

7th East Asian Symposium on Otology

EASO 2022 in Tokyo

Program & Abstracts

March 24 (Thu) - 26 (Sat), 2022

President: **Prof. Hiromi Kojima, MD**
The Jikei University School of Medicine

General Secretary: Prof. Yutaka Yamamoto, MD





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Greetings

The 7th East Asian Symposium on Otology (EASO 2022) in Tokyo
President: **Prof. Hiromi Kojima, MD**
The Jikei University School of Medicine



The 7th East Asian Symposium on Otology (EASO 2022) will be held online, delivered from our campus in Tokyo, during the three days spanning March 24 to March 26, 2022. The 3rd Symposium was also held in Japan hosted by Prof. Ken Kitamura in Nagasaki. With each meeting, the EASO has become a vital symposium for professionals not only in East Asia, but across the broader Asia Pacific region. It is thus quite an honor to be the president of this event in 2022.

The unprecedented events of 2020 and 2021 have challenged all of us. It is truly unfortunate that the EASO 2020 scheduled to be hosted in Taiwan under the leadership of Prof. Tien-Chen Lieu had to be cancelled due to the spread of COVID-19.

This year, we have decided to organize EASO 2022 online. This decision was made by the local organizing committee and the EASO Board to carry out the conference safely and successfully. It is pity that we cannot meet you all in person, but we are very much looking forward to seeing you LIVE!

Despite this difficult time, we received many free papers, and many colleagues agreed to be chairs or speakers in our program. We sincerely appreciate your generous support. Guided by the expertise of my fellow organizing committee members, I anticipate a lively online symposium.

We look forward to welcoming you all!



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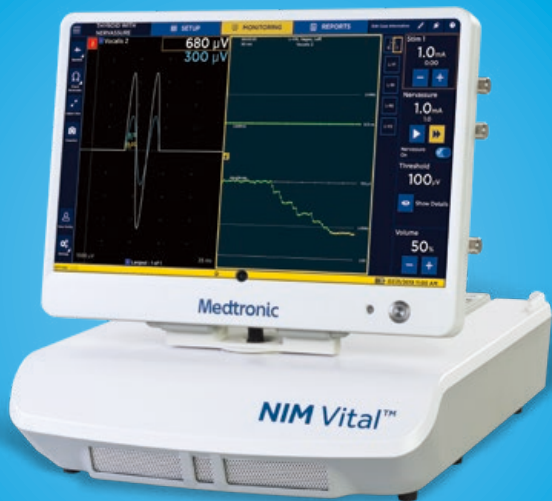
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Program at a Glance

	24th Mar (Thu)	25th Mar (Fri)		26th Mar (Sat)		
		Room 1	Room 2	Room 1	Room 2	
9:00		Opening Ceremony				9:00
15		Keynote Lecture 1 Ja Won Koo		Special Program 8 Skull Base	Special Program 9 Genetics	15
30		Special Program 1 Endoscopic & Exoscopic Ear Surgery	Special Program 2 Auditory Implants (CI & ABI)	Keynote Lecture 3 Seiji Kakehata		30
45				Coffee Break		45
10:00		Coffee Break		Special Program 10 Regenerative Medicine	Special Program 11 Middle Ear and Facial Nerve	10:00
15		Sponsored Session 1 Co-sponsored by: Nihon Cochlear Co., Ltd				15
30		Special Program 3 Cholesteatoma	Special Program 4 Auditory Implants (Baha & VSB)	Sponsored Session 2 Co-sponsored by: Medtronic Japan Co., Ltd.		30
45				Coffee Break		45
11:00		Keynote Lecture 2 Joshua K. C. Chen		Special Program 12 Innovative Medicine on Otology	Special Program 13 Sensorineural Hearing Loss and Tinnitus	11:00
15		Coffee Break				15
30	Board Meeting	Special Program 5 Vestibular Disease	Special Program 6 Basic Research	Free Paper 4 Audiology	Free Paper 5 Middle Ear Surgery & Facial Nerve	30
45		Special Program 7 The impact of COVID-19 on Otology	Free Paper 1 Vestibular Disorder	Closing Ceremony		45
16:00				Coffee Break		16:00
15		Free Paper 2 Auditory Implants	Free Paper 3 Middle Ear & EAC			15
30						30
45						45
17:00						17:00
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20:00						20:00



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Program

25th Mar (Fri)

9:00-9:15 **Opening Ceremony** Room 1

9:15-10:00 **Keynote Lecture 1** Room 1

Chair: Chin-Kuo Chen

Chang Gung Memorial Hospital, Linkou, Taoyuan City, Taiwan

KL01-1 Practical application of middle cranial fossa approach in otology clinic

Ja Won Koo

Seoul National University, Seoul, Korea

10:00-11:30 **Special Program 1** Room 1

Endoscopic & Exoscopic Ear Surgery

Chairs: Yutaka Takumi

Department of Otorhinolaryngology - Head and Neck Surgery, Shinshu University School of Medicine, Matsumoto, Japan

Tsukasa Ito

Department of Otolaryngology, Head and Neck Surgery, Yamagata University Faculty of Medicine, Yamagata, Japan

SP01-1 Combining TEES and exoscopic mastoidectomy as a dual approach to the treatment of cholesteatomas

Tsukasa Ito

Department of Otolaryngology, Head and Neck Surgery, Yamagata University Faculty of Medicine, Yamagata, Japan

SP01-2 Endoscopic Ear Surgery - 10 years experience in Taiwan

Chang-Wei Huang

Department of Otolaryngology, Kuang-Tien General Hospital, Taichung City, Taiwan

SP01-3 The Endoscopic Management of Congenital Cholesteatoma

Hyong-Ho Cho

Chonnam National University Medical School, Gwangju, Korea

SP01-4 Transcanal endoscopic approach using a 70-degree endoscope for cholesteatoma

Masahiro Takahashi

The Jikei University School of Medicine, Tokyo, Japan

SP01-5 Endoscopic Stapes Surgery

Il Joon Moon

Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

SP01-6 Advantages of the ORBEYE surgical microscope system in otologic surgery

Yutaka Takumi

Department of Otorhinolaryngology - Head and Neck Surgery, Shinshu University School of Medicine, Matsumoto, Japan

Auditory Implants (CI & ABI)

Chairs: Lieber P. H. Li

Cheng Hsin General Hospital, Taipei, Taiwan

Katsumi Doi

Kindai University, Osaka, Japan

SP02-1 **Bilateral Cochlear Implantation in Chang-Gung Memorial Hospital, Taiwan- Report of 160 cases**
Che-Ming Wu

Department of Otolaryngology, Chang-Gung Memorial Hospital, Chang-Gung University, Taipei, Taiwan

SP02-2 **Tailoring the clinical decision for cochlear implantation in the post-genomic era**
Chen-Chi Wu

Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan

SP02-3 **Monosyllabic recognition errors in children with hearing aids and children with cochlear implants**

Shujiro Bando Minami

*National Hospital Organization Tokyo Medical Center, Department of Otolaryngology, Tokyo, Japan /**National Hospital Organization Tokyo Medical Center, National Institute of Sensory Organs, Tokyo, Japan*

SP02-4 **How do we select the proper array length for patients with high-frequency hearing loss?**
Hidekane Yoshimura

Shinshu University, Matsumoto, Japan

SP02-5 **Residual Hearing Preservation for Cochlear Implantation Surgery**
Hungpin Wu

Department of Otolaryngology, Taichung Tzuchi Hospital, Taichung, Taiwan / School of Medicine, Tzuchi University, Hualien, Taiwan

SP02-6 **Auditory Brainstem Implant in Non-tumor patients. Who is the ideal candidates?**
Jae Young Choi

*Yonsei University, Seoul, Korea***Considerations in CI performance -factors contributing to a lifetime of hearing performance**

Chair: Tatsuya Yamasoba

The University of Tokyo, Tokyo, Japan

SS01-1 J. Thomas Roland Jr.

NYU Langone Health, New York, USA / NYU Grossman School of Medicine, New York, USA

SS01-2 David R Friedmann

NYU Langone Health, New York, USA

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12:45-14:00 **Special Program 3**

Room 1

Cholesteatoma

Chairs: Yutaka Yamamoto

The Jikei University School of Medicine, Tokyo, Japan

Sung Won Chae

The Korea University, Seoul, Korea

SP03-1 Treatment strategies for middle ear cholesteatoma based on a nationwide survey

Manabu Komori

St. Marianna University School of Medicine, Kawasaki, Japan

SP03-2 Mastoid obliteration and canal wall reconstruction with perichondrium-preserved conchal cartilage

Withdraw

Tzong-Yang Tu

Taipei Veterans General Hospital, Taipei, Taiwan

SP03-3 The management of congenital cholesteatoma

Jiunn-Liang Wu

Department of Otolaryngology, Head and Neck Surgery, National Cheng Kung University Hospital, Tainan, Taiwan

SP03-4 Amplicon sequence variant (ASV) -level 16S rRNA gene sequencing for cholesteatoma microbiome analysis

Taro Fujikawa

Department of Otolaryngology, Tokyo Medical and Dental University, Tokyo, Japan

SP03-5 Epigenetic regulation as a new target for middle ear cholesteatoma therapy

Tomomi Yamamoto-Fukuda

Department of Otorhinolaryngology, The Jikei University School of Medicine, Tokyo, Japan

12:45-14:00 **Special Program 4**

Room 2

Auditory Implants (Baha & VSB)

Chairs: Jae Young Choi

Yonsei University, Seoul, Korea

Satoshi Iwasaki

International University of Health and Welfare Mita Hospital, Tokyo, Japan

SP04-1 Long-Term Outcomes of BAHA: A 20-Year Experience in Tokyo Medical and Dental University

Yoshiyuki Kawashima

Tokyo Medical and Dental University, Tokyo, Japan

SP04-2 Comparison of audiological outcome and compliance of bone conduction hearing implants in SSD

Byung Yoon Choi

Seoul National University Bundang Hospital, Seongnam, Korea

SP04-3 BAHA Surgery: prevention for skin overgrowth and troubleshooting

Akira Ganaha

Department of Otorhinolaryngology-Head and Neck Surgery, University of Miyazaki, Miyazaki, Japan

SP04-4 BONEBRIDGE implantation in microtia patient in Taiwan

William Kuan Hua Chen

Holistic Hearing Healthcare Center, Chinese Medical University Hospital, Taichung, Taiwan / ENT Department, Chinese Medical University Hospital, Taipei Branch, Taipei, Taiwan / Institution of Public Health, National Yang Ming Chiao Tung University, Taipei, Taiwan

SP04-5 Bonebridge Implantation with Auricular Reconstruction for Microtia Patients

Kai-Chieh Chan

Division of Otolaryngology, Department of Otolaryngology & Head and Neck Surgery, Chang Gung Memorial Hospital, Linkou, Taiwan

14:00-14:45 **Keynote Lecture 2**

Room 1

Chair: Yukiko Iino

Tokyo-Kita Medical Center, Tokyo, Japan

KL02-1

The Outcome of Rounded insertion in CI recipients with cystic malformed cochleae

Joshua K. C. Chen

Chinese Medical University Hospital, Taichung, Taiwan

15:00-16:00 **Special Program 5**

Room 1

Vestibular Disease

Chairs: Pa-Chun Wang

Cathay General Hospital, Taipei, Taiwan

Tetsuo Ikezono

Saitama Medical University Hospital, Saitama, Japan

SP05-1

Effect of intratympanic dexamethasone combination with gentamicin in Meniere's disease

Sung Huhn Kim

Yonsei University College of Medicine, Seoul, Korea

SP05-2

Vestibular rehabilitation for prolonged dizziness of BPPV and Meniere's disease

Tadashi Kitahara

Department of Otolaryngology, Nara Medical University, Kashihara, Japan

SP05-3

Characteristics of vestibular symptoms of perilymphatic fistula cases

Han Matsuda

Saitama Medical University, Saitama, Japan

SP05-4

Niigata PPPD Questionnaire as a screening tool of Persistent Postural- Perceptual Dizziness (PPPD)

Arata Horii

Niigata University, Niigata, Japan

15:00-16:00 **Special Program 6**

Room 2

Basic Research

Chairs: Yun-Hoon Choung

Department of Otolaryngology, Ajou University School of Medicine, Gyeonggi, Korea

Masato Fujioka

Kitasato University School of Medicine, Kanagawa, Japan

SP06-1

Drug discovery and development using hiPSC-based technology

Masato Fujioka

Kitasato University School of Medicine, Kanagawa, Japan / Keio University School of Medicine, Tokyo, Japan

SP06-2

Trials to increase drug delivery to the inner ear

Yong-Ho Park

Chungnam National University, College of Medicine, Daejeon, Korea

SP06-3

Optical Coherence Tomography for Mouse Cochlear Imaging and its Potential Clinical Application

Hsin-Chien Chen

Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan

SP06-4

Circadian clock in the inner ear and related disorders

Chao-Hui Yang

Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan

16:00-17:00 **Special Program 7**

Room 1

The impact of COVID-19 on Otology

Chairs: Hong Ju Park

Department of Otorhinolaryngology-Head and Neck Surgery, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

Yurika Kimura

Ebara Hospital, Tokyo, Japan

SP07-1 The impact of COVID-19 on otology diseases

Pey-Yu Chen

Department of Otolaryngology, MacKay Memorial Hospital, Taipei, Taiwan / Department of Audiology and Speech-Language Pathology, Mackay Medical College, New Taipei City, Taiwan

SP07-2 The impact of COVID-19 on Otology

Toshinori Kubota

Yonezawa City Hospital, Yonezawa, Japan / Yamagata University Faculty of Medicine, Yamagata, Japan

SP07-3 Clinical manifestations of sudden sensorineural hearing loss associated with COVID-19 Vaccination

Hong Ju Park

Department of Otorhinolaryngology-Head and Neck Surgery, Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea

SP07-4 How has the COVID-19 epidemic impacted hearing care?

Yurika Kimura

Ebara Hospital, Tokyo, Japan

16:00-17:30 **Free Paper 1**

Room 2

Vestibular Disorder

Chairs: Masanori Ishii

JCHO Tokyo Medical Center, Tokyo, Japan

Yujin Kato

The Jikei University School of Medicine, Tokyo, Japan

FP1-1 Usefulness of CT images reformatted in Poschl or Stenvers plane on SSCD

Taro Takanami

Toho University School of Medicine, Sakura, Japan

FP1-2 A review of 10 cases of endolymphatic sac surgery performed at our hospital

Fumihiko Mochizuki

St.Marianna University of Medicine Hospital, Kawasaki, Japan

FP1-3 cVEMP may contribute to the differentiation between vestibular migraine and Meniere's diseases

Takaki Inui

Department of Otorhinolaryngology - Head & Neck Surgery, Osaka Medical and Pharmaceutical University, Takatsuki, Japan

FP1-4 Group Vestibular Rehabilitation Program: A Cost-Effective Treatment Option for Dizzy Patients

Jae Sang Han

Department of Otorhinolaryngology-Head and Neck Surgery, College of Medicine, The Catholic University of Korea, Seoul, Korea

FP1-5 Vestibular Function Assessment using Machine Learning and Wearable Sensors

Kuan-Chung Ting

Department of Otolaryngology-Head and Neck Surgery, Taipei Veterans General Hospital, Taipei, Taiwan / Institute of Clinical Medicine, National Yang Ming Chiao Tung University, Taipei, Taiwan / School of Medicine, National Yang Ming Chiao Tung University, Taipei, Taiwan

FP1-6 **Diagnoses and treatment result for clinical types of Benign Paroxysmal Positional Vertigo**
Delgerzaya Enkhtaivan
Department of Otorhinolaryngology, School of Medicine, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia

FP1-7 **A Reliability Analysis of Upright Head Roll Test for Lateral Semicircular Canal BPPV**
Jae-Hyun Seo
Department of Otolaryngology Head & Neck Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

FP1-8 **The effect of osteoporotic drugs on the changes of otoconial layer in ovariectomized mice**
Takahiro Nakata
Ehime University Graduate School of Medicine, Toon, Japan

FP1-9 **Effect of defective bone calcium metabolism on otolith formation in zebrafish**
Aya Iwamoto
Yamaguchi University Graduate School of Medicine, Ube, Japan

17:00-18:20 **Free Paper 2**

Room 1

Auditory Implants

Chairs: Masaomi Motegi
The Jikei University School of Medicine, Tokyo, Japan
Sho Kurihara
University of Miyazaki, Miyazaki, Japan

FP2-1 **Cochlear Implant Surgery in the Elderly**
Masumi Kobayashi
Nagoya University Graduate School of Medicine, Nagoya, Japan

FP2-2 **Cochlear Implantation Outcomes in Patients with Auditory Neuropathy Spectrum Disorder**
Pei-Hsuan Lin
Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan / Department of Otolaryngology, National Taiwan University Hospital Yunlin Branch, Yunlin, Taiwan

FP2-3 **Comprehensive Prediction Model, Including Genetic Testing, for the Outcomes of Cochlear Implantation**
Ji Hyuk Han
Department of Otorhinolaryngology, Yonsei University College of Medicine, Seoul, Korea

FP2-4 **Simultaneous cochlear implant after resection of intracochlear schwannoma in NF2 patients**
Zhihua Zhang
Department of Otolaryngology, Head & Neck Surgery, Shanghai Ninth People's Hospital, affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China / Ear Institute, Shanghai Jiaotong University School of Medicine, Shanghai, China / Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases, Shanghai, China

