) were smaller than TVN and SVN group. (8.3±5.2 p=0.012, and 10.1±6.5, p<0.001 respectively) In the vHIT analysis of 74 patients, 38 (97.4%) of 39 patients showed positive horizontal vHIT and 36 (92.3%) of 39 patients showed positive anterior vHIT in SVN group. 3 (50%) of 6 patients in IVN group showed positive posterior vHIT. In TVN group, 27 (93.1%) of 29 patients showed positive horizontal vHIT and 25 of 29 (86.2%) revealed positive anterior vHIT. 29 (100%) of 29 patients were presented with positive posterior vHIT.

Conclusion: Inferior vestibular neuritis (IVN) was minor subtype of vestibular neuritis and its clinical characteristics were different from those of SVN and TVN. Disease course of IVN was relatively mild and short to compare with TVN and SVN. Also, various involvement sites of labyrinth could be possible and it might have a role of discrepancy between each diagnostic test in acute vestibular neuritis.

P-83 Analysis of 250 PLF suspected cases using CTP detection test

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Background & Method: Perilymphatic fistula (PLF) is defined as an abnormal communication between the perilymph and middle ear, where there are leaky sites. The clinical manifestation of PLF is widely variable, and there was no physiological or biochemical diagnostic test for PLF that has the proper specificity and sensitivity. Therefore, it is very difficult to make a definite diagnosis of PLF.

By the proteomic analysis, we have identified an isoform of Cochlin, CTP (Cochlin tomo-protein). CTP is a perilymph specific protein, which is not expressed in blood, CSF or saliva. After 4 years of effort, we could establish a highly reliable ELISA-kit and again we could confirm this specific expression of CTP. Also, with a help of private clinical test enterprise (SRL inc.) in Japan, CTP test is widely available nationwide. With this background, in 2013, Japanese PLF diagnostic criteria was proposed. In this criteria, a definite diagnosis can be made with one of these basic rules. 1)Visual identification of fistula(s) between the middle and inner ear by microscope or endoscope. 2)Biochemical detection of perilymph specific protein from MEL (middle ear lavage), such as Cochlin-tomoprotein (CTP).

MEL was collected as follows: (1) after myringotomy or during PLF repair surgery, the middle ear was rinsed with 0.3ml saline 3 times, (2) MEL was recovered and blood cells and cell debris were removed, (3) the supernatant was taken and stored frozen. If there is 2 l of perilymph in the MEL, the test is positive, or if you see any leakage under the microscope, and if it is perilymph, then the test will be positive.

The classification of PLF is categorized as follows. Cat.1 includes trauma, middle and inner ear diseases, Cat.2 includes barotraumas caused by antecedent events of external origin, Cat.3 includes barotraumas caused by antecedent events of internal origin, Cat.4 has no apparent antecedent event (idiopathic).

We tested more than 250 samples between August 2014 and January 2015. In those cases, 54 cases were linked to Cat.1 and 10 were positive, 15 were linked toCat.2 and 1 was positive, 22 cases were linked to Cat.3 and 6 were positive, and 68 cases were linked to Cat.4 and 14 were positive.

The characteristics of hearing loss varies considerably. In the 21 CTP positive cases in categories 2-4, 43 % had sudden hearing loss, 14% had sudden and progressive, 14% were recurrent, 9% were progressive. Among those 21 cases, PLF repair surgery was performed in 8 cases.

We address how appropriate recognition and treatment of PLF can improve hearing and balance disorders in the afflicted patients.

P-84 Perilymphatic fistula due to Penetrating middle ear injury

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Background: Penetrating trauma of the middle ear can occur as a result of the introduction of a variety of foreign bodies (e.g., a knitting needle, a hair pin, a bullet, twig of a tree, ear pick, cotton tipped applicators, a stone, and iatrogenic damage. Inner ear damage exposes the patient to permanent disabilities in hearing and vestibular function. Etiologies of inner ear damage due to penetrating middle ear injury includes labyrinthine concussion, acoustic trauma, and perilymphatic fistula (PLF)

Conservative treatment is adequate for labyrinthine concussion and acoustic trauma, but traumatic PLF is an otologic emergency that may require surgical treatment. Appropriate recognition and treatment of PLF is especially important and it can improve hearing and balance, and hence the quality of life of the afflicted patients.

The cochlin-tomoprotain (CTP) detection test can be used to make a definite, objective diagnosis of PLF. CTP is a perilymph specific protein, which is not expressed in blood, CSF or saliva. After 4 years effort, we could establish a highly reliable ELISA-kit and again we could confirm this specific expression of CTP. If CTP is positive, the case can diagnose PLF. We report the case of traumatic PLF and by diagnosing CTP detection test.