FP2-5 **Evaluation of the bone marrow area around the mastoid cavity of the infants**
Yosuke Tona
Department of Otolaryngology-Head and Neck Surgery, Graduate School of Medicine, Kyoto University, Kyoto, Japan

FP2-6 **Auditory brainstem implant for congenital hearing loss: preliminary results of 50 cases**
Hao Wu
Department of Otolaryngology, Head & Neck Surgery, Shanghai Ninth People's Hospital, affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China / Ear Institute, Shanghai Jiaotong University School of Medicine, Shanghai, China / Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases (14DZ2260300), Shanghai, China

FP2-7 **Experimental study on the safety and efficacy of domestic auditory brainstem implant system**
Huan Jia
Department of Otolaryngology-Head and Neck Surgery, Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China / Ear Institute, Shanghai Jiao Tong University School of Medicine; Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases, Shanghai, China

- FP2-8** **Effect of Bonebridge™ on Tinnitus in Patients with Asymmetric Hearing Loss or Single-Sided Deafness**
Yeonji Kim
Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

17:30-18:30 Free Paper 3

Room 2

Middle Ear & EAC

Chair: Manabu Komori

St. Marianna University School of Medicine, Kawasaki, Japan

- FP3-1** **Otitis media with ANCA-associated vasculitis: A multicenter study in Japan**
Kan Kishibe
Asahikawa Medical University, Asahikawa, Japan / Intractable Otitis Media Working Group of The Japan Otological Society, Tokyo, Japan
- FP3-2** **Labyrinthine calcification in ears with OMAAV: a report of two cases**
Tadao Yoshida
Department of Otorhinolaryngology, Nagoya University Graduate School of Medicine, Nagoya, Japan
- FP3-3** **The diagnostic utility of extracellular trap cell death-derived products as biomarkers for OMAAV**
Shinya Morita
Department of Otolaryngology - Head and Neck Surgery, Faculty of Medicine and Graduate School of Medicine, Hokkaido University, Sapporo, Japan / Intractable Otitis Media Working Group of The Japan Otological Society, Tokyo, Japan
- FP3-4** **Surgical interventions in patients with eosinophilic otitis media with the use of biological drugs**
Saori Kikuchi
Department of Otolaryngology, Tokyo Kita Medical Center/Deafness and Middle Ear Surgicenter, Tokyo, Japan
- FP3-5** **Effect of Pneumococcal Conjugate Vaccine on Prevalence of Otitis Media with Effusion**
Chisei Satoh
Department of Otorhinolaryngology, Nagasaki University Hospital, Nagasaki, Japan
- FP3-6** **EGFR/PDPK1 axis in squamous cell carcinoma of the external auditory canal**
Naotaro Akiyama
Toho University School of Medicine, Tokyo, Japan

26th Mar (Sat)

9:00-10:00 **Special Program 8**

Room 1

Skull Base

Chairs: Yang Sun Cho

Sungkyunkwan University School of Medicine, Samsung Medical Center, Seoul, Korea

Kuniyuki Takahashi

Niigata University, Niigata, Japan

- SP08-1 Steroid treatment for sudden sensorineural hearing loss in patients with vestibular schwannoma**
Jong Dae Lee
Soonchunhyang University School of Medicine, Bucheon, Korea
- SP08-2 Retrolabyrinthine Approach for Large Cerebellopontine Angle Meningioma**
Mao-Che Wang
Taipei Veterans General Hospital, Taipei, Taiwan
- SP08-3 Surgical outcome of 69 external auditory canal cancer treated at a single institution**
Takeshi Tsutsumi
Tokyo Medical and Dental University, Tokyo, Japan
- SP08-4 Role of hearing preservation surgery for small and medium-sized vestibular schwannomas**
Naoki Oishi
Keio University, Tokyo, Japan

9:00-10:00 **Special Program 9**

Room 2

Genetics

Chairs: Chen-Chi Wu

National Taiwan University Hospital, Taipei, Taiwan

Shin-ichi Usami

Shinshu University, Nagano, Japan

- SP09-1 Milestone toward cochlear gene therapy for patients with hereditary hearing loss**
Hidekane Yoshimura
Shinshu University, Matsumoto, Japan
- SP09-2 Genetic Analysis of Hearing Loss in Japan**
Kotaro Ishikawa
National Rehabilitation Center for Persons with Disabilities, Tokorozawa, Japan
- SP09-3 Prediction Models for Hereditary Hearing Loss**
Pey-Yu Chen
Department of Otolaryngology, MacKay Memorial Hospital, Taipei, Taiwan / Department of Audiology and Speech-Language Pathology, Mackay Medical College, New Taipei City, Taiwan
- SP09-4 Cochlear implantation in retrocochlear pathologies caused by genetic mutations and cCMV infection**
Chen-Chi Wu
Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan

10:00-10:45 **Keynote Lecture 3**

Room 1

Chair: Seung Ha Oh

Seoul National University College of Medicine, Seoul, Korea

KL03-1

The Future of Ear Surgery is Looking Up- Heads Up Surgery with the Endoscope and Exoscope

Seiji Kakehata

Yamagata University, Yamagata, Japan

11:00-12:15 **Special Program 10**

Room 1

Regenerative Medicine

Chairs: Ja Won Koo

Seoul National University, Seoul, Korea

Norio Yamamoto

Kyoto University, Kyoto, Japan

SP10-1

Regeneration of the tympanic membrane perforation and the new concept tympanoplasty

Shin-ichi Kanemaru

Department of Otolaryngology, Head and Neck Surgery, Hearing Disturbance and Tympanic membrane Regeneration Center, Medical Research Institute, Kitano Hospital, Osaka, Japan / Translational Research Center for Medical Innovation, Kobe, Japan / Department of Otolaryngology, Kanai Hospital, Kyoto, Japan

SP10-2

Middle ear mucosal regenerative therapy by cell sheet transplantation

Kazuhiisa Yamamoto

Jikei University School of Medicine, Tokyo, Japan

SP10-3

Otic Organoids Derived from Induced Pluripotent Stem Cells as a Model of Drug-Induced Neuropathy

Sho Kurihara

University of Miyazaki, Miyazaki, Japan / Jikei University School of Medicine, Tokyo, Japan

SP10-4

CRISPR/Cas9 Genome-Editing in Patient-Derived iPSCs: Functional Assays of Deafness Genes

Yi-Lu Li

Department of Otolaryngology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan / Institute of Clinical Medicine, College of Medicine, National Cheng Kung University, Tainan, Taiwan / Department of Genetic Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan

SP10-5

Regenerative medicine of the middle and inner ear

Norio Yamamoto

Kyoto University, Kyoto, Japan

11:00-12:15 **Special Program 11**

Room 2

Middle Ear and Facial Nerve

Chairs: Shinichi Haginomori

Osaka Medical and Pharmaceutical University, Osaka, Japan

Hyung Jong Kim

Hallym University, Gangwon, Korea

SP11-1

Medical and surgical treatment of Bell's palsy and Ramsay-Hunt syndrome

Masashi Hamada

Tokai University, School of Medicine, Isehara, Japan

SP11-2

Facial Nerve Monitor and Electric Stapes Reflex in Cochlear Implant

Chung-Feng Hwang

Department of Otolaryngology, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan

SP11-3 Regenerative treatment for severe facial paralysis

Naohito Hato
Ehime University School of Medicine, Ehime, Toon, Japan

SP11-4 Imaging Analysis for Predicting Intraoperative Findings in Middle Ear Disease.

Masaomi Motegi
The Jikei University School of Medicine, Tokyo, Japan

SP11-5 Stapes surgery for otosclerosis: Personal experience

An-Suey Shiao
Department of Otolaryngology, Cheng Hsin General Hospital, Taipei, Taiwan

12:15-13:05 Sponsored Session 2

Room 1

Chair: Seiji Kakehata

Yamagata University, Yamagata, Japan

SS02-1 Transcanal Endoscopic Ear Surgery (TEES) - Tips and Pitfalls -

Kunio Mizutari
Department of Otolaryngology, National Defense Medical College, Saitama, Japan

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13:15-14:30 Special Program 12

Room 1

Innovative Medicine on Otology

Chairs: Chih-Hung Wang

Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan

Yumi Ota

Osaka University, Osaka, Japan

SP12-1 Innovative treatments for hearing loss

Pei-Hsuan Lin
Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan / Department of Otolaryngology, National Taiwan University Hospital Yunlin Branch, Yunlin, Taiwan

SP12-2 Kobayashi's silicone plug for patulous eustachian tube: A retrospective case series

Takeshi Oshima
Nihon University School of Medicine, Tokyo, Japan

SP12-3 Underwater endoscopic ear surgery: evidence and techniques

Daisuke Yamauchi
Tohoku University Graduate School of Medicine, Sendai, Japan

SP12-4 The Application of Artificial Intelligence (AI) on Cochlear Implant (CI)

Lieber P. H. Li
Department of Otolaryngology, Cheng Hsin General Hospital, Taipei, Taiwan / Faculty of Medicine and Institute of Brain Science, National Yang Ming Chiao Tung University, Taipei, Taiwan

SP12-5 Holography guided exoscopic surgery

Taku Ito
Tokyo Medical and Dental University, Tokyo, Japan

13:15-14:45 **Special Program 13**

Room 2

Sensorineural Hearing Loss and Tinnitus

Chairs: Tien-Chen Liu

Taiwan University Hospital, Taipei, Taiwan

Sho Kanzaki

Keio University, Tokyo, Japan

SP13-1 How effect is counseling prior to surgery for both middle ear diseases and tinnitus?

Sho Kanzaki

Keio University, Tokyo, Japan

SP13-2 Surgical management of sigmoid sinus associated pulsatile tinnitus

Jen-Tsung Lai

Kuang-tien general hospital, Taichung, Taiwan

SP13-3 How to Manage Middle Ear Myoclonic Tinnitus: IT-Botox Injection & Middle Ear Tendon Resection

Shi Nae Park

The Catholic University of Korea, College of Medicine, Seoul, Korea

SP13-4 Update on Idiopathic Sudden Sensorineural Hearing Loss

Kyung Wook Heo

Inje University Busan Paik Hospital, Busan, Korea

SP13-5 Long-term Speech Perception Outcome in Mandarin Speaking Post-lingual SNHL Deaf Adult After Cochlear implant

Lin Hung-Ching

Department of Otolaryngology, Mackay Medical College, Taipei, Taiwan / Department of Audiology and Speech Language Pathology, Mackay Medical College, Taipei, Taiwan

SP13-6 Animal study for the relationship between cochlear synaptopathy and tinnitus

Kunio Mizutari

National Defense Medical College, Tokorozawa, Japan

15:00-16:00 **Free Paper 4**

Room 1

Audiology

Chairs: Yuika Sakurai

The Jikei University School of Medicine, Tokyo, Japan

Tomokatsu Udagawa

The Jikei University School of Medicine, Tokyo, Japan

FP4-1 Neuroprotective Effect of Valproic Acid on Salicylate-Induced Tinnitus

Chul Ho Jang

Chonnam National University Medical School, Gwangju, Korea

FP4-2 Patient experience in participating in the development of a clinical protocol for tinnitus

Akbota Seitkali

Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan

FP4-3 Children with unilateral hearing loss notice more difficulty under mask-wearing life.

Hiromi Kanazawa

Jichi Medical University Saitama Medical Center, Saitama, Japan

FP4-4 Predicting treatment outcome in immune mediated inner ear disease through clinical characteristics

Che Hsuan Lin

Taipei Medical University Hospital, Taipei, Taiwan / Taipei Medical University School of Medicine, Taipei, Taiwan

FP4-5 Biallelic p.V37I variant in *GJB2* is associated with increasing incidence of hearing loss with age
Ying Chen
Department of Otolaryngology Head and Neck Surgery, Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China

FP4-6 Role of Dichotic Digit Test for the Early Diagnosis of Alzheimer's Disease
Munyoung Chang
Department of Otolaryngology-Head and Neck Surgery, Chung-Ang University College of Medicine, Seoul, Korea

15:00-16:00 **Free Paper 5**

Room 2

Middle Ear Surgery & Facial Nerve

Chair: Kazuhisa Yamamoto
The Jikei University School of Medicine, Tokyo, Japan

FP5-1 Latency shift in compound muscle action potentials during electroneurography in facial palsy
Yusuke Ayani
Osaka Medical and Pharmaceutical University, Takatsuki, Japan

FP5-2 Differential diagnosis study of geniculate ganglion venous malformation and schwannoma
Zhaoyan Wang
Department of Otolaryngology, Head & Neck Surgery, Shanghai Ninth People's Hospital, affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China / Ear Institute, Shanghai Jiaotong University School of Medicine, Shanghai, China / Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases, Shanghai, China

FP5-3 Outcomes of outer and middle ear congenital malformation reconstructive surgery
Jargalkhuu Erdenechuluun
MNUMS, Ulaanbaatar, Mongolia / EMJJ-ENT-Clinic, Ulaanbaatar, Mongolia

FP5-4 Outcome of endoscopic tympanoplasty
Jargalkhuu Erdenechuluun
MNUMS, Ulaanbaatar, Mongolia / EMJJ-ENT-Clinic, Ulaanbaatar, Mongolia

FP5-5 Effects of fibrous collagen/CDHA/hUCS biocomposites on bone tissue regeneration
Chul Ho Jang
Chonnam National University Medical School, Gwangju, Korea

FP5-6 ASC/chondrocyte-laden alginate hydrogel/PCL hybrid scaffold for auricle regeneration
Chul Ho Jang
Chonnam National University Medical School, Gwangju, Korea

16:00-16:15 **Closing Ceremony**

Room 1

Keynote Lectures

Keynote Lecture 1

KL01-1

Practical application of middle cranial fossa approach in otology clinic

Ja Won Koo

Seoul National University, Seoul, Korea



Keynote Lecture 2

KL02-1

The Outcome of Rounded insertion in CI recipients with cystic malformed cochleae

Joshua K. C. Chen

Chinese Medical University Hospital, Taichung, Taiwan



Keynote Lecture 3

KL03-1

The Future of Ear Surgery is Looking Up- Heads Up Surgery with the Endoscope and Exoscope

Seiji Kakehata

Yamagata University, Yamagata, Japan



Abstracts

Special Program 1 Endoscopic & Exoscopic Ear Surgery

SP01-1

Combining TEES and exoscopic mastoidectomy as a dual approach to the treatment of cholesteatomas

Tsukasa Ito

Department of Otolaryngology, Head and Neck Surgery, Yamagata University Faculty of Medicine, Yamagata, Japan

We have treated advanced cholesteatomas using a dual approach which combines transcanal endoscopic ear surgery (TEES) and microscopic ear surgery (MES). The indications for the dual approach are those cholesteatomas which extend beyond both the Donaldson's line and the posterior end of the lateral semicircular canal and into the central mastoid cells. The term "dual approach" has ironically a double meaning in that dual refers to the two types of surgical procedures which have been employed, microscopic and endoscopic. However, dual also refers to the fact that this procedure uses two "ports," a transmastoid port made by a microscopic canal wall up mastoidectomy and a transcanal port made by TEES. This dual approach will utilize both a transcanal approach using an endoscope and a retroauricular approach using both a microscope and endoscope. The microscope has long been the only option for visualizing the surgical field in ear surgery, but it now shares the stage with the endoscope and exoscope. The exoscope allows for an ergonomic, heads-up posture which can alleviate strain on the surgeon. The exoscope also facilitates communication and education because the surgical field is visible on a high-quality 4K-3D display which can be viewed by the surgical team and student observers. I will introduce a new dual approach using both TEES and exoscopic ear surgery (ExES) in this session.

SP01-2

Endoscopic Ear Surgery - 10 years experience in Taiwan

Chang-Wei Huang

Department of Otolaryngology, Kuang-Tien General Hospital, Taichung City, Taiwan

Endoscopic ear surgery (EES) was an innovative creation during the past decade. We could believe that EES had replaced MES (Microscopic ear surgery) in over 90% regular ear surgeries (middle ear and mastoid) so far. The IWGEES colleagues in Taiwan made contribution on both basic and clinical researches in this field. I will share our 10 years experience, including the development of EES in Taiwan and application on chronic ear, otosclerosis or congenital middle ear anomaly, and cholesteatoma surgery. Furthermore, I will review some important EES foundation issues, such as pros/cons, and limitation of EES. Lastly, I will mention about the future of EES, including exoscopy, wireless cochlear implantation, and otological navigation system.

Special Program 1 Endoscopic & Exoscopic Ear Surgery**SP01-3****The Endoscopic Management of Congenital Cholesteatoma****Hyong-Ho Cho***Chonnam National University Medical School, Gwangju, Korea*

Congenital cholesteatoma is a white mass that exists inside the normal eardrum, and is difficult to detect in the early stages because there are no specific symptoms. It is mainly found around the age of 5 who complain of symptoms such as hearing loss or a feeling of fullness in the ears.

Recently, with the development of endoscopic diagnostic technology and increased interest in this disease, the diagnosis rate is increasing and the diagnosis time is getting faster. Therefore, the prevalence of early congenital cholesteatoma confined to the tympanic cavity without invasion of the mastoid cavity is increasing.