Case: 42 year old man had penetrating middle ear injury while ear picking. He had right sided mixed hearing loss, tinnitus and sever vertigo and imbalance. He was hospitalized and had conservative treatment for 2 weeks, and his symptoms did not improve. After about 2 months, he was referred to our clinic. High resolution CT scan revealed air in the cochlea, vestibule, semicircular canals and stapes luxation, and his hearing was progressively worsening. PLF repair surgery was performed and during operation we took a sample (MEL, middle ear lavage) for CTP detection test. Intraoperatively, perilymph leakage was not obvious and the stapes luxation, which was smoothly taken out through oval window. Ossicular chain was reconstructed using Teflon piston and oval window was covered with fascia. vHIT showed rt. anterior canal was severely affected, mild dysfunction in the posterior canal and normal in the lateral canal. o and cVEMP showed vestibular hyper-responsiveness in the rt. ear.

The detection of CTP in MEL was 8.70 ng/ml, which was well over the cut off value (0.8). This test result implies the perilymph was continuously leaking for 2 months. Even though he had chronic PLF, severe vertigo ceased gradually, and hearing improved remarkably from 60 to 35dB postoperatively.

Conclusion: As we have reported previously(*), The CTP detection test enabled a definite diagnosis of traumatic PLF among penetrating middle ear injury cases. The inner ear damage may be dependent upon the rapidity of onset, duration of the perilymph leakage, the site of the leakage and other biological factors. Using this CTP detection test, a definitive diagnosis of PLF can be made and appropriate therapeutic options for this surgically correctable disease can be taken into consideration.

* Ikezono T, et al: Cochlin-tomoprotein (CTP) detection test identifies traumatic perilymphatic fisutula due to penetrating middle ear injury. Acta Otolaryngol 131: 937-944, 2011.

P-85 Clinical aspects of auditory and vestibular symptoms according to the course of temporal bone fracture lines

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Introduction & Object: Among the skull fracture, about one-fifth involves the temporal bone. The Most common sequelae of temporal bone fracture include facial paralysis (FP), sensorineural hearing loss (SNHL), tinnitus, vertigo and balance disturbance, and cerebrospinal fluid (CSF) leak through the fracture lines

The classification of temporal bone fracture is of great importance in planning treatment, forecasting prognosis. High-resolution, thin-section CT can accurately diagnose temporal bone fractures and fracture types.

Materials & Method: The 78 temporal bone of the 73 patients who were diagnosed temporal bone fracture by the HR CT were selected in the study. The five are bilateral fracture of temporal bone. The patient with history of head trauma, otitis media, neurological disease, and skull surgery were excluded.

Type of temporal bone fracture was classified with several radiological categories. (longitudinal, transverse, combined, otic capsule sparing, otic capsule violating, petrous involve, middle ear, mastoid, external auditory canal). Otoscopic findings, Pure tone audiometry, H-B grade of facial nerve paralysis cases, caloric test with dizziness cases were evaluated.

Results: 49 of Longitudinal fracture 12 cases of transverse 17 cases of combine fractures were classified. We have only one case of otic capsule involve. The twelve cases showed facial palsy. (The five patents were H-B G (II), two cases were H-B (III) five cases were H-B G (IV). The 24 cases have symptom of ear fullness. The 16 cases have symptom of dizziness. The 14 cases have tinnitus. The 8 cases have ossicular dislocation.

Conclusions: Most of otic capsule sparing cases of temporal bone fracture showed row risk of facial nerve paralysis, auditory vestibular symptom. However the careful evaluations of fracture using HRCT give otology surgeon a hint of early intervention prevention of cochleovestibular sequelae.

P-86 Corticosteroids and antiviral Treatment for Bell's Palsy

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Objectives: The therapeutic efficacy of antivirals in the treatment of Bell's palsy is still unclear, clinical applications of an antiviral-steroid combination for treatment of Bell's palsy are increasing. The present study was designed to determine the therapeutic efficacy of antiviral agents in Bell's palsy patients assorted by clinical factors, including patient age, initial severity of disease, electroneurography and underlying disease.

Subjects and Methods: Of the 1, 342 included patients, 773 (57.6%) received steroid alone, and 569 (42.4%) received a combination of steroid and antiviral agents. Outcomes were measured using House-Brackmann scale according to age, initial severity, electroneurography and underlying disease.

Results: The rate of recovery with initially severe palsy was higher in the S+A than in the S group. However, the rates of recovery were similar with initially moderate palsy. In patients assorted by age and severity of electroneurography, the overall recovery rate was higher in the S+A than in the S group, but the differences were not statistically significant. The recovery rate without diabetes mellitus and hypertension was higher in the S+A group than in the S group. But in the patients with HTN and DM, the difference of recovery rate between S+A group and S group is not statistically significant.

Conclusions: Compared with steroid alone, steroid plus antivirals showed a better recovery rate in patients with initially severe Bell's palsy and those without hypertension and DM. The recovery rate in patients receiving combination treatment was generally higher than in patients treated with steroid alone, providing evidence for the efficacy of antiviral therapy in the treatment of Bell's palsy. (Journal of Internal Medicine 2015 In Press)

P-87 Longitudinal Change of VZV Specific Cell-Mediated Immunity in Hunt Syndrome and Bell's Palsy

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Objectives: 1. To compare longitudinal changes of Varicella-zoster virus (VZV)-specific cell-mediated immunity (CMI) in Hunt syndrome with Bell's palsy using IFNγ enzyme-linked immunospot (ELISPOT). 2. To examine the role of VZV-specific CMI for VZV reactivation in the facial nerve in Hunt syndrome.

Methods: This prospective study was conducted in our tertiary referral hospital between 2010 and 2013. Nineteen Hunt syndrome and 59 Bell's palsy patients were enrolled. Mononuclear cells isolated from whole blood were incubated with VZV antigen in culture plates for 40 hours. Anti IFNγ antibody was added and the ELISPOT system counted immunostained spots indicating VZV-specific CMI. The relationship between the spots and days from the onset of palsy were compared between Hunt syndrome and Bell's palsy patients.

Results: Immediately after the onset, the number of spots in the Hunt syndrome group was much lower than in the Bell's palsy group, indicating low VZV-specific CMI. However, it increased rapidly and showed a strong positive relationship between the number of spots and days from the onset of palsy ($r = 0.64$) in Hunt syndrome. Several months after the onset, the number of spots in Hunt syndrome decreased gradually. In contrast, the Bell's palsy group showed no such relationship ($r=-0.22$).

Conclusions: These results suggest that low CMI to VZV may play an important role in VZV reactivation in the facial nerve, thus leading to facial palsy in Hunt syndrome. VZV vaccination is considered to be beneficial to promote VZV-specific CMI for the prevention of Hunt syndrome.

P-88 Study of automatic calculation and standardization of facial nerve palsy grading

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Introduction: The assessment of facial nerve palsy (FNP) is essential for the diagnosis, treatment, and prognosis of patients. Existing facial grading systems (FGS) have some issues for betterment. The aim of this study is to evaluate the usefulness of our new grading system in patients with various degrees of acute peripheral FNP.

Materials and Methods: Facial photographs (resting, mouth extension, eye closing, eyebrow lifting) of 5 healthy people and 35 FNP patients were analyzed using PC-based FNP grading system (FGS 2.0) that we developed. FGS 2.0 classified FNP area into 3 components - mouth asymmetry ratio (MAR), closing eyes asymmetry ratio (CAR), and eyebrow asymmetry ratio (EAR). Ratio of asymmetry between two sides was measured for MAR and EAR. Then, MAR, CAR, and EAR were weighted with the ratio of 5:3:2 for integrated values of FNP. In addition, FNP degrees of the 40 cases classified using House-Brackmann grading system (HBGS). Results using FGS 2.0 were compared with those by HBGS.

Results: Mean MAR and EAR for healthy people were 0.94 (0.92-0.96) and 0.99 (0.98-1.00), respectively, which showed statistically significant differences compared with each grade of FNP patients ($p<0.001$). Measured values of MAR and EAR in FNP patients were compared according to their grades classified by HBGS. MAR between HBGS II (0.94) and III (0.65) had a significant difference ($p<0.001$), whereas EAR showed a significant difference between HBGS I (0.99) and II (0.93) ($p=0.007$). CAR had a difference between HBGS III and IV ($p=0.026$). Integrated values of FNP showed a linear proportion according to degrees of FNP and there were significant differences in all combination between HBGS II and V.

Conclusion: Results using PC-based FGS program showed characteristics by grade of HBGS. Further revaluation of FGS 2.0 is needed for standardized assessment of FNP.