The principle of treatment for congenital cholesteatoma is surgical treatment that completely removes the lesion to prevent recurrence.

In surgery using a conventional surgical microscope, depending on the scope of the lesion, tympanoplasty, atticoplasty, closed cavity mastoidectomy, and open cavity mastoidectomy can be performed. In these surgeries, the postauricular approach has been mainly used for reasons such as securing a sufficient surgical field of view.

Recently, according to the development of ear surgery using an endoscope, in the case of Patsic stage I-III congenital cholesteatoma with only a local lesion in the middle ear without involvement of the mastoid cavity, it is possible to remove the lesion by accessing the external auditory canal without mastoidectomy or postauricular incision.

In this presentation, I plan to explain how to remove congenital cholesteatoma of Patsic Stage I-III through total endoscopic ear surgery, and review the results of surgery performed at the author's hospital.

SP01-4**Transcanal endoscopic approach using a 70-degree endoscope for cholesteatoma****Masahiro Takahashi, Takara Nakazawa, Sho Kurihara, Masaomi Motegi, Kazuhisa Yamamoto, Yutaka Yamamoto, Hiromi Kojima***The Jikei University School of Medicine, Tokyo, Japan*

Exclusive endoscopic tympanoplasty for cholesteatoma was first described by Tarabichi, and endoscopic techniques have improved the treatment outcomes, especially in terms of residual disease. The use of angled endoscopes reduces blind areas, which is beneficial for reducing the incidence of residual disease. Endoscopes with angles of 30° and 45° are commonly used; however, few reports exist regarding the use of 70° endoscopes for ear surgery. We typically employ 70° endoscopes for endoscopic sinus surgery; therefore, we decided to apply this approach to ear surgery.

The use of 70° endoscopes facilitates the resection of cholesteatomas without necessitating the removal of extensive regions of the external ear canal, which facilitates reconstruction, since the areas requiring reconstruction are smaller. In our study using a 3D printer model, the amount of excision was 57%, and the size of the reconstructed graft was 32% when using a 70° endoscope compared with a case treated using a microscope, both of which were the smallest among their respective groups of endoscopes (Takahashi M, et al. J Int Adv Otol, in press). Moreover, recurrence was not observed in the 34 patients diagnosed with pars flaccida cholesteatoma who had undergone surgery using 70° endoscopes and were followed-up for >2 years (range: 24-48 months, mean: 36 months).

While not all surgeons can easily use 70° angled endoscopes, it is not difficult for those who are familiar with using such devices during endoscopic sinus surgery. This is because the approach to the maxillary sinus and the attic-antrum are very similar. Of course, taking care to not contact important structures when inserting the endoscope is necessary. However, the tip does not move because it is fixed on the opposite side of the target when using a 70° angled endoscope, implying that the target is mostly the attic or the antrum, and the 70° endoscope maintains contact with the anteroinferior wall of the external ear canal. Therefore, the use of a 70° endoscope entails a risk comparable to that associated with the use of other endoscopes (Takahashi M, et al. Eur Arch Otorhinolaryngol. 2021; 278:1283-1288.).

Herein, I present a surgical video to show the usefulness and precautions associated with a 70° endoscope.

Special Program 1 Endoscopic & Exoscopic Ear Surgery

SP01-5

Endoscopic Stapes Surgery

Il Joon Moon

Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Many surgical techniques have been performed in the treatment of patients with stapedia fixation including otosclerosis. Among these surgical techniques, stapedotomy was commonly used, and it has traditionally been performed with the use of a microscope. Recently, endoscopic ear surgery has become popular worldwide, and endoscopes have been used with increasing frequency in stapes surgery. Transcanal endoscopic approach can provide enhanced visualization of middle ear anatomy and fit the current concepts related to minimally invasive surgery. Based on previous reports, endoscopic stapes surgery has shown similar successful outcomes and complication rates compared with microscopic approaches. In this lecture, outcomes and importance of the learning curve regarding endoscopic stapes surgery in our institution will be discussed along with previously reported outcomes from other institutions. Endoscopic stapes surgery can be considered as a feasible modality for managing patients with stapedia fixation for surgeons who have appropriate surgical experience with endoscopic ear surgery.

SP01-6

Advantages of the ORBEYE surgical microscope system in otologic surgery

Yutaka Takumi, Hidekane Yoshimura, Jun Shinagawa

Department of Otorhinolaryngology - Head and Neck Surgery, Shinshu University School of Medicine, Matsumoto, Japan

Introduction

In recent years, endoscopic heads-up surgery has become widespread in otologic surgery, contributing not only to the reduction of surgeon fatigue, but also to the promotion of surgical guidance by sharing the field of view. In addition to these advantages, the ORBEYE surgical microscope system enables two-handed operation and sharing of 4K 3D high-resolution images, which is vastly different from conventional microscopes. Based on the experience of using it in our hospital, we discuss its advantages in otologic surgery.

Advantages of visual axis freedom and working space

In the case of tympanoplasty for middle ear cholesteatoma, which is one of the most extensive otologic surgeries, it is necessary to operate from various angles. Since the ORBEYE has a wide visual axis, it is possible to operate with a better view by moving the camera without rotating the patient's head or bed position. In addition, since the camera body is compact, instruments can be inserted into the surgical field in a relaxed posture, which reduces arm and shoulder fatigue.

Advantages in surgical guidance and student education

In microsurgery, the surgeon is in 3D view, but the sub-monitor is in 2D view, and it takes time to learn detailed surgical techniques due to the lack of stereoscopic effect. The ORBEYE system allows us to share the same high-resolution stereoscopic images on a 55-inch 3D main monitor, which makes it easier to provide surgical guidance and leads to efficient training of surgeons. In addition, by using the ORBEYE as an external camera, it is possible to seamlessly share the surgical field from the skin incision stage even in many clinical practice students.

Advantages of 4K 3D high-definition digital imaging

The ORBEYE provides a bright field of view with minimal shadowing due to the use of dual-axis LED illumination and a high-sensitivity CMOS sensor, enabling surgery with high-definition images necessary for otologic surgery. With a zoom range of up to 26x, it provides very clear images when observing the round window under high magnification before cochlear implantation. The image processing is compatible with a wide color gamut, resulting in vivid color tones. In addition, the 55-inch 3D monitor, which displays the 4K 3D image to the fullest, is placed in front of the surgeon to provide an immersive feeling like a movie theater, allowing for delicate operations with a wider field of view.

Special Program 2 Auditory Implants (CI & ABI)

SP02-1

Bilateral Cochlear Implantation in Chang-Gung Memorial Hospital, Taiwan- Report of 160 cases **Che-Ming Wu**

Department of Otolaryngology, Chang-Gung Memorial Hospital, Chang-Gung University, Taipei, Taiwan

Bilateral cochlear implantation is the current trend globally for the treatment of severe or very severe hearing loss in adults and children. Existing literature shows that audibility in a noise-filled environment, sound-source and high frequency signal identification in bilateral cochlear implant (CI) recipients are superior to those with only one implant. Due to the high costs of CIs and low number of cases, it was difficult to study the overall effects of bilateral cochlear implantation in Taiwan and other Mandarin-speaking areas in the past. As a result, there were only few reports on its outcomes in Mandarin-speaking CI users. Fortunately, from July 1, 2017, the government provided reimbursement for one CI for children under the age of 18 years. Clinical cases of bilateral implants are thus expected to increase significantly. From July 2017 to Dec 2021, 176 cases (84 male, 92 female, 8 adults, 168 children) receive bilateral sequential CI in our hospital. Between them, 160 patients have follow-up of over 2 years. The aim of this study is to report speech perception scores and satisfaction of 2nd implant use using subjective questionnaires in these 160 recipients. and explore factors (implant age, the inter-implant interval and CI use time) that may influence these outcome.

SP02-2

Tailoring the clinical decision for cochlear implantation in the post-genomic era

Chen-Chi Wu

Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan

Cochlear implantation is currently the treatment of choice for children with severe to profound sensorineural hearing impairment (SNHI). However, the outcomes with cochlear implants (CIs) vary significantly among recipients. Genetic diagnoses provide direct clues about the pathogenesis of SNHI, enabling personalized medicine in CI candidates.

In this talk, I will present our experience regarding how genetic information can help tailor the clinical decision for cochlear implantation. With confirmed genetic diagnoses, the clinicians will be able to: (1) delineate the natural course of SNHI and the time point for cochlear implantation; (2) predict the benefits of CI in patients with retrocochlear pathologies of genetic causes; and (3) select appropriate CI devices/electrodes for patients with specific genetic mutations.

Special Program 2 Auditory Implants (CI & ABI)

SP02-3

Monosyllabic recognition errors in children with hearing aids and children with cochlear implants

Shujiro Bando Minami^{1,2}, Yuri Nishiyama¹, Ryoko Ijuin³, Tomoko Kuroki³, Satoko Wakabayashi⁴, Kimitaka Kaga²

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[Objective]

To reframe the criteria for pediatric cochlear implants (CIs) in Japan, monosyllabic recognition errors at the time of school entry were compared in deaf or hard of hearing (D/HH) children with hearing aids (HAs) or CIs in early childhood.

[Method]

This study enrolled D/HH children who started auditory-verbal therapy at Fujimidai Auditory Center for Hearing-Impaired Children before age 1 year and who underwent auditory assessment during the previous year of schooling, at age 5 or 6 years, from 2010 to 2020. Children with inner ear malformations and mental retardation were excluded. The results of monosyllabic speech discrimination with amplification, in the 67-S speech audiometric test with a 70 dB HL sound field under quiet conditions using only acoustic input, were compared in children with HAs and CIs.

[Result]

The study included 43 children with bilateral HAs (HA group) and 46 with bimodal or bilateral CIs (CI group). The mean \pm SD rates of correct answers in monosyllabic perception were $77.9 \pm 16.0\%$ in the HA group and $80.5 \pm 12.2\%$ in the CI group, and the mean \pm SD rates of correct answers in vowel perception were $92.2\% \pm 14.1\%$ and $87.0 \pm 16.3\%$, respectively, with the rate of correct answers to [u] sounds being significantly lower than that to [a] sounds in both groups. The average correct answer rates to [h], [w], and [j] sounds in the HA group and to [dʒ], [w], and [j] sounds in the CI group were $\geq 90\%$ each, whereas the correct answer rates to [b] and [r] sounds in the HA group and [r] sounds in the CI group were $\leq 60\%$. The monosyllabic recognition errors [ni] \rightarrow [mi], [ne] \rightarrow [me], [ri] \rightarrow [ni], [ta] \rightarrow [a], [su] \rightarrow [ʃi], and [ʃi] \rightarrow [su] were observed in the HA group, and [mo] \rightarrow [wa], [ni] \rightarrow [mi], [ri] \rightarrow [ni], [to] \rightarrow [ko], [su] \rightarrow [ʃi], [ʃi] \rightarrow [su], and [mo] \rightarrow [wo] were observed in the CI group.

[Discussion]

This study showed that children with HAs and CIs respond similarly to some monosyllabic sounds but differently to others. Recognition errors may be caused by difficulties identifying similar articulation styles, articulation positions, and formant transition.

SP02-4

How do we select the proper array length for patients with high-frequency hearing loss?

Hidekane Yoshimura

Shinshu University, Matsumoto, Japan

Electric-acoustic stimulation (EAS) has emerged as a standard treatment for patients with high-frequency hearing loss. EAS is usually performed with short electrodes of 16-24 mm in length. However, most EAS recipients may gradually lose residual acoustic hearing in the implanted ear over time. In these cases, EAS eventually needs to be converted to pure ES via cochlear implants (CIs), thus increasing the disadvantages for patients treated with short electrodes if residual hearing is lost or if it is unsuitable for EAS. To avoid this dilemma, EAS using longer electrodes, without causing significant intra-cochlear damage would be ideal.

We have previously reported that hearing preservation (HP) is independent of the length of the inserted cochlear implant (MED-EL FLEXsoft [31.5 mm] vs. FLEX28 [28 mm] vs. FLEX24 [24 mm]) (Yoshimura et al., 2020a). We have also documented that in cases meeting the EAS criteria with longer electrodes, residual hearing can be preserved in all patients (Yoshimura et al., 2020b). EAS with longer electrodes can offer broader cochlear coverage, resulting in natural frequency matching compared with shorter electrodes. Therefore, reliable HP after deep insertion of longer electrodes could extend the indications for CI to cases with less severe deafness and more residual hearing, as in EAS cases.

We previously reported that genetic testing could provide the etiology of hearing loss as well as further information regarding the state of residual hearing (Usami et al., 2012). For example, most patients with *CDH23* mutations initially present with high-frequency hearing loss. Subsequently, their residual hearing at low frequencies deteriorates gradually over time, suggesting that the clinician should provide longer electrodes for broader coverage of the frequency range. Additionally, even when the causative gene of hearing loss is not identified, ongoing low-frequency hearing loss is sometimes observed in the implanted ear or in both ears, indicating that longer electrodes should be selected. Taken together, the clinician should select the proper array length for each individual according to the "future" (not current) status of residual acoustic hearing based on the etiology and/or the natural course of hearing loss to allow EAS users to optimize mapping toward more natural hearing.

Special Program 2 Auditory Implants (CI & ABI)**SP02-5****Residual Hearing Preservation for Cochlear Implantation Surgery****Hungpin Wu^{1,2}***¹Department of Otolaryngology, Taichung Tzuchi Hospital, Taichung, Taiwan, ²School of Medicine, Tzuchi University, Hualien, Taiwan*

Cochlear implantation (CI) has developed for more than 4 decades. Initially, CI was used for profound bilateral hearing impairment. However, the indications for CI have expanded in recent years to include children with symptomatic partial deafness. Therefore, how to preserve residual hearing is important for both patients and otologists.

The loss of residual low-frequency hearing is thought to be the result of many factors. All surgical methods have the same goal: protect the intracochlear structures and preserve residual low-frequency hearing to improve speech perception. Fully opening the round window membrane, a straight electrode array, slower insertion speed, and the use of corticosteroids result in a higher rate of hearing preservation. However, there were no differences in hearing preservation between cochleostomy or round window approaches, standard or shorter length arrays, and early or conventional activation schedules after CI. Therefore, the classic atraumatic technique, including very slow and delicate insertion and administering intraoperative corticosteroids, can improve hearing outcomes. We are going to introduce our efforts on this issue.

SP02-6**Auditory Brainstem Implant in Non-tumor patients. Who is the ideal candidates?****Jae Young Choi***Yonsei University, Seoul, Korea*

In the early 2000s, Colletti et al. reported that non-tumor patients with sensorineural hearing loss, including cochlear nerve aplasia or ossified cochlea, showed better outcome than NF-2 patients after ABI and claimed to extend the indication of ABI including them. We performed ABI in 18 cases with hearing loss (14 pre-lingual deaf: 4 post-lingual deaf) due to non-tumorigenic origin and we herein described our experiences. We operated via the suboccipital approach with Pulsar ci100 ABI (Med-El Co., Innsbruck, Austria). Intra-operative electrical auditory brainstem response (EABR) and post-operative computerized tomography (CT) were performed to confirm correct electrode site. All the patients with narrow IAC who received ABI improved their auditory performance except one case of non-user. Two of three patients with ossified cochlea, except one with long deaf period, improved their auditory performance. ABI will be an alternative option for non-tumor patients with severe-profound hearing loss who failed with CI or was contraindicated for CI.

Special Program 3 Cholesteatoma

SP03-1

Treatment strategies for middle ear cholesteatoma based on a nationwide survey

Manabu Komori

St. Marianna University School of Medicine, Kawasaki, Japan

The Japan Otological Society (JOS) conducted a nationwide survey of middle ear cholesteatoma surgery that underwent initial surgery in the year starting January 2015. A total of 1,787 cases were enrolled from 74 institutions nationwide. 1,133 cases were of the flaccid type, 233 cases were of the tense type, 100 cases were secondary, 231 cases were congenital, and 90 cases were unclassifiable.

In 2018, a total of 1,456 patients from 49 institutions nationwide were surveyed for follow-up, and 1,060 patients were investigated for hearing prognosis and 1,084 patients for recurrence prognosis. The results showed that the hearing improvement rate was 63.3%, and recurrence was observed in 152 cases (14.0%). This rate was slightly higher due to the inclusion of residual at the time of planned operation, and there was no difference in the final recurrence rate after planned operation. For that reason, there was no difference in the final recurrence rate between canal wall up surgery and canal wall down then reconstruction surgery.

In addition, in 2020, JOS described a more detailed description of the optional techniques in tympanoplasty. The extent to which optional procedures are performed for each condition and surgery is also becoming clearer.

Finally, I will discuss our approach to surgical selection. Based on the results of a nationwide survey, I have adopted a basic strategy of tympanoplasty that preserves the posterior wall of the external auditory canal, depending on the degree of progression.

Based on the results of the nationwide study, I will discuss the standard technique according to the degree of progression and the optional procedures that should be performed. In addition, I will discuss issues that need to be considered in the future and the prospects for middle ear cholesteatoma treatment in the near future.