P-89 Usefulness of Individual Evaluation Items in the Yanagihara Grading System

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Background: The Yanagihara grading system, which is a regional 40-point scoring system, is most widely used in Japan for evaluating the facial nerve function in the patients with Bell's palsy and Ramsay Hunt syndrome. However, this system has been pointed to have various problems such as differences of scores among evaluators and is therefore expected to be simplified. In this paper, we investigated which of 10 evaluation items of the Yanagihara system were really useful to assess the severity and change of the facial paralysis.

Subjects and Methods: The subjects were 361 patients who were diagnosed with Bell's palsy or Ramsay Hunt syndrome within 14 days from the onset of facial palsy at the ENT department of Tokai University Hospital between July 2008 and September 2012. They aged 16 through 85. We divided the subjects into two groups, who visited within 3 days and who visited after 3 days passed from the onset of facial palsy. Distributions of scores (0, 2 and 4 points) of each evaluation items were statistically compared between two groups, and p values less than 0.05 was considered significant (Fisher's exact test).

Results: In the following 5 items, the score distributions were not statistically different between two groups; at rest symmetry, closure of eye lightly, closure of eye on the involved side only, blowing out cheeks, and whistle. Conversely, in the remaining 5 (wrinkle forehead, closure of eye tightly, wrinkle nasal root, grin, and depress lower lip), the score distributions were statistically different between two groups, and the rate of 0 point in the latter group was found to be higher.

Discussion: The advantages of the Yanagihara grading system are abilities to evaluate facial movements regionally and to catch the chronological change of facial paralysis. However, it has been pointed to have problems such as differences of the score among evaluators and difficulties to assess sequelae. We therefore investigated to know which of 10 evaluation items of the Yanagihara system really contributed to assessments of the severity and changes of facial paralysis. The following 5 items, Wrinkle forehead, Closure of eye tightly, Wrinkle nasal root, Grin, Depress lower lip, successfully showed the significant statistical differences between the group of patients with the grade unchanged and the group with progression of facial paralysis, and these items seemed to represent the progression of facial paralysis in its acute stage. On the other hand, 'Closure of eye lightly' might reflect improvement of facial paralysis, because the distribution of score-up in the group with improvement of facial paralysis was found to be statistically higher compared to the other 2 groups. Conversely, there were no statistical differences obtained between 3 groups in the score change distributions of 'At rest', 'Closure of eye on the involved side only', and 'Whistle'. The latter 2 were hardly considered to be subjects to pick up a tiny change of movement in the acute stage of facial paralysis, and therefore could be eliminated from the evaluation items. Regarding 'At rest' it seems originally difficult to grade grossly the feature of the patient. This should be modified to have more minute categories.

Conclusion: The grading system is desired to reflect the progression and improvement of facial palsy. To achieve this purpose, the Yanagihara system can be modified by eliminating unnecessary items.

P-90 B-Cell Lymphoma of the Temporal bone A rare presentation

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Temporal bone involvement by malignancies, primary or secondary, is rare. Diagnosis is frequently delayed as the symptoms mimic more common otological conditions like otitis external or media. Involvement of cranial nerves or cochleovestibular system may occur in advanced cases. More commonly, the bone involvement is due to direct extension of locally invasive squamous or adenocarcinomas of ear. Primary B cell bone lymphomas are also a rare entity and the presentation is usually with pain, swelling or fracture of involved bones. Mastoiditis due to destruction of underlying temporal bone by malignant lymphoma has only been reported in about 20 cases in the literature. We describe a case of primary B cell lymphoma presenting with radiological evidence of mastoiditis, skull base osteomyelitis and sigmoid sinus thrombosis. Patient was initially treated with broad-spectrum antimicrobials and it was not until development of facial palsy that a decision of mastoid exploration was made. Histopathological examination confirmed infiltration of temporal bone by malignant B cells. Staging studies including a diagnostic bone marrow biopsy diagnosed the patient with stage IV primary diffuse large B cell lymphoma of the bone. Treatment was initiated with multi-agent chemotherapy with good results.

Discussion & Conclusion: Atypical presentation of otological signs and symptoms refractory to medical management requires a thorough evaluation and consideration of uncommon differentials. A high index of suspicion towards temporal bone malignancies may be helpful in timely diagnosis.

P-91 Efficacy of concurrent superselective intra-arterial chemotherapy and radiotherapy for late-stage squamous cell carcinoma of the temporal bone

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Advanced squamous cell carcinoma (SCC) of the temporal bone is a poor-prognosis disease because of the cranial base and the great vessel located, respectively, superior and medial to the ear, which pose anatomical barriers in performing en bloc resection with an appropriate safety margin.In our institution and related facilities, patients with advanced SCC have been treated with superselective intra-arterial chemotherapy combined with radiotherapy since 2006. Here we report the results from our analysis and discussion on the local control rate, disease-free survival rate, adverse events, and cisplatin dosage in 12 patients treated with this therapy.