SP03-2 **Withdraw**

Mastoid obliteration and canal wall reconstruction with perichondrium-preserved conchal cartilage

Tzong-Yang Tu

Taipei Veterans General Hospital, Taipei, Taiwan

Canal-wall-down mastoidectomy may eradicate cholesteatoma with a relatively low recurrence rate. There are many materials advocated to treat the resulting open mastoid to avoid formation of a trouble cavity. Among them, conchal cartilage is commonly adopted to obliterate the mastoid cavity because of its autologous origin and easy accessibility. The author uses a perichondrium-preserved conchal cartilage composite graft to obliterate the mastoid cavity with the hypothetical advantages of rapid establishment of circulation through revascularized perichondrium, well-nourished cartilage in turn facilitates fast epithelialization and minimizes the chance of infection. The small size of the cartilage pieces (1 mm³) also provides good plasticity to fill all corners of mastoid of any shape to prevent formation of dead space that might host infection.

The rabbit model showed the perichondrium-preserved cartilage obliteration reaped the benefits of a higher rate of blood vessels formation, better survival of chondrocytes and evident new cartilage generation in the composite graft one month after surgery. Maturation of newly generated cartilage to lamellar bone was seen through endochondral ossification and bone remodeling 2-4 month later. Long-term histologic observation exhibited a space-occupying mass effect and an osteogenesis effect 2 years after operation in the graft of the experimental animals. This mass effect prevents necrosis, pocket or dead space formation and the osteogenesis effect generates cancellous bone and bone marrow in the perichondrium-cartilage composite graft to maintain the viability with a normal turnover of osteochondral tissue. These findings provide the scientific supports of the patients' results.

Clinically, 102 patients with a mean 9 years follow-up period showed no obvious atrophy, necrosis or pocket formation of perichondrium-cartilage graft in the mastoid cavities. Mild unsatisfactory results, including partial resorption of the cartilage in 5 ears and incomplete epithelialization in 7 ears, were observed during the follow-up periods. Logistic regression analysis revealed a poor pre-op middle ear condition and previous surgery were significant predictors of these unsatisfactory results. Thus, a fast and complete epithelialization on the surface of obliterated mastoid cavity and the reconstructed posterior canal wall greatly decreased the possibility of trouble cavity formation.

Special Program 3 Cholesteatoma

SP03-3

The management of congenital cholesteatomaJiunn-Liang Wu¹, Tsun-Chih Cheng²¹Department of Otolaryngology, Head and Neck Surgery, National Cheng Kung University Hospital, Tainan, Taiwan, ²Department of Otolaryngology, An Nan Hospital, China Medical University, Tainan, Taiwan

Congenital cholesteatoma is defined as a whitish mass behind an intact eardrum. Increasing in diagnosis of congenital cholesteatoma is observed in recent years due to growing awareness by health professionals and improving diagnostic modalities. Previous studies have discovered that pediatric congenital cholesteatoma is more aggressive and more prone to recurrence than adult cholesteatoma. Besides, the Potts stage of the disease is one of the crucial risk factors concerning disease recurrence. Combining endoscopic approach during surgery is recommended to enhance visualization of areas that are more challenging to visualize using a microscopic approach only. However, there is still no consensus on the management of postoperative follow-up. Although, high-resolution Computed Tomography (CT) and diffusion-weighted sequence Magnetic Resonance Imaging (MRI) have been introduced in cholesteatoma assessment, the image resolution threshold may hinder the early detection of small residual cholesteatoma.

To avoid delayed diagnosis of residual lesions, we performed planned second surgery for cases in advanced stages or with open type cholesteatoma. We experienced 24 congenital cholesteatoma from Oct. 2007 to Jan. 2022. Six patients had stage I/II and closed type cholesteatoma underwent en bloc resection in one stage surgery. For the other 18 cases with stage III/IV or failed to remove keratin lesions as a whole, planned second surgery was performed 6 to 10 months after the primary surgery. Eight out of the 18 patients (44.4%) were found with residual lesions during the second surgery. Of those residual lesions, 4 keratin pearls were less than 5 mm in diameter, and the tiniest lesion was only 1 mm. In our study, no disease recurrence was found by now.

The study we present is an attempt to highlight the importance of planned second surgery in advanced congenital cholesteatoma for correct detection of residual lesions. By adopting the treatment policy, the result has been very positive with relatively low recurrence.

SP03-4

Amplicon sequence variant (ASV) -level 16S rRNA gene sequencing for cholesteatoma microbiome analysisTaro Fujikawa¹, Kousuke Tanimoto², Yoshiyuki Kawashima¹, Taku Ito¹, Keiji Honda¹, Takamori Takeda¹, Takeshi Tsutsumi¹¹Department of Otolaryngology, Tokyo Medical and Dental University, Tokyo, Japan, ²Genome Laboratory of Medical Research Institute, Tokyo Medical and Dental University, Tokyo, Japan

Objective/Hypothesis: Commensal bacteria colonizing the external auditory canal (EAC) may form pathogenic biofilms in cholesteatoma and chronic suppurative otitis media (COM), causing infection recurrence and tissue destruction. The aim of this study was to compare the microbiota between cholesteatoma and COM and identify biomarkers to explain the relevant phenotypes of cholesteatoma.

Methods: The amplicon sequence variants (ASV) -level 16S rRNA gene sequencing analysis was performed for 20 cholesteatomas and 9 COMs using surgical specimens in which biofilm was rigorously dissolved using combined methods of chemical and mechanical lysis.

Results: The alpha diversity was not different between cholesteatoma and COM, and the bacterial compositions were similar to those of the EAC flora at the phylum level. On the other hand, the beta diversity was significantly different between cholesteatoma and COM ($P = 0.002$), and the mean relative abundance of the genus *Staphylococcus* was significantly higher in cholesteatoma than COM (58.8% and 17.3%, respectively; $P = 0.005$). At the species level, coagulate-negative staphylococci (CoNS) were significantly more abundant in cholesteatoma ($P = 0.002$), while the abundance of *Staphylococcus aureus* (*S. aureus*) was increased in both cholesteatoma and COM (10% and 9.9%, respectively). Linear discriminant analysis coupled with effect size measurements (LEfSe) identified *S. caprae*, *S. capitis*, *S. pettenkoferi*, and *S. lugdunensis* as potential biomarkers for cholesteatoma. In contrast, common bacteria of acute otitis media such as *Haemophilus*, *Moraxella*, *Streptococcus*, *Alloiooccus* and *Turicella* were extremely rare in both diseases. Among the potential pathogens, the relative abundance of *S. aureus* showed a positive correlation with the volume of cholesteatoma of the primary resection ($R = 0.60$, $P = 0.02$).

Conclusion: The microbiota of cholesteatoma and COM was significantly different at the genus and species level, while the bacterial compositions indicated the translocation of EAC bacteria as the origin of pathogens. Altered microbiota of cholesteatoma suggests the involvement of *Staphylococcus* infections in the aggressiveness of cholesteatoma. Our results may provide an insight into the pathophysiology and development of therapeutic strategies for cholesteatoma.

Epigenetic regulation as a new target for middle ear cholesteatoma therapy

Tomomi Yamamoto-Fukuda

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Distinct histone modifications regulate gene expression without changing the DNA sequence in certain diseases, but little is known about it in middle ear cholesteatoma. It is known that histone acetylation destabilizes the nucleosome and chromatin structure and induces gene activation. The association of histone acetylation with chronic inflammatory diseases has been indicated in recent studies. And the histone H3 trimethylation at lysine4 (H3K4me3) has been reported to regulate stem cell self-renewal and differentiation and the frequent mutation of H3K4me3 promotes developmental disease and tumor initiation. Menin is a highly specific binding partner of mixed-lineage leukemia 1 (MLL1), a histone methyltransferase that catalyzes H3K4me3 and is required for the recruitment of the MLL1 complex to the target genes. In this study, we first correlated the expression level of histone modification in paraffin-embedded sections of human middle ear cholesteatoma tissues and the temporal bones of an animal model of cholesteatoma immunohistochemically. As a result, we found that there was a significant increase of the expression levels of H3K27ac and H3K4me3 both in human cholesteatoma tissues and the animal model. And then, after cholesteatoma was induced in the mouse model, menin-MLL inhibitor, MI503, was administered daily into the ear. The use of MI503 decreased the expression level of H3K27ac and H3K4me3, as result, reduced cholesteatoma in the in vivo model and decreased the proliferation of epithelial stem/progenitor cells in a dose-dependent manner. We demonstrated that inhibition of the menin-MLL interaction may be a potentially useful strategy in the conservative treatment of cholesteatoma.

Special Program 4 Auditory Implants (Baha & VSB)**SP04-1****Long-Term Outcomes of BAHA: A 20-Year Experience in Tokyo Medical and Dental University**

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Introduction: Several studies on long-term outcomes of bone-anchored hearing aid (BAHA) have been reported from Europe and the United States, while few such studies have been reported from Asian countries. The ethnic disparity in skin complications of BAHA was reported, while the long-term skin-complication rate in Japanese patients remains to be clarified. In Japan, 20 years have passed since the first BAHA was implanted in 2001 in Tokyo Medical and Dental University Hospital. This study aims to describe the long-term outcomes of BAHA in Japanese implantees.

Materials and Methods: Patients implanted with BAHA(s) in Tokyo Medical and Dental University Hospital between September 2001 and December 2014 were included in this study. Medical records of the patients were retrospectively reviewed on surgical techniques, adverse skin reaction of Holgers' grade 2 or more, and implant loss.

Results: Thirty implantations in 28 patients (17 males and 11 females) were performed during the period. The mean age at implantation was 39.1 ± 17.9 years (ranging from 18 to 78 years). The implantation surgeries were carried out with a classic manual procedure from 2001 to 2004 ($n = 9$), dermatome technique using FAST system from 2004 to 2011 ($n = 14$), or linear incision from 2012 to 2014 ($n = 7$). The mean follow-up period was 10.3 ± 5.9 years.

Overall, 3 implants were spontaneously lost at 3 months, 4 years, or 9 years after implantation. Supposing that every patient who lost their implant contacted or returned to the hospital, the incidence of implant loss within 5 years after implantation was calculated to be 6.7% (2/30), while that within 10 years was 13.0% (3/23). The incidence of adverse skin reaction in the first year was 53.3% and decreased over time: 36.7% from 2 to 3 years, 26.3% from 4 to 5 years, and 10.5% from 6 to 10 years. Regarding the surgical procedure, the incidence of adverse skin reaction during the first 5 years after implantation is significantly lower in cases with the dermatome technique using the FAST system (31.0%) and linear incision (29.6%) compared to the classic manual procedure (66.7%).

Conclusion: The incidence of implant loss within 5 years was 6.7%, while no implant loss has been observed later than 10 years after surgery. Although the incidence of adverse skin reaction in the first year after implantation (53.3%) was much higher than the reported incidence of 16.1-38.1%, the incidence decreased over time.

SP04-2**Comparison of audiological outcome and compliance of bone conduction hearing implants in SSD**

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Single sided deafness (SSD), defined as a condition where a patient has non-amplifiable hearing in one ear, with the contralateral ear possessing normal audiometric function. Patients with SSD differ from patients with bilateral hearing loss in that a patient with SSD hears normally in a quiet environment with a limited number of speakers. But hearing becomes difficult in noisy environment and the directionality, and the head shadow effect, have variable effects depending on the acoustic environment. The hearing difficulty perceived by SSD patients differ from person to person, and the need for intervention depends on the individual's daily sound environments. Therefore a shared decision-making approach is needed to find the best mode of rehabilitation for each patient.

Several options, both implantable and wearable, are available: CROS aids, wearable and implantable bone conduction devices and cochlear implants. There is also the option of doing nothing and living with unilateral hearing. These options are not equivalents and they provide different kinds of benefit. To find the best device for a patient, we need comparison studies among devices. This talk will focus particularly on bone conduction devices.

Functional gain of BAHA connect or the BAHA attract with the Baha5 Superpower and OSIA, which the maximum power output (MPO) is higher than other devices, tops those of other devices. Bonebridge and Baha attract/Baha5 show middle tier functional gain. In contrast, Baha attract with BP110 and Sophono gave the poorest functional gain. The effective gain showed similar tendency. Each device shows different functional gain in SSD patients which correlates with the specified MPO of each device.

We compared the effective gain and functional gain between the constant user and nonuser group. We defined the user group as those who wear their device regularly for more than 2 hours per day. Irrespective of the type of device, effective gain and functional gain tended to be higher in the user group compared with the non-user group. Difference of functional gain between two groups was significant at 3 kHz.

Higher power output devices lead to higher effective and functional gain allowing the elimination of acoustic head shadow. Rigorous fitting focusing on the 3kHz gain may be mandated for higher daily use rate.

Special Program 4 Auditory Implants (Baha & VSB)

SP04-3

BAHA Surgery: prevention for skin overgrowth and troubleshooting

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The BAHA (bone-anchored hearing aid) is a bone conduction hearing aid with percutaneous transmission of sound vibrations to the skull. Since it was introduced in 1981, there have been significant advancements in both technology and surgical technique. Overall, BAHA surgery is safe with relatively infrequent complications. However, insertion of the percutaneous implant may sometimes give rise to adverse skin reactions which is the main complication. Poor outcomes have decreased over the years through advances in implant technology and surgical technique. Most complications can be managed in the office with topical therapy, although revision surgery may be required in extensive skin overgrowth cases. In this session, we will present our experience with BAHA implantations.

A retrospective review of all patients referred to the Miyazaki University Hospital who underwent BAHA surgery between 2007 and 2020 was carried out. In total, surgical and follow-up data were collected who had been using their BAHA for more than 6 months. The presence of localized skin reaction was evaluated using Holger's classification system for soft tissue reaction around an implant site. Holger's grade of 2 or higher was considered to be an abnormal inflammatory localized tissue reaction.

A total of 50 implants were placed in 50 patients (25 male and 25 female) with a mean age of 59 years (range, 14-87 years; SD, 17). The mean follow-up period was 78 months (range, 6-174 months; SD, 60). In 41 (82%) of the patients had a Holger's score less than or equal to 1. The incidence of adverse skin reactions was identified in nine (18%) out of 50 patients. Of the nine patients, revision surgery underwent in five patients (10%) caused by skin overgrowth. Revision surgery underwent removal of subcutaneous tissue and thinning the skin flap in two patients. A longer abutment was used in three revisions when the inciting factor for skin overgrowth was thought to be a mismatch between the scalp thickness and length of the abutment. No intraoperative complications, skin dehiscence, retroauricular pain, and implant loss were reported.

The most common severe postoperative complication is skin overgrowing the abutment. This can be successfully managed with revision surgery. In addition to the outcomes of postoperative complications of BAHA, we will present some tips in BAHA surgery to prevent skin overgrowth and troubleshooting for skin overgrowth.

SP04-4

BONEBRIDGE implantation in microtia patient in Taiwan

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BONEBRIDGE (BB) is active bone conduction implant that is placed fully under the skin and can be used for patients aged 5 years or above with conductive/ mixed hearing loss or single-side deafness. BB has been proved to provide optimal functional gain when compared with conventional bone conductive hearing aids. In Taiwan, the majority BB cases are children & adolescent with uni-/bilateral microtia. Most of these cases already have had auricular reconstruction or plan to do it in the future and ENT surgeons may encounter difficulties in BB surgeries because of stiffness of auricle and constriction scar. The aim of this study is to share our experience in performing BB in microtia patients pre/post-reconstruction surgery. All patients had full-set audiological testing, HRCT of temporal bone and experienced BCHAs for at least one week prior to surgery. Three-dimensional preoperative surgical planning was used in cases with small mastoids. Incision location was adjusted by anatomical structure and should avoid previous surgical scar. Reconstructed Auricles are gently covered/protected, granulation and scar tissue should be incised properly to optimize surgical field. Post-op compression by gauze is necessary. Patients start to wear the device 2-3 weeks later and are followed regularly after the surgery.

We enrolled all BB cases aged from 5 years to 17 years operated by our team. Two of them have mixed hearing loss and the rest have microtia. BCI lifts were applied in six patients and mini-plate was used in one patient. No patient presented post-operative bleeding or other major complications but some of cases experienced some wound oozing post-operative and resolved by properly compression and wound care. Average functional gain is 43.6 dB post-operatively. Compared to BCHAs, BB provide 10 -15 dB more in low and high frequencies. Patients has poor subjective and objective benefits from BCHAs has low satisfactory rate when using BB.

Patients' experience of BCHAs pre-operative is highly related to post-operative outcome and satisfaction. This feedback is crucial in consulting before surgical intervention. For congenital atresia or microtia patients, BB provides a safe surgical approach, satisfied hearing improvement and has the advantage of preserving the intact skin. Surgical incision and BCI location should be modified individually based on patients' anatomical structure and auricular reconstruction surgery history.

Special Program 4 Auditory Implants (Baha & VSB)

SP04-5

Bonebridge Implantation with Auricular Reconstruction for Microtia PatientsKai-Chieh Chan¹, Zung-Chung Chen²¹Division of Otolaryngology, Department of Otolaryngology & Head and Neck Surgery, Chang Gung Memorial Hospital, Linkou, Taiwan,²Craniofacial Center of Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan

Background: The aim of this study was to evaluate the audiological and clinical results of simultaneous Bonebridge (BB) implantation and auricular reconstruction (AR) for microtia patients with aural atresia.