P-92 Hematogeneous renal cell carcinoma metastasis in the post operative middle ear

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Metastatic renal cell carcinoma (RCC) involving the temporal bone is an extremely rare entity. It is usually asymptomatic, however, patients sometimes have facial palsy and severe otalgia. Thus, misdiagnosis as otitis media acute, mastoiditis and Rumsay-Hunt syndrome in early on set is not uncommon. Among the metastatic tumors in the temporal bone, RCC is more frequent subsequent to the breast carcinoma and the lung carcinoma from previous reports. We report of the case the RCC metastasis to the temporal bone in the middle of molecular targeted therapy. A 60-year-old man presented left facial palsy with severe retroauricular pain and he also underwent middle ear surgery on the left for the cholesteatoma more than 30 years before and had been aware of discontinuous otorrhea, therefore, initially we speculated that facial palsy was derived from recurrent cholesteatoma or Ramsay hunt syndrome. Exploratory tympanotomy revealed its pathology as RCC metastasis and post operative MR indicated hematogenous metastasis. To the best of our knowledge, no report was obtained that temporal bone metastasis in the middle of chemotherapy or hematogenous metastasis in the post operative middle ear. RCC metastasis in the temporal bone was quite uncommon. We never miss the possibility of the disease derived from the malignancy or its metastasis, especially severe facial palsy and otalgia are observed, even the original disease was cured or under treatment. Moreover, this case indicates that hematogenous metastasis can be occurred in the post operative state of the temporal bone.

P-93 Osteoid osteoma of the temporal bone manifesting only as first-bite syndrome and systematic review

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First bite syndrome is a rare pain syndrome sometimes, occurring after surgery of the upper cervical region. It presents as excruciating pain, triggered at the first bite of each meal and subsequently diminishing in severity. However, no previous report has addressed this syndrome without a history of head and neck surgery other than 4 cases of malignant tumor arising from parotid gland or parapharyngeal space. First, we report herein a unique case of osteoid osteoma of the temporal bone with first-bite syndrome as the sole clinical symptom, which diminished after the surgical resection.

Alongside with osteoblastoma, osteoid osteoma is benign bone tumor which had been grouped with other osteoblastic neoplasm such as osteoma, bone islands, and osteogenic sarcoma. They were singled out as a separate pathological entity simultaneously by Jaffe and Lichtenstein in 1956, which usually involve long bones and require surgical excision. The histological pattern is very similar to each other, and dominated by osteoblasts that produce trabeculae of osteoid in a well vasculized stroma. Contrasting to osteoblastoma, osteoid osteoma has a limited growth, less endangering nearby structures. Recognition of these benign neoplasms is of practical importance because of the challenging and difficult differential diagnosis. In this way, we performed a systematic review of osteoid osteoma arising in the temporal bone to clarify the characteristic differences comparing with osteoboastoma of the temporal bone.

P-94 Multi-variables on Music Perception in Adult Cochlear Implant Recipients

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Objectives: The purpose of this study was to investigate music perception performance of adult CI (cochlear implant) recipients on multi-variables.

Methods: Sixty-one adult patients with at least six months implant experiences participated in this study. Their mean age was 45.1 and each of them used various hearing modes, such as Unilateral CI, Bilateral CIs, Bimodal, Unilateral electric acoustic stimulation (EAS), Bilateral EAS, Bimodal EAS. Pitch ranking test (PRT) and melodic contour identification (MCI) were utilized as a measurement at postoperative 6-month. All musical stimuli were provided in front of the each participant trough the speaker at average 75dB SPL. Music perception performance of the participants was analyzed on variables of hearing modes, device use, hearing loss types, age, and postoperative music training.

Result: The EAS users showed significantly high scores, compared to the other groups with different hearing modes. Prelingually deafened group and monaural hearing group presented the poorest performance. There was significant difference between adult and old age group, while young adult and adult group did not so. For the group with music training after surgery, they had relatively high scores than the group without music training.

Conclusion: Although each participant demonstrated different results according to individual hearing modes and demographics, binaural hearing and EAS users showed high performance in general. Particularly, high scores of EAS and Bimodal users presented the importance of residual hearing use in music perception. However, the number of participants in EAS, bilateral CIs, older age groups was relatively small which would affect the result. It is required to have enough participants in those groups and analysis with more various factors for further study.