Methods: Forty-one microtia patients with unilateral BB implantation were enrolled in this retrospective study. Twenty (48.7%) patients underwent BB implant alone; 21 (51.3%) subjects received combined BB implantation with AR. Of them, 13 (31.7%) underwent simultaneous BB implant and AR with Medpor at one stage; 8 (19.6%) underwent simultaneous BB implant and AR with autologous costal cartilage (ACC) during the second stage. The post-op audiological performance and complication rate were analyzed. Auditory aided and unaided sound fields were evaluated using (1) a pure-tone average (PTA4), (2) a speech reception threshold (SRT), and (3) a Speech Discrimination Score (SDS) at a sound level of 65 dB SPL.

Results: There were total 28 males (68.2%) and 13 females (31.8%) with an average age of 18.6 ± 11.7 years in this study. The average duration of postoperative follow-up was 15.4 ± 12.6 months. The average unaided and aided BB SF audiometry thresholds were 63.1 ± 5.7 and 29.4 ± 9.5 dB, respectively, and the average functional gain was 33.7 ± 10.6 dB. SRT improved from unaided 63.4 ± 13.1 to 30.6 ± 10.6 dB under aided condition, with an average SRT improvement of 32.8 ± 14.2 dB. The average un-aided SDS at 65 dB SPL was $51.5 \pm 19.7\%$, and aided with a BB implant was $69.1 \pm 18.1\%$, representing an average SDS improvement of $17.6 \pm 19.1\%$. There was no difference on functional gain, improvement of SRT or SDS between sole BB implantation group and BB combined with AR group ($p > 0.05$). No major AR complications were noted. However, patients undergoing combined surgery are more prone to develop post-op postauricular skin complications with hematoma/seroma ($p < 0.05$).

Conclusion: In microtia patients with aural atresia, BB implantation alone or with AR is equally feasible and effective for hearing rehabilitation. The decision on hearing restoration and AR can be tailor-made according to individual needs. There is no difference on audiological performance in both groups. However, skin issue related to the combined surgery may result in delay activation of sound processor.

Special Program 5 Vestibular Disease

SP05-1

Effect of intratympanic dexamethasone combination with gentamicin in Meniere's disease

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Chemical labyrinthectomy using gentamicin is a popular method for treating intractable vertigo attacks in Meniere's disease. However, the risk of hearing loss remains a major concern for clinicians. We investigated the effect of simultaneous dexamethasone and gentamicin application on hearing preservation and vertigo control in patients with intractable Meniere's disease. A single-institutional, prospective, single-blinded, randomized clinical trial was conducted. Gentamicin-soaked Gelfoam® was directly applied on the oval window following middle ear exploration. On the round window, dexamethasone-soaked Gelfoam® was applied in the gentamicin with dexamethasone group (GD group, N = 18), and saline-soaked Gelfoam® was applied in the gentamicin with sham reagent group (GO group, N = 19). The hearing change 8 weeks after the procedure and vertigo control 2-12 months after the procedure were investigated. The high-frequency hearing threshold was significantly increased in the GO group ($p = 0.005$ and 0.012 for 4 and 8 kHz, respectively), but not in the GD group. The short-term (2-6 months) vertigo control was more successful in the GD group (57.89% vs. 94.44%, $p = 0.019$), but long-term control was insignificant (6-12 months). In conclusion, the combined application of gentamicin and dexamethasone in chemical labyrinthectomy is an effective method for protecting high-frequency hearing and vertigo control.

SP05-2

Vestibular rehabilitation for prolonged dizziness of BPPV and Meniere's disease

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Objective: The aim of the present study was to evaluate the association of neuro-otological examination, blood tests, and scoring questionnaire data with treatment-resistant intractability of persistent dizziness in BPPV and MD.

Methods: We managed 1,520 successive vertigo/dizziness patients at the Vertigo/Dizziness Center in Nara Medical University from May 2014 to April 2018. 611 patients were diagnosed as BPPV (611/1520; 40.2%) and 522 patients were diagnosed with MD (522/1520; 34.3%) according to the 2015 diagnostic guideline of ICVD. 66 of 611 in unilateral BPPV and 60 of 522 in unilateral MD were intractable unremitting floating sensation and enrolled for hospitalization to undergo neuro-otological examinations including pure-tone audiometry (PTA), the caloric test (C-test), vestibular evoked cervical myogenic potentials (cVEMP), subjective visual vertical (SVV) test, glycerol test (G-test), electrocochleogram (ECoG), inner ear magnetic resonance imaging (ieMRI), blood tests including anti-diuretic hormone (ADH) and bone alkaline phosphatase (BAP), and self-rating questionnaires of depression score (SDS). Data are presented as positive (+) ratios of the number of patients with examination and questionnaire data outside of the normal range.

Results: In BPPV, the ratio (+) data were as follows: C-test=21.2% (14/66), cVEMP=24.2% (16/66), SVV=48.5% (32/66), G-test=18.2% (12/66), ECoG=18.2% (12/66), ieMRI=12.1% (8/66), ADH=9.1% (6/66), BAP=13.6% (9/66), and SDS=37.9% (25/66). In MD, the ratio (+) data were as follows: C-test=33.3% (20/60), cVEMP=25.0% (15/60), SVV=50.0% (30/60), G-test=55.0% (33/60), ECoG=63.3% (38/60), ieMRI=86.7% (52/60), ADH=35.0% (21/60), BAP=11.7% (7/60), and SDS=40.0% (24/60). Multivariate regression analysis revealed that the periods of persistent dizziness were significantly longer in BPPV with C-test (+), endolymphatic hydrops (+), and BAP (+) and in MD with C-test (+), SVV (+), and SDS (+).

Conclusions: Although most of patients with BPPV and MD are usually treatable through the appropriate conservative medical therapy, the presence of such factors mentioned above may make the persistent dizziness intractable and may thus require additional treatments.

Special Program 5 Vestibular Disease**SP05-3****Characteristics of vestibular symptoms of perilymphatic fistula cases****Han Matsuda***Saitama Medical University, Saitama, Japan*

Perilymphatic fistula (PLF) was first recognized in the early days of stapedectomy, when balance problems resulting from unsuccessful sealing was documented. It then became apparent that head trauma and barotrauma following external events such as flying or diving could cause PLF. There were descriptions of internal precipitating events such as sneezing, coughing, or "idiopathic PLF" with no trauma history. However, it is an entity disbelieved by many, especially in some countries where residents are still taught it does not exist. One of the issues of the controversy surrounding the existence of PLF is based on terminology. PLF is defined as an abnormal communication between the fluid-filled space of the inner ear and the air-filled space of the middle ear and mastoid, or cranial spaces. Therefore, "Otic capsule dehiscence" is, by definition, one type of PLF. On the other hand, the Japanese PLF study group focused on the perilymph leakage. Because there were no proper biomarkers to detect perilymph leakage, the conventional gold standard for PLF detection was the intraoperative visualization of the fistula. Based on proteomic analysis, we have identified an isoform of Cochlin, Cochlin-tomoprotein (CTP), as a perilymph-specific protein that is not expressed in the blood, CSF or saliva. The detection of CTP in the middle ear is indicative of the presence of a PLF and perilymph leakage. We started testing samples by western-blot, and have tested samples from 170 hospitals by ELISA. Finally, last June, the Japanese FDA approved the test.

We recently published a case of PLF in the *Frontiers in neurology*. The patient blew her nose, and it created a rapid increase in the body pressure. This ended up rupturing of the membranous stapes structure, which caused pneumolabyrinth, severe vertigo and mixed hearing loss, and CTP test was positive. Fifteen years before the onset of her hearing loss, she felt true rotational vertigo for 3-4 seconds, when she blew her nose. This indicates that the presence of a fistula is the cause of vertigo. On the other hand, to my understanding, the rapid changes of the pressure and rapid leakage are the keys in damaging the membranous labyrinthine structure. CTP test may reveal the difference between fistula-induced symptoms and leakage-induced symptoms.

This presentation will show data about CTP positive cases' clinical characteristics, focusing on the difference between fistula and leakage.

SP05-4**Niigata PPPD Questionnaire as a screening tool of Persistent Postural- Perceptual Dizziness (PPPD)****Arata Horii***Niigata University, Niigata, Japan*

Persistent Postural- Perceptual Dizziness (PPPD)¹⁾ is a chronic vestibular syndrome characterized by vestibular symptoms lasting >3 months, which is typically preceded by acute vestibular disorders. The core vestibular symptoms of PPPD are dizziness, unsteadiness, or non-spinning vertigo, which are exacerbated by upright posture/walking, active or passive motion, and exposure to moving or complex visual stimuli. Recent reports demonstrated that PPPD is not rare but present in approximately 20% of all dizzy patients in neurologic practice²⁾. Diagnostic criteria of PPPD consists of symptomatic items without test items for vestibular function, implicating that precise investigations of history and symptoms are important for diagnosing PPPD. For this purpose, Niigata PPPD Questionnaire (NPQ) has been proposed³⁾. The NPQ consists of four questions each for three exacerbating factors. Reliability and validity were statistically verified and its capability as a diagnosing tool of PPPD was demonstrated by high area under the curve (AUC) of the receiver operating characteristic (ROC) curve (=0.83). Visual stimulation score of 9 (full score=24) had sensitivity of 82% and specificity of 74 % for diagnosing PPPD.

We utilized the scores of NPQ to investigate possible subtypes of PPPD⁴⁾. A factor analysis of the patients' answers to the NPQ revealed three underlying factors among the exacerbating factors in the NPQ that were different those categorized in the diagnostic criteria: visual factor, walking/active motion factor, and passive motion/standing factor. Subsequent cluster analysis using these factors revealed three clusters: the visual-dominant subtype (45%) ; the active motion-dominant subtype (19%) ; and the mixed subtype (36%). The patients in the active motion-dominant subtype were significantly older than those in the visual-dominant subtype. However, multiple comparison analyses performed on precipitating diseases, the Dizziness Handicap Inventory, the Hospital Anxiety and Depression Scale, and several vestibular tests failed to point the characteristics of each subtype. In the future, PPPD patients maybe treated by tailor-made strategies according to the subtype.

1) Staab JP, Eckhardt-Henn A, Horii A, et al. *J Vest Res* 27: 191-208, 2017

2) Kim HJ, Lee JO, Choi JY, et al. *J Neurol* 267: 2252-59, 2020

3) Yagi C, Morita Y, Kitazawa M et al. *Otol Neurotol* 40: e747-e752, 2019

4) Yagi C, Morita Y, Kitazawa M et al. *Front Neurol* 12: 652366, 2021

Special Program 6 Basic Research

SP06-1

Drug discovery and development using hiPSC-based technology

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Hearing loss is one of the most common sensory impairments. Pendred syndrome/DFNB 4 (PDS) is a disorder with fluctuating and progressive hearing loss, vertigo, and thyroid goiter and the mutations in *SLC26A4* gene are typically identified. We found pathophysiology of a neurodegenerative disorder phenotype in PDS patient derived cochlear cells that were induced via induced pluripotent stem cells (iPSCs) and found sirolimus, an mTOR inhibitor, as an inhibitor of cell death with the minimum effective concentration less than 1/10 of the approved dose for other diseases. Given that there is no rational standard therapy for PDS, we planned a study to examine effects of low dose oral administration of sirolimus for the fluctuating and progressive hearing loss, and the balance disorder of PDS by daily monitor of their audio-vestibular symptoms. This double-blind, placebo-controlled trial was carried out with 16 of outpatients with fluctuating hearing diagnosed as PDS in *SLC26A4*. genetic testing aged in between 7 and 50 years old at the time of consent and given either placebo or sirolimus tablet (NPC-12T). In NPC-12T placebo arm, placebo will be given for 36 weeks; In active substance arm, placebo will be given for 12 weeks and the NPC-12T for 24 weeks.

SP06-2

Trials to increase drug delivery to the inner ear

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The application of steroids for the treatment of hearing loss, including cochlear implant surgery and sudden hearing loss, is very diverse. The authors observed the expression of glucocorticoid receptor in the cochlea and conducted animal experiments in which dexamethasone, a representative steroid, was administered in various ways. In this presentation, we would like to talk about some strategies and attempts to increase the steroid concentration in the cochlea. Representatively, we compared the effects of systemic and local administration in experimental animals, and we would like to talk about attempts to control the round window membrane and attempts using new drug formulations.

Special Program 6 Basic Research**SP06-3****Optical Coherence Tomography for Mouse Cochlear Imaging and its Potential Clinical Application****Hsin-Chien Chen***Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan*

For patients with severe to profound sensorineural hearing loss, performing cochlear implantation (CI) might promise to restore the hearing functions. Currently, this surgery mainly relies on the hand lens or surgical microscope, where the success rate and surgery time depend on the surgeon's experience. Thus, having a guidance tool allowing real-time, volumetric imaging of the cochlea structure might facilitate the implantation surgery. Optical coherence tomography (OCT) can meet the desired characteristics as a noninvasive imaging guidance tool with sufficient temporal and spatial resolutions than computed tomography or magnetic resonance imaging but not requiring exogenous contrast agents.

In this study, we first investigated the optical characteristics of the cochlea using two separate OCT systems operating at 1.06- μm and 1.31- μm wavelength regimes. Based on the quantitative analysis performed, we found that 1.06- μm OCT imaging exhibited better imaging contrast between the cochlear conduits and surrounding bony cochlea wall using ex vivo mouse cochlear samples. Although 1.31- μm OCT provides images with a deeper imaging depth when compared to 1.06- μm OCT, we believe the imaging contrast might play a better role in the development of a guidance tool for CI surgery. In order to investigate this hypothesis, we also have investigated the feasibility of identifying the electrode of CI within the ex vivo cochlear sample with the 1.06- μm OCT imaging.

Leveraging the preliminary results aforementioned, we have first designed a compact and lightweight imaging probe supporting volumetric OCT imaging of the cochlea of the inner ear. When compared to a side-viewing design, a forward imaging probe design might provide better ergonomics to perform OCT imaging during the surgery. Furthermore, this probe can be used for other otorhinolaryngology applications, such as imaging the middle ear or tympanic membrane, where the current assessment mainly relies on the otoscope. In addition, we are exploring the feasibility of performing chemical cochleostomy with phosphoric acid gel (PAG) and concurrently monitoring using OCT. When compared to existing approaches toward cochleostomy, such as mechanical drilling, PAG-cochleostomy might provide better control of the cochleostomy process.

SP06-4**Circadian clock in the inner ear and related disorders****Chao-Hui Yang***Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan*

Circadian rhythm is present in almost all eukaryotes with a 24-hour cycle. Daily rhythmic changes are found in several physiological processes, including sleep, appetite, hormone level, metabolism and gene expression. There are at least nine core circadian clock genes that regulate central and peripheral circadian oscillators using transcriptional-translational feedback loops.

Recently, the circadian clock had been reported in the cochlea and inferior colliculus by the presentation of circadian oscillation in circadian clock genes expression. The cellular clocks in the cochlea were dynamically regulated and longitudinally distributed. In addition, time-dependent sensitivity to noise was found in the mice, which were exposed to noise during the night are more vulnerable than when exposed during the day. We recently observed that circadian dysregulation by constant light exacerbated noise-induced permanent threshold shifts. In the clinic, we also found the altered expression of circadian clock genes in peripheral blood leukocytes of patients with sudden sensorineural hearing loss. These results imply that circadian regulation plays an important part in the inner and related disorders.

Special Program 7 The impact of COVID-19 on Otology

SP07-1

The impact of COVID-19 on otology diseases

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The coronavirus disease 2019 (COVID-19), which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a novel emerging infectious disease that rapidly spread worldwide since the end of 2019. Currently, there is no effective antiviral treatment for COVID-19. Therefore, vaccination and non-pharmaceutical interventions (NPI), such as quarantine, wearing a mask, have become particularly important. NPIs decline the onset and flatten the peak of the epidemic. While adequate coverage of vaccines can reduce the number of infections as well as the proportion of severe cases, thereby reducing the overall morbidity and mortality. I hypothesized that the prevalence of COVID-19 and universal vaccination affects the diagnosis and management of several common diseases of otorhinolaryngology.

Here, I would like to review the changes in the epidemiology of common otology disorders in Taiwan during the COVID-19 pandemic.

SP07-2

The impact of COVID-19 on Otology

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Significant risk exists for viral transmission of COVID-19 during otological surgery because its causative agent, the SARS-CoV-2 virus, has been found to be present in the middle ear epithelium during upper respiratory tract infections. Specifically, viral-laden aerosols are generated during temporal bone drilling. The Japan Otological Society thus issued guidelines on April 6, 2020 for performing bone drilling during otological surgery in the age of COVID-19. These guidelines suggested that mastoid surgery be avoided unless there was a life-threatening emergency such as acute mastoiditis or cholesteatoma with intratemporal complications. In response, our department reduced the number of scheduled otological surgeries from April to June 2020 after the first confirmed COVID-19 case in Yamagata prefecture on March 31st, 2020.

However, we investigated whether transcanal endoscopic ear surgery (TEES) presents less risk of viral transmission than traditional microscopic ear surgery (MES) by avoiding or reducing the need for temporal bone drilling. Our department employs three different surgical approaches: non-powered TEES which allows access up to the aditus ad antrum with transcanal atticotomy using a chisel or curette; powered TEES which allows access up to the superior portion of the Donaldson's line by transcanal atticotomy (TCAA) using a drill or ultrasonic aspirator; and a dual MES/TEES approach which employs both MES and non-powered TEES when the disease extends to the central mastoid beyond the lateral semicircular canal. To further decrease aerosolization and the risk of viral transmission, we use an Oto-tent for a mastoidectomy during MES and cover the ear canal with gauze for a TCAA during powered TEES.

We investigated the degree of aerosolization during the TEES TCAA and the MES mastoidectomy. A fine particle visualization system (ViEST; Shin Nippon Air Technologies Co.) and particle counter (Model 9111; Nitta Co.) were used for measurement and pig bone was used to perform a pseudo-operation in a clean room dedicated to visualization measurement. The aerosol count was 1,033,222/45.28L for MES; 511,316/45.28L with a drill for powered TEES and 10,791/45.28L with an ultrasonic aspirator for powered TEES. The use of the Oto-tent with MES further reduced the aerosol count to 325,324/45.28L; and the use of gauze with powered TEES with a drill reduced the aerosol count to 58,956/45.28L and with an ultrasonic aspirator to 31,948/45.28L.

Special Program 7 The impact of COVID-19 on Otology**SP07-3****Clinical manifestations of sudden sensorineural hearing loss associated with COVID-19 Vaccination**

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Objective: Sudden sensorineural hearing loss (SSNHL) is a common otologic emergency that significantly affects the patient's quality of life. The etiology remains unknown, although viral infections and vascular compromise are possible pathogenic mechanisms. This study aimed to investigate the clinical manifestations of sudden sensorineural hearing loss (SSNHL) temporally related to COVID-19 vaccination.

Methods: The study included 28 patients who presented with the complaint of SSNHL which occurred within 31 days after COVID-19 vaccination to the otolaryngology outpatient clinic between April 2020 and February 2022.

Results: There were 14 men and 14 women, and the mean age was 47 years old (ranged 23-66). The most associated vaccine was Pfizer COVID-19 vaccine (19 of 28, 68%), followed by Moderna (6 of 28, 21%), Oxford-AstraZeneca (2 of 28, 7%), and Janssen (1 of 28, 4%). Hearing loss started after the second dose of COVID-19 vaccine in 15 (54%), the third dose in 7 (25%) and the first dose in 6 (21%). The mean interval between the onset of SSNHL and vaccination was 8.9 days. The initial hearing loss was low-frequency HL only in 9, mild HL in 9, moderate HL in 2, moderately severe HL in 2, severe HL in 2, and profound HL in 5. The patients were with oral and/or intratympanic steroids.

Conclusion: The current study provides clinical features of SSNHL temporally related to COVID-19 vaccination which occurred mean 9 days after vaccination with various degrees of hearing loss, though there is no evidence of an association between vaccination and SSNHL. Multicenter study with a larger study population is under progress and will provide further information including treatment outcomes.

SP07-4**How has the COVID-19 epidemic impacted hearing care?**

Yurika Kimura

Ebara Hospital, Tokyo, Japan

The outbreak of COVID-19 has had a significant impact on the practice of hearing impairment from multiple perspectives.

First, one topic is the impact of SARS-CoV-2 infection itself on hearing. The viral theory has been proposed as one of the causes of sudden sensorineural hearing loss, and there have been several case reports pointing to the possibility of sudden sensorineural hearing loss due to SARS-CoV-2 infection. At the laboratory level, the expression of ACE2, the viral receptor for SARS-CoV-2, TMPRESS and FURIN, which are necessary for the virus to penetrate the cell membrane, has been observed in human inner ear tissues, which supports the possibility of acute sensorineural hearing loss as a symptom of COVID-19. Decreased response to TEOAE has also been reported in COVID-19 patients. Hereafter, it is necessary to analyze the impact of SARS-CoV-2 as a cause of hearing impairment, such as changes in the prevalence of sudden sensorineural hearing loss during the pandemic period using big data.

Second, the impact of wearing masks to prevent droplet infection on the treatment of hearing impairment is also enormous. Hearing-impaired people have been able to communicate not only by speech but also by lip-reading and reading the facial expressions of others. However, the wearing of masks as a measure against infection interferes with other elements and reduces the clarity of speech, making communication difficult. In addition, people with severe hearing loss often need to speak loudly in their ears, which poses a higher risk of droplet infection than normal communication. Hearing aids are prone to falling out when worn with a mask, resulting in poor adherence to hearing aid use and the financial burden of loss. On the one hand, hearing care is perceived as a "service that can be postponed" due to the pandemic, and the business impact is significant.

On the other hand, unlike other otorhinolaryngological services, telemedicine, such as eardrum observation and hearing tests using smartphone applications, is relatively easy to introduce, and in fact, language training using online services has grown dramatically due to the spread of corona.

In this presentation, we plan to discuss the impact of the COVID-19 pandemic on hearing impairment care and future challenges.

Special Program 8 Skull Base

SP08-1

Steroid treatment for sudden sensorineural hearing loss in patients with vestibular schwannoma

Jong Dae Lee, Se A Lee

Soonchunhyang University School of Medicine, Bucheon, Korea

Objectives: Sudden sensorineural hearing loss (SSNHL) has several etiologies. It may be a presenting symptom of vestibular schwannoma (VS). The aim of this study was to investigate the recovery rate after steroid therapy and factors affecting the prognosis of SSNHL with VS.

Methods: Magnetic resonance imaging (MRI) findings and charts of all adult patients who presented with SSNHL between July 2001 and December 2020 were retrospectively reviewed.

Results: Among the 1698 patients presenting with SSNHL, VS was found in 43 (2.5%) patients. Of the 32 cases that were analyzed, 10 cases were accompanied with dizziness. Eleven cases (34.3%) showed good recovery. The pure-tone audiometry values significantly improved among patients who showed a good recovery. Among the factors affecting SSNHL prognosis, only age was associated with good recovery. There was no association between steroid response and initial hearing level, presence of vertigo, tumor size, or tumor extension.

Conclusion: Our study showed that hearing recovery of SSNHL does not exclude a VS diagnosis. We suggest that steroid treatment should be considered, even if SSNHL coexists with VS. Only age was found to be a factor associated with good recovery after steroid treatment.

SP08-2

Retrolabyrinthine Approach for Large Cerebellopontine Angle Meningioma

Mao-Che Wang

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For skull base tumor surgeries, good surgical exposure is essential. Every millimeter bony removal counts for better surgical exposure. Surgical approaches for cerebellopontine angle (CPA) tumors are middle fossa approach, retrosigmoid-retrolabyrinthine approach and translabyrinthine approach. In Taipei Veterans General Hospital, we use translabyrinthine approach and retrolabyrinthine approach for large CPA tumors. The surgeries were done by an ear surgeon and a neurosurgeon. For large tumors without useful hearing we use translabyrinthine approach and for large tumor with useful hearing other than acoustic neuroma, we use retrolabyrinthine approach. The advantage of retrolabyrinthine approach is the chance of preserve hearing. The disadvantage of this approach is less surgical exposure to CPA than translabyrinthine approach. From Oct. 2013 to Dec. 2021, we did retrolabyrinthine approach tumor removal for 32 patients with large CPA meningioma. Total tumor removal or near total tumor removal were achieved in all patients. Hearing was preserved in 29 patients (90.6%). For patient without facial palsy pre-operatively, only 1 patient had grade 4 facial palsy 31 remain good facial function post-operatively (H-B grade 1 or 2) (96.9%). Retrolabyrinthine and infralabyrinthine approach can be an alternative approach for lateral skull base lesions. Hearing and facial nerve function preservation can be achieved in most patients. Team work is the key of skull base surgery.

Special Program 8 Skull Base**SP08-3****Surgical outcome of 69 external auditory canal cancer treated at a single institution****Takeshi Tsutsumi, Takahiro Asakage, Yoshiyuki Kawashima, Yusuke Kiyokawa***Tokyo Medical and Dental University, Tokyo, Japan*

External auditory canal cancer is an extremely rare entity, with an annual incidence of 1 in a population of 1 million. Due to its rarity and surgical difficulty caused from complex anatomy of the temporal bone, no general consensus has been reached yet on the treatment protocol for external auditory canal cancer. In this paper, we present the short-term outcomes of 69 cases with external auditory canal cancer, managed from July 2015 to March 2021 in Tokyo Medical and Dental University Hospital.

Fifty-seven cases were treated with surgery (42 primary / 6 salvage surgical group) consisted of lateral temporal bone resection (n=43), subtotal temporal bone resection (n=12), and partial resection (n=2), while 12 cases without surgery (non-surgical group) consisted of TPR-RT (n=6, TPF-RT group), CDDP-RT (n=1) and heavy particle therapy (n=4). In the surgical group, 48 patients were pathologically diagnosed as SCC, 5 ACC, and 4 adenocarcinomas, while in the non-surgical group, 8 patients were diagnosed as SCC and 4 ACC.

Short-term outcomes were compared between the primary surgical group and the TPF-RT group. In the primary surgical group, the short-term outcomes of ACC and adenocarcinoma are better than those of SCC. Analyses of cases with SCC revealed no statistically significant difference of OS, DSS, and DFS between the primary surgical group and the TPF-RT group. In the primary surgical group, postoperative recurrences occurred within a year of surgery in most cases. Only the positive surgical margin, determined by postoperative histopathology, was associated with significantly poorer outcomes. Patients with postoperative recurrence consisted of 4 cases with salvage surgeries after the failure of conservative treatment, 3 cases with rapid preoperative progressions, and 4 with recurrent neck lymph node metastasis. Among the cases with advanced disease, no statistically significant differences in the outcomes were observed between the primary surgical and TPF-RT groups. While surgical treatment was associated with relatively good outcomes in our cases, considering the highly invasive nature of extended surgery, TPF-RT could be an option of choice for the treatment.

SP08-4**Role of hearing preservation surgery for small and medium-sized vestibular schwannomas****Naoki Oishi***Keio University, Tokyo, Japan*

The incidence of diagnosed sporadic unilateral vestibular schwannoma has increased since the 1970s primarily due to increasing access to MRI. When hearing preservation surgery is considered for small or medium-sized tumors, the natural history of the tumor is critical. The attempt of hearing preservation surgery should be considered only in the cases of possible tumor progression and hearing deterioration. The intraoperative continuous hearing monitoring system application offers excellent help for surgeons to achieve hearing preservation in vestibular schwannoma surgery. Based on our clinical cases, patients showing shorter auditory brainstem response (ABR) wave V latency (< 6.5 msec) or a higher otoacoustic emission (OAE) response during preoperative analysis were good candidates for the present hearing preservation surgery by the retrolabyrinthine approach. We have adopted a hearing-focused strategy for small to medium-sized tumors based on the preoperative ABR/OAE results.

Special Program 9 Genetics

SP09-1

Milestone toward cochlear gene therapy for patients with hereditary hearing loss

Hidekane Yoshimura

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Recent advances in genetic testing have enabled the identification of pathogenic variants in many cases with hereditary hearing loss, and systems have been developed to provide personalized treatment based on etiology.

Gene therapy, is thus expected to become an unprecedented curative strategy, and primarily includes three approaches. The first approach, "gene replacement," is the most common method for supplying a functional protein through delivering a normal gene, and is used to treat inherited disorders caused by loss-of-function mutations, such as recessive diseases. The second approach, "gene silencing," is used to treat diseases with gain-of-function mutations by suppressing the mutated gene expression. The third approach, "gene editing," enables correction of pathogenic variants using genome editing tools such as the CRISPR/Cas9 system. Several reports have demonstrated the use of cochlear gene therapy to restore auditory function in neonatal mouse models of genetic deafness. We previously presented the first successful application of cochlear gene therapy in an adult mouse model of progressive human deafness (Yoshimura et al., 2019). Using a single intracochlear injection of an artificial microRNA in an adeno-associated viral vector, we demonstrated that RNAi-mediated gene silencing can slow the progression of hearing loss, improve inner hair cell survival, and prevent stereocilia bundle degeneration in mature Beethoven mice, which are a model of human TMC1 deafness.

However, there are many hurdles in the clinical application of gene therapy for hereditary hearing loss. In humans, it is important to consider how gene therapy can be combined with the current therapies. At present, the therapeutic options for sensorineural hearing loss are hearing aids (HAs) and cochlear implants (CIs), which are not biological treatments, but are highly useful. Even if gene therapy becomes a curative treatment, it is unlikely to immediately become an alternative therapy to CIs and HAs. Further, to actualize gene transfer to the human inner ear, use of CIs is considered a reasonable strategy. Therefore, initiating a hybrid therapy based on CIs combined with gene therapy for hereditary hearing loss is considered clinically feasible (Yoshimura et al., 2021).

SP09-2

Genetic Analysis of Hearing Loss in Japan

Kotaro Ishikawa

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In Japan, genetic testing for the patients with hearing loss was approved by the Ministry of Health, Labour and Welfare for inclusion in social health insurance coverage. It started in 2012 with screening for 46 mutations in 13 deafness genes using the Invader assay¹. Since August 2015, this genetic testing has been expanded to screen 154 mutations in 19 deafness genes using targeted genomic enrichment with massively parallel DNA sequencing combined with the Invader assay and TaqMan genotyping. Mori et al. reported that 717 unrelated Japanese patients with hearing loss were analyzed using this NGS method². Total allele frequency of 154 mutations in 19 deafness genes was 32.64% and the total number of cases associated with at least one mutation was 44.07%. Among these, they were able to diagnose 212 patients. However, we cannot identify the causative gene in about 60% patients by social health insurance-based genetic testing. To increase the detection of mutation rate, Professor Usami in Shinshu University organized the Japan hearing loss research consortium. About 100 institutions nationwide are joining the hearing loss research consortium Japan. In 2021, Usami et al. reported the result of genetic analysis for 10,047 samples obtained from social health insurance-based genetic testing of hearing loss³. They used the same platform with a diagnostic DNA panel carrying 63 deafness genes and the same filtering algorithm. The overall diagnostic rate was 38.8%, with the rate differing for each age group; 48.6% for the congenital/early-onset group (~5 y.o.), 33.5% for the juvenile/young adult-onset group, and 18.0% for the 40+ y.o. group. Each group showed a different causative gene. The result of genetic analysis of hearing loss can be effective in deciding a treatment plan like indication of cochlear implant.

1. Abe S, Yamaguchi T, Usami S: Application of deafness diagnostic screening panel based on deafness mutation/gene database using invader assay. *Genet Test* 2007; 11: 1292-1297.

2. Mori K, Moteki H, Miyagawa M, Nishio S, Usami S: Social health insurance-based simultaneous screening for 154 mutations in 19 deafness genes efficiently identified causative mutations in Japanese hearing loss patients. *PLOS ONE* 2016; 11 (9) : e0162230.

3. Usami SI, Nishio SY: The genetic etiology of hearing loss in Japan revealed by the social health insurance-based genetic testing of 10K patients. *Hum Genet* 2021; Oct 1. doi: 10.1007/s00439-021-02371-3.

Special Program 9 Genetics**SP09-3****Prediction Models for Hereditary Hearing Loss****Pey-Yu Chen**^{1,2}, **Chen-Chi Wu**^{3,4,5}

¹Department of Otolaryngology, MacKay Memorial Hospital, Taipei, Taiwan, ²Department of Audiology and Speech-Language Pathology, Mackay Medical College, New Taipei City, Taiwan, ³Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan, ⁴Department of Medical Genetics, National Taiwan University Hospital, Taipei, Taiwan, ⁵Department of Medical Research, National Taiwan University Hospital Hsin-Chu Branch, Hsin-Chu, Taiwan

Sensorineural hearing impairment (SNHI) is one of the most common sensory disorders, affecting two in every 1,000 newborns worldwide. Hereditary hearing loss (HHL) accounts for more than half of the SNHI cases, and recessive mutations in GJB2 are the most common causes of HHL worldwide. After the widespread application of next generation sequencing, an increased number of genes have been identified as contributing causes to hearing loss. However, there is a wide variation in audiological presentations even for the same HHL group. As a result, it is essential to delineate the genotype-phenotype correlations and establish reliable prediction models. The ultimate goal is to assist in genetic counseling and lead to timely intervention by genetic diagnosis. In this talk, I will present our recent works on the prediction models for GJB2 and MYO15A mutations.

SP09-4**Cochlear implantation in retrocochlear pathologies caused by genetic mutations and cCMV infection****Chen-Chi Wu**

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The outcomes with cochlear implants (CIs) vary significantly among recipients, and is severely compromised by retrocochlear pathologies in the auditory pathway. Retrocochlear pathologies can arise from a diversity of genetic and acquired etiologies. Of these, genetic auditory neuropathy (AN) and congenital CMV (cCMV) infection have been shown to be important causes of retrocochlear pathologies in pediatric CI candidates.

In this talk, I will present our experience regarding cochlear implantation in retrocochlear pathologies caused by genetic mutations and cCMV infection. Our results demonstrated that most genetic AN cases (e.g., patients with OTOF, WFS1 & OPA1 mutations) were associated with favorable CI outcomes; whereas CI outcomes in cCMV patients were variable and related to neurodevelopmental disorders and brain MRI findings. In the meantime, our recent studies in experimental animals and biomaterials indicate that molecular therapy may provide an opportunity to optimize CI function for patients with retrocochlear pathologies in the future.

Special Program 10 Regenerative Medicine

SP10-1

Regeneration of the tympanic membrane perforation and the new concept tympanoplasty

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We developed the novel therapy for the Tympanic membrane (TM) perforation without conventional surgical treatment by using a gelatin sponge as a scaffold and basic fibroblast growth factor (b-FGF) as a regulatory factor and a fibrin glue to establish good regenerative conditions. Cells for regeneration are automatically supplied by mechanical disruption of the perforation edge as a trigger. The procedures of this treatment are as follows;

1. Mechanical disruption is performed around the perforation edge.
2. Trimmed gelatin sponges soaked in b-FGF are put into the tympanic cavity and on the TM. Fibrin glue drop over them.
3. Removing a crust on the TM, the TM's regeneration can confirm three weeks after the treatment.
4. If the perforation remains, the above treatment can be performed up to 4 times.

This regenerative treatment for the TM perforation was approved in November 2019 by the National Health Insurance in Japan. Before its approval, Retyma® (Norvel Pharma Inc, Tokyo, Japan) that is a combination kit of a gelatin sponge and b-FGF, as a specialized medicine for the TM perforation, received pharmaceutical approval in Japan. Post Marketing Surveillance has been ongoing to investigate the efficacy and safety of Retyma® for several years. One year after the approval in Kitano Hospital, Osaka, Japan, the TM perforation closure rate (89/91 ears) was 98%, and favorable hearing improvement was achieved with a small air-bone gap. There were no serious adverse events.

However, only 20%-30% of patients with perforations met the eligibility criteria for TM regeneration. Finding ways to increase the number of eligible patients in the future is thus essential. Next, we developed a new concept of tympanoplasty for patients with chronic otitis media, combined with cleaning the tympanic cavity and the TM regeneration trans-canal, trans-TM, using an endoscope.

In this session, we will introduce this regenerative treatment and the new concept tympanoplasty combined with the regeneration of the TM.

SP10-2

Middle ear mucosal regenerative therapy by cell sheet transplantation

Kazuhisa Yamamoto

Jikei University School of Medicine, Tokyo, Japan

Recurrence of cholesteatoma, after surgical intervention, often occurs due to poor mucosal regeneration in the middle ear and mastoid cavities, which subsequently impairs aeration in the middle ear. Conventional tympanoplasty often results in a lack of mucosal regeneration in the resected area of the mastoid cavity. If regeneration of the damaged middle ear mucosa were possible in the early postoperative period, it would be possible to prevent re-adhesion of the tympanic membrane and recurrence of adhesive otitis media. Additionally, regeneration of middle ear mucosa would prevent recurrent cholesteatoma. We developed a novel treatment method combining canal wall up tympanoplasty and autologous nasal mucosal epithelial cell sheet transplantation for postoperative regeneration of the middle ear mucosa. Tissue-engineered autologous nasal mucosal epithelial cell sheets were fabricated by culturing the harvested cells in an aseptic environment. The cultivated cell sheets were transplanted, during tympanoplasty, onto the exposed bony surface of the middle ear cavity where the mucosa had been lost.

Till date, we have performed this procedure on nine patients with middle ear cholesteatoma and six patients with adhesive otitis media (first-in-human study). All patients have shown favorable post-operative course, with no adverse event or complication, and improved aeration and hearing ability after transplantation.

Based on the above results of prior clinical study, an investigator-initiated clinical trial for nasal mucosa cell sheet, a regenerative medicine product, for cholesteatoma was started in November 2021 (pivotal study).

This treatment simultaneously preserves the external ear canal morphology, as in standard canal wall up tympanoplasty, and incorporates autologous cell sheet transplantation, which enables prevention of recurrent cholesteatoma. This study represents a great step forward in the development of a new surgical approach for treating adhesive otitis media and cholesteatoma. The results of this research are expected to be the world's first regenerative medicine product using nasal mucosa and a new therapeutic agent originating in Japan for intractable middle ear diseases.

Special Program 10 Regenerative Medicine**SP10-3****Otic Organoids Derived from Induced Pluripotent Stem Cells as a Model of Drug-Induced Neuropathy**Sho Kurihara^{1,2}, Hiromi Kojima²¹University of Miyazaki, Miyazaki, Japan, ²Jikei University School of Medicine, Tokyo, Japan

The spiral ganglion of the cochlea is essential for hearing and contains primary bipolar neurons that relay action potentials generated by mechanosensory hair cells. Injury to spiral ganglion neurons (SGNs) causes permanent hearing loss because these cells have limited regenerative capacity. This makes the treatment of sensorineural hearing loss highly challenging, and currently there are no curative therapies.

The development of novel treatments for sensorineural hearing loss requires suitable models. Although animal experiments provide useful insights, mouse models may not fully recapitulate the phenotype of hearing loss in humans. To overcome the limitations of non-human model systems, stem cell technology to generate human inner ear cells in vitro could be a useful tool. Furthermore, the robust proliferation of stem cells enables their use in high-throughput drug screening assays.

Here, we report a highly efficient protocol for differentiating human induced pluripotent stem cells (hiPSCs) into otic organoids that contain SGN-like cells and demonstrate that otic organoids have potential for use as an experimental model of drug-induced neuropathy. Otic progenitor cells were induced by two-dimensional culture of hiPSCs for 9 days. Otic spheroids were formed after 2D culture of Otic progenitor cells for 2 days in a hypoxic environment. Otic organoids were generated by 3D culture of otic spheroids under hypoxic conditions for 5 days and normoxic conditions for a further 30 days or more. The protein expression profile, morphological characteristics and electrophysiological properties of SGN-like cells in otic organoids were comparable to those of primary SGNs. Live-cell imaging of AAV-syn-EGFP-labeled neurons demonstrated temporal changes in cell morphology and revealed the toxic effects of ouabain (which causes SGN-specific damage in animal experiments) and cisplatin (a chemotherapeutic drug with ototoxic adverse effects). Furthermore, a cyclin-dependent kinase-2 inhibitor suppressed the toxic effects of cisplatin on SGN-like cells in otic organoids. The otic organoid is a candidate novel drug screening system and could be used to identify drugs for the prevention of cisplatin-induced neuropathy.

SP10-4**CRISPR/Cas9 Genome-Editing in Patient-Derived iPSCs: Functional Assays of Deafness Genes**Yi-Lu Li^{1,2,3}, Jiunn-Liang Wu¹, Peng-Chieh Chen²¹Department of Otolaryngology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan, ²Institute of Clinical Medicine, College of Medicine, National Cheng Kung University, Tainan, Taiwan, ³Department of Genetic Medicine, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan

Genetic hearing loss is the most common inherited sensory deficit in newborns, mostly manifested as a non-syndromic hearing loss (NSHL). Autosomal recessive non-syndromic hearing loss (ARNSHL) accounts for 80% of NSHL. With the rapid development of next-generation sequencing (NGS), genetic causes of congenital hearing loss can be identified efficiently. Moreover, because the genotype-phenotype association of ARNSHL varies widely, comprehensive understanding of the etiology of ARNSHL is critical.

A reliable and stable cell model is indispensable for studying the molecular pathophysiology of deafness genes. In recent decades, human and mouse embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSCs) have been used to generate cells with the characteristics of hair cells (HCs), that is, hair cell-like cells (HCLCs). Compared to mouse model, these in vitro models provide the niche in microscopic vision to elaborate the molecular function more rapidly and more efficiently. A combination of iPSC technology with genome-editing technology may provide an attractive cell-based strategy to regenerate hair cells and treat hereditary deafness in humans.

The CRISPR/Cas9 system has been widely utilized for the genome editing, typically via the homology-directed repair (HDR) pathway. By delivering the Cas9 nuclease complexed with a synthetic guide RNA (gRNA) into a cell, the target sequence of cell's genome can be recognized and opened, making existing nucleotides to be removed and/or replaced with a new one in vivo. Such revolution in genetics has proved as numerous transgenic models mimicking disease progression as well as therapeutic approaches.

Here I propose a series of in vitro and in vivo experiments to study the pathogenesis of novel gene mutations in genetic hearing loss. After identifying mutations through whole exome sequencing (WES), the pathogenic role of the genes of interest can be studied in the iPSCs established via reprogramming and CRISPR/Cas9 genome editing technology. The edited iPSCs can even be differentiated into inner ear otic progenitors and HCLCs and evaluated for the possible cell-based therapy. Moreover, the underlying mechanism of progressive hearing loss driven by mutations on different alleles and genotype-phenotype correlation will be clarified in transgenic mice. This pipeline not only can help genetic hearing loss diagnostics and therapeutics but also can be applied for other genetic disorders.

Special Program 10 Regenerative Medicine

SP10-5

Regenerative medicine of the middle and inner ear

Norio Yamamoto

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There are several possible strategies to achieve regeneration of target organs. These strategies include transplanting stem cell-derived cells and reprogramming mature cells to desired cells (transdifferentiation). Most of the factors required for these strategies are selected based on the progressively accumulating knowledge of developmental biology.

The middle and inner ear have essential roles in transmitting incoming sound to the central auditory pathway. Middle ear mucosa is involved in the aeration of the tympanic cavity, affecting the conductive hearing ability, and it physiologically regenerates. However, severe otitis media or extensive tympanoplasty disturb the middle ear mucosa regeneration and cause poor hearing outcomes after the surgery. Inner ear disease is more challenging to treat than middle ear mucosal disturbance. The inner ear contains sensory epithelia, including hair and supporting cells, which never regenerate after birth in mammals. As a result, sensorineural hearing loss is intractable because it is mainly caused by sensory epithelia loss.

To overcome these problems and achieve better hearing, we applied several strategies for regenerative medicine. To regenerate middle ear mucosa efficiently, we used human induced pluripotent stem cell (hiPSC) -derived airway epithelial cells (AECs). After inducing AECs from hiPSCs in vitro, we transplanted them into the middle ear of immunodeficient rats. Transplanted AECs survived for one week in three of six rats and two weeks in three of eight rats. Immunohistochemical analysis showed that ciliated cells, basal cells, and goblet cells had regenerated within the middle ear cavity.

For the inner ear regeneration, we took a strategy to elucidate the inner ear's developmental mechanisms and find essential factors for the transdifferentiating of inner ear sensory epithelia. We utilized published data obtained from single-cell RNA sequencing of embryonic mice to identify lineage-specific genes in the early developing inner ear. This data set contained transcriptomic data from 5,000 otic epithelial cells at E9.5-13.5. We projected the 5,000 cells onto a two-dimensional space encoding the transcriptional state and visualized the pattern of otic epithelial cell differentiation. We identified 15 clusters based on known genes that characterize the four different tissues in the inner ear. By comparing transcriptomes between these 15 clusters, we identified several candidates of lineage-specific genes.

Special Program 11 Middle Ear and Facial Nerve**SP11-1****Medical and surgical treatment of Bell's palsy and Ramsay-Hunt syndrome****Masashi Hamada, Kyoko Odagiri***Tokai University, School of Medicine, Isehara, Japan***Introduction**

Although steroids and antiviral drugs have been widely used as medication for Bell's palsy (Bell) as well as Ramsay-Hunt syndrome (RHS), their treatment outcomes are not satisfying. In 2008, we introduced an administration of antiviral drugs with various dose in addition to high dose of steroid for Bell and RHS. Dose and kinds of each drug were decided based on severity of facial nerve paralysis.

From another standpoint, surgical decompression is usually performed on the patients with poor prognostic diagnosis by ENoG. Since 2008, we have been attempting transmastoid decompression with maximum uncovering the genu.

In this paper, we show our results of both medical and surgical treatment of Bell and RHS.

Subjects and Methods

One hundred ninety-eight patients with Bell (including zoster sine herpete; ZSH) were subjected to administration of prednisolone (PSL) 60mg or hydrocortisone (HC) 1000mg together with valacyclovir (VACV) 3000mg. Selection of steroids depends on Yanagihara's 40 points score (YS) (PSL for <10, HC for >12). Sixty patients with RHS had administration of VACV 60mg or acyclovir (ACV) 1500mg together with PSL 60mg or HC 1000mg based on YS.

Out of/off those patients, 31 patients with Bell and 42 with RHS had undergone decompression via transmastoid approach with maximum uncovering the genu. After each treatment, usual rehabilitation was introduced during 6-12 months period, and final outcome was assessed by YS and House-Brackmann (H-B) grade at 1 year follow-up.

Results

In 166 patients with Bell, 151 (91.0%) were assessed as >36 points of YS and H-B grade I or II (clinically-complete cure; CCC). In 55 patients with RHS, 46 (83.6%) were assessed as CCC. In the patients with surgical decompression performed, 20 out of 31 with Bell (64.5%) were evaluated as CCC, and 20 out of 42 with RHS (47.6%) were assessed as CCC.

Discussion and Conclusion

Final results of our medical treatment based on severity for Bell is similar to that of high dose of PSL alone proposed by Stennert E, whereas those of RHS was found much better than previous reports. High dose of steroid is considered not essential and antiviral drugs may have a key on Bell as well as RHS.

Transmastoid decompression with maximum exposure of genu is thought to have better outcome compared to conventional ones. Regardless Bell or RHS, maximum decompression of genu, where causative virus is believed to activate, seems important to achieve better outcome.

SP11-2**Facial Nerve Monitor and Electric Stapes Reflex in Cochlear Implant****Chung-Feng Hwang***Department of Otolaryngology, Kaohsiung Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Kaohsiung, Taiwan*

Purpose: Facial paralysis is one of possible complications for cochlear implant (CI). The purpose of the study was to share our experience in the use of intraoperative facial nerve monitor (IFNM) and stapedius reflex during CI.

Methods: This retrospective analysis included the patients who underwent CI surgery. All patients were operated by single experienced surgeon. Facial nerve course was investigated by surgical exploration and then detected by a monopolar stimulator.

Results and Discussion: There were 188 patients with mean age of 18.41+19.33 years. First, we stimulated horizontal segment of facial nerve through posterior atticotomy. The positive rate was 86.79% with average threshold 0.66+0.32 mA. Next, the genu and descending segment were stimulated intraoperatively, the positive rate was 97.3% and the average threshold was 0.70+0.20 mA. We found chorda tympani in 56.91% cases. As to intraoperative neural shunt stimulation through chorda tympani, the incidence of facial nerve response was 74.77% (80/107) and threshold of chorda tympani was 1.65+0.77 mA. Besides, stimulating facial nerve sometime induced stapedius reflex. The incidence of positive stapedius reflex was 74.53%. The average threshold was 0.50+0.18 mA. Finally, we stimulate the genu and descending segment again, the positive rate was 98.9% (186/188) and the average threshold was 0.42+0.17 mA. Since the middle ear cavity of CI patients is almost normal, we can stimulate different segments and branches of the facial nerve. This study stimulated and measured thresholds for horizontal segment, descending segment, chorda tympani and stapedia nerve. First, we suggest the stimulation of the horizontal segment can be used as a positive control group. The shunt of chorda tympani may be misinterpreted as false-positive results do exist especially when stimulating with higher stimulation current. The electrical stapedius reflex may also use as the guide of functional facial nerve during surgeries. It can help surgeons to notify the presence of facial nerve even without audible warning sound of monitor.

Conclusions: The study concluded that routine use of IFNM is recommended in surgeries in CI. IFNM offers great aid in preventing iatrogenic facial nerve injury, mapping the course of facial nerve, and early identification of dehiscence of facial nerve anatomy, assisting in the maintenance of its integrity and postoperative functionality.

Special Program 11 Middle Ear and Facial Nerve

SP11-3

Regenerative treatment for severe facial paralysis

Naohito Hato

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Background: Recently, the effectiveness of intratympanic administration of steroids for facial nerve paralysis has been reported clinically. Insulin-like growth factor-1 (IGF-1) and basic fibroblast growth factor (bFGF) promotes the regeneration of denervated nerves. It is important to investigate the treatment effect of intratympanic growth factor on severe facial paralysis in guinea pigs.

Objective: The aim of this study was to evaluate the treatment effect of intratympanic administration of IGF-1 or bFGF with a gelatin hydrogel on severe facial paralysis in guinea pigs.

Methods: We performed the following procedures on guinea pigs. In the normal group, no procedure was performed. In the saline and IGF-1 groups, facial paralysis was induced by freezing of the facial canal. The vertical segment of the facial canal was accessed via the otic bulla, without removing the bony wall of the facial canal. The canal was then frozen for 5s using freeze spray. Subsequently, in the saline, IGF-1 and bFGF groups, a gelatin hydrogel impregnated with saline, IGF-1, and bFGF respectively, was placed around the facial canal. All animals exhibited complete facial paralysis immediately after the procedure and recovered gradually. Facial nerve functions were evaluated using three test batteries: facial movement observation, electrophysiological testing, and histological assessment.

Results: At 10 weeks postoperatively, the facial movement scores for the IGF-1 group and bFGF group were improved compared to those in the saline group. The conductive velocity was significantly faster in the IGF-1 group and bFGF group than in the saline group. There was a significant between-group difference in the nerve fiber number and myelin thickness.

Conclusion: Intratympanic IGF-1 or bFGF administration improved facial nerve regeneration. This novel method could provide prompt ambulatory regenerative treatment and reduce the incidence of poor recovery in patients with severe facial paralysis.

SP11-4

Imaging Analysis for Predicting Intraoperative Findings in Middle Ear Disease.

Masaomi Motegi, Masahiro Takahashi, Kazuhisa Yamamoto, Yuika Sakurai, Yutaka Yamamoto, Hiromi Kojima

The Jikei University School of Medicine, Tokyo, Japan

OBJECTIVES: Disturbed perilymph behind a labyrinth fistula can lead to hearing deterioration, especially with cholesteatoma extension to the perilymphatic space (EPS). Dura involvement also can pose a risk of residual disease or dural injury. Meanwhile, recurrent middle-ear infection can induce the ossicular fixations, adversely affecting post-tympanoplasty hearing outcomes; however, it remains challenging to identify such variation preoperatively. We aimed to evaluate the diagnostic value of computed tomography (CT) for prediction of EPS or dural exposure in cholesteatoma and ossicular fixation in chronic otitis media (COM).

METHODS: 1) We included serial high-resolution CT images showing a cholesteatomatous bone defect in lateral semicircular canal (LSC) and middle cranial fossa (MCF) requiring mastoidectomy. We evaluated the length and angle between the margins of each bone defect on CT. Receiver operating characteristic (ROC) curves were constructed to determine the cut-off points. 2) The fixation of each ossicle was assessed during tympanoplasty. The impact of otoscopic findings, CT features, and hearing levels on the prediction of ossicular fixation was evaluated using multivariable logistic regression analyses.

RESULTS: 1) 30 bone defects on LSC were included, 6 (20.0%) showed EPS. For length and angle on LSC fistula, the optimal cut-off values were 3.65 mm and 71.6°, respectively, with 100% sensitivity and 91.67% specificity for both. Meanwhile, 107 bone defects on MCF were included. 54 (50.5%) showed dural exposure. For length, the cut-off values were 3.99 mm, with 77.78% sensitivity and 95.45% specificity. 2) 135 patients were included. Soft-tissue density between the malleus head and the anterior wall and poor development of mastoid cells were independent predictors of malleus fixation. >50% tympanic membrane perforation, poor development of mastoid cells, and a >40-dB preoperative air-bone gap (ABG) at 500 Hz were independent predictors of incus fixation.

CONCLUSION: A length >3.65 mm and an angle >71.6° for LSC defects on axial images are reliable diagnostic markers of EPS. A length >3.99 mm for MCF defects on coronal planes is reliable for dura exposure. CT analysis can provide surgeons with a more conscientious preparation for handling deeper labyrinth fistulae or MCF erosion. Besides, the accurate prediction of ossicular fixation in COM based on CT and ABG may facilitate decision-making regarding the ossiculoplasty.

Special Program 11 Middle Ear and Facial Nerve**SP11-5****Stapes surgery for otosclerosis: Personal experience****An-Suey Shiao***Department of Otolaryngology, Cheng Hsin General Hospital, Taipei, Taiwan***Background:**

Otosclerosis is a primary disease of the otic capsule characterized by disordered bone remodeling causing conductive or mixed hearing loss. Stapes surgery is currently the treatment of choice with the best results. The purpose of this presentation was to review our experience and analyze the outcomes of stapes surgery.

Methods:

From October 2018 to November 2021, 113 ears of 103 patients with otosclerosis underwent stapedectomy or stapedotomy surgery performed by a single surgeon at Cheng Hsin General Hospital, Taipei, Taiwan. Preoperative and postoperative audiometry was reviewed. Cases involving conductive hearing loss due to causes other than otosclerosis were excluded from the study (n=8), as were revision cases (n=9) and patients not followed up (n=19). A total of 28 cases were excluded. The remaining 85 ears in 79 patients were included for analysis. We averaged pure-tones in the format of thresholds at frequencies of 0.5, 1, 2 and 4 kHz. Closure of the postoperative air-bone gap (ABG) within 10 dB was considered successful. The mean, standard deviation and range of postoperative ABG and number of decibels of change were analyzed using SPSS statistical software. The criteria for statistical significance was set at $P < 0.05$.

Results:

There were 61 females (71.8%) and 24 males (28.2%) aged 13 to 74 years (mean = 44.5 years and standard deviation = 14.0). Mean four-frequency preoperative ABG was 29.8 ± 10.5 dB (range: 12.5-68.8 dB) versus 12.8 ± 8.1 dB (range: 0-41.3 dB) in postoperative ($P < 0.05$). The average ABG reduction was 17.2 ± 10.2 dB (range: -6.3-46.2 dB). The postoperative ABG was closed to 10 dB in 64.7% of cases. The percentage of ABG closed between 10 and 20 dB was 20.0%. 11.8% of the patient's postoperative ABG improved from preoperative ABG, and 2.4% remains the same. There was one patient (1.2%) had worse postoperative ABG.

Conclusions:

The results of the study revealed an excellent reduction in ABG. However, our success rate is slightly lower than that found in the current literature³. Further study is necessary in the future for a possible indicator of poor prognosis for the postoperative hearing outcome.

Special Program 12 Innovative Medicine on Otology

SP12-1

Innovative treatments for hearing loss

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Hearing loss is the most common sensory deficit in both children and adults. The etiologies of hearing loss are diverse; some could be improved after medication, and some could be treated with surgery. However, in a large portion of the patients, the hearing loss is not reversible. Pathology in the inner ear is the majority since the inner ear hair cells do not regenerate and the inner ear function generally cannot be recovered. Current managements for permanent hearing loss includes hearing aids and cochlear implants. With recent advances in basic science and biomedical material development, novel treatment modalities have been envisaged. 1) **Gene therapy** for genetic diseases has been a hot topic since late 20th century. Several recent studies, including ours, have successfully restored audiovestibular functions in genetically defected mice using gene therapy. 2) **Stem cell therapy** for restoring the inner ear function is another thriving field. The differentiated inner ear organoid cells are a potential treatment strategy to rebuild the function of the inner ear hair cells and spiral ganglion neurons. 3) **Nanoparticles and biomedical scaffolds** are developed for promoting inner ear drug delivery. We propose the potential of combining biomedical scaffolds with cochlear implant as a new strategy for gene therapy and drug delivery. 4) Finally, **ultrasound** is another potential tool for augmentation of drug delivery to inner ear. Our preliminary data demonstrated that very low intensity ultrasound is capable of enhancing drug delivery into cochlear explants without causing any damages.

SP12-2

Kobayashi's silicone plug for patulous eustachian tube: A retrospective case series

Takeshi Oshima

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Patulous eustachian tube (PET) is a disease exhibiting symptoms such as autophonia, aural fullness and breath audition due to an abnormally patent eustachian tube (ET). A variety of treatments, including conservative therapy and surgical procedures, have been attempted to manage the disease. Conservative treatment is usually sufficient to relieve patients of those annoying symptoms, but surgery is necessary in some refractory cases. Many surgical procedures have been reported for PET. The ET plugging surgery with a specially-designed silicone plug (Kobayashi's PET Plug) has been reported with long-term effectiveness and safety.

In this study, the plugging surgery was attempted in 222 ears of 184 patients, following diagnosis of "definite PET", based on the clinical criteria proposed by the Japan Otological Society. Two hundred-fifty operations, including revision, was performed under local (239 ears, 95.6%) or general (11 ears, 4.4%) anesthesia. Plug insertion was failed in 9 ears. Due to insufficient relief or annoying symptoms, revision surgery was performed in 28 ears. A bony wall of the external auditory canal was widened by drilling in 2 ears because of canal stenosis. Postoperative follow-up was performed in our hospital in most cases, and short-term outcome (3-11 months after surgery) could be assessed retrospectively in 110 ears of 96 patients. A variety level (complete relief to slight improvement) of improvement was found in 94 ears (85.5%). The patulous eustachian tube handicap inventory-10 (PHI-10) was recorded both pre- and post-operatively in 87 ears. PHI-10 scores were 29.3 ± 9.65 preoperatively and 13.6 ± 13.3 postoperatively, indicative of statistically significant improvement. No severe complication was observed in short-term period. Myringotomy closure was failed in 14 ears (12.7%). Tympanostomy tubes were observed in 15 ears (13.6%) at the short-term observation point.

Kobayashi's plugging surgery can be performed with high effectiveness and no severe complication, however, mild complication may decrease postoperative satisfaction and QOL. Accurate preoperative diagnosis is most important for postoperative outcome.

Special Program 12 Innovative Medicine on Otolaryngology**SP12-3****Underwater endoscopic ear surgery: evidence and techniques****Daisuke Yamauchi***Tohoku University Graduate School of Medicine, Sendai, Japan*

We have been performing underwater endoscopic ear surgery (UWEES) as a technique for handling the inner ear space during middle ear surgery (Yamauchi 2020). The advantages of UWEES are that (1) it offers a clear view of the surgical field, so that the surgeon can visualize the membranous labyrinth in situ without collapse, and (2) it facilitates minimal invasion of the inner ear through use of an appropriate perfusate that maintains the ion and pH balance of the perilymph. To clarify these advantages further and obtain basic data, we conducted animal experiments and analysis of clinical results. Here we report our UWEES technique and discuss the results with reference to specific cases.

The most common indication for UWEES is surgery for labyrinthine fistula of the semicircular canal, which is often necessary in cases of advanced cholesteatoma and chronic otitis media (Yamauchi 2014). The mastoid cavity or external auditory canal is filled completely with perfusate delivered via an endo-scrub lens cleaning sheath (Medtronic) covering a 0 or 30-degree, 2.7-mm-diameter, high-definition endoscope (Storz or Olympus). The island residual matrix is exfoliated using a dissector and covered and/or plugged with temporal fascia, bone chips and bone paste endoscopically. The level of the saline is then reduced to just above the fascia by gentle suction, and more bone paste and fascia is applied for sufficient sealing closure.

Saline was used as the perfusate until 2016, but thereafter we employed artificial cerebrospinal fluid (CSF) (ARTCEREB, Otsuka Pharmaceutical Co., Ltd.). We consider that artificial CSF perfusate similar to perilymph is suitable for maintaining the physiological environment of the inner ear and facilitates better outcomes (Yamauchi 2021). We compare various perfusates for UWEES in model animals. The ABR threshold was not significantly changed after surgery when artificial CSF was used, but was significantly higher when saline was employed.

We also applied UWEES for cases of superior semicircular canal dehiscence syndrome (SCDS) (Yamauchi 2017). The membranous canal was transected to clearly observe the area of dehiscence and the plug. Although transient reversible hearing loss was observed, the final hearing outcomes were favorable after long-term follow-up (Kawamura 2022).

SP12-4**The Application of Artificial Intelligence (AI) on Cochlear Implant (CI)****Lieber P. H. Li^{1,2}, An-Suey Shiao^{1,2}***¹Department of Otolaryngology, Cheng Hsin General Hospital, Taipei, Taiwan, ²Faculty of Medicine and Institute of Brain Science, National Yang Ming Chiao Tung University, Taipei, Taiwan*

The application of Artificial Intelligence (AI) in the field of clinical Otorhinolaryngology is emerging, which will be the key issue to the success of smart health and precision medicine. The trend indicated by the evolution of brain-computer interface (BCI) in early 21st century predicted the vision for the widespread application of AI in clinical medicine, and revealed the importance of neural plasticity as a bridge between human brain and AI. The problem of AI, however, resided in the fact that Artificial Intelligence could go wrong and become Artificial Ignorance especially when the clinical issue to be resolved remained not clear enough. Results and conclusions of researches by the Cochlear Implant (CI) team of Cheng Hsin General Hospital in recent years on the application of AI on CI in terms of noise reduction and music appraisal will be presented.

Special Program 12 Innovative Medicine on Otology

SP12-5

Holography guided exoscopic surgery

Taku Ito

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Background:

Holography is an innovative technology that depicts an effective interaction of humans with the digital world. Three-dimensional (3D) holograms based on individual patient's medical image data is now widely available and indispensable for accurate and safe surgery. We explored the use of patient-specific 3D temporal bone holograms for intra-operative surgical guide.

Methods:

We processed the patient's DICOM images by segmenting the external ear canal, bone, ossicles, and jugular vein using threshold segmentation technique. Facial nerve, cochlea, and semicircular canals were manually outlined if required. The 3D organ modeling was converted into STL files as viewed through mixed reality headset, HoloLens (Microsoft, Seattle, WA, USA). Cochlear implants were performed by the retroauricular approach using the ORBEYE exoscope. 3D holograms were aligned by registration marker displayed on the 4K 3D monitor.

Results:

3D hologram through HoloLens guided the surgeon in the right direction of the bone drilling and assisted in comprehending the spatial relationship among facial nerve, semicircular canal, and round window. It did not require extensive or expensive equipment.

Conclusions:

Holographic image-guided temporal bone surgery using wearable holographic computer provided better spatial recognition of invisible vital structures inside the temporal bone. 3D hologram has good compatibility with 4K 3D monitor of ORBEYE. This platform holds the promise of innovative adjunctive surgical instrument.

Special Program 13 Sensorineural Hearing Loss and Tinnitus

SP13-1

How effect is counseling prior to surgery for both middle ear diseases and tinnitus?

Sho Kanzaki

Keio University, Tokyo, Japan

The management of patients with tinnitus who receive middle ear surgery has not been established. In Japanese tinnitus guideline there is no description regarding middle ear disease accompanied with conductive hearing loss and tinnitus. We propose that surgical treatment (hearing recovery surgery) combined with counseling are useful for patients with middle ear disease and tinnitus.

Purpose: The aim of this study is (1) how many patients who receive middle ear surgery have tinnitus and (2) how educational counselling and middle ear surgery is effective with consistent tinnitus.

Subjects and methods: Twenty four cases out of 90 cases accounted for 26.7% of the middle ear diseases scheduled for surgery in the past two years. Of the 42 patients with hearing loss in the second year, 14 had consistent and intermittent tinnitus. Among them we have 6 patients complaining consistent tinnitus and we examined the change in the Tinnitus Handicap Inventory (THI) for patients with tinnitus before and after surgery.

Results: Ten out of 13 cases (about 76.9%) reported that postoperative tinnitus improved. THI score in two cases showed worse.

Conclusions and significance: Two cases showed worse THI in both mixed hearing loss cases with a small hearing improvement. The mechanism of improvement is similar to tinnitus retraining therapy including hearing aid because the increase in external sound input through hearing restoration after surgery to avoid silence.

SP13-2

Surgical management of sigmoid sinus associated pulsatile tinnitus

Jen-Tsung Lai, Chang-Wei Huang

Kuang-tien general hospital, Taichung, Taiwan

We will present several special managements of sigmoid sinus associated pulsatile tinntus.

1. sandwich technique for transmoid resurfacing method.
2. How to apply otologic navigation systems in identifying a dehiscence.
3. Compare the transauditory canal sound record preoperative and postoperative using a Toynbee stethoscope.

Special Program 13 Sensorineural Hearing Loss and Tinnitus

SP13-3

How to Manage Middle Ear Myoclonic Tinnitus: IT-Botox Injection & Middle Ear Tendon Resection

Shi Nae Park

The Catholic University of Korea, College of Medicine, Seoul, Korea

Middle ear myoclonic tinnitus (MEMT) has quite specific symptoms of crackling tinnitus. The rhythmic movement of two middle ear muscles causes this annoying symptom of middle ear myoclonic tinnitus and it can be diagnosed by otoendoscopic examination or impedance audiogram. Combinational medical therapy with anticonvulsants, anxiolytics as well as muscle relaxants for up to 3 months may induce complete resolution of tinnitus although non-responders need further intervention.

Since it is a type of tinnitus caused by movement of the muscles in the middle ear, intratympanic Botox injection (IT-Botox) has been applied to the patients as translational research after an animal experiment. Twenty-four patients who underwent IT-Botox injection were included to evaluate the efficacy and safety of this new therapy for MEMT. Complete resolution of the symptom has been observed in 25% of the patients and partial resolution was observed in 67% of the patients. Non-responders (8%) of IT-Botox or the patients who still complained of annoying tinnitus underwent middle ear tendon resection (METR).

Surgical results of METR have been published by our group back in 2017, demonstrating the complete resolution rate of the symptom in 92% of the patients with intractable MEMT. No specific side effects including hearing loss or hyperacusis after METR has been observed during their follow-up period. Video clips showing our techniques of IT-Botox and METR will be introduced with the tips of these interventional therapies for MEMT.

SP13-4

Update on Idiopathic Sudden Sensorineural Hearing Loss

Kyung Wook Heo

Inje University Busan Paik Hospital, Busan, Korea

Sudden hearing loss is a frightening symptom that often prompts an urgent or emergent visit to a health care provider. It is frequently but not universally accompanied by tinnitus and/or vertigo. Sudden sensorineural hearing loss (SSNHL) affects 5 to 27 per 100,000 people annually, with about 66,000 new cases per year in the United States. SSNHL has defined as a rapid decline (less than 3 days) of more than 30 dB sensorineural hearing loss in at least three contiguous frequencies without any identifiable cause. Those cases with an identifiable cause are referred to non-idiopathic SSNHL. SSNHL may be classified as primary SSNHL and secondary SSNHL. Primary SSNHL has three proposed major etiologies, namely viral infection, vascular insufficiency, and autoimmune disorder. It has also been hypothesized that pathologic activation of the cellular stress pathway involving nuclear factor kappa B within the cochlea could develop primary SSNHL. In secondary SSNHL, causes include neoplasm, stroke, and irradiation, after excluding those with acoustic trauma, head injury, Meniere's disease (MD), perilymph fistula, and ototoxicity. These excluding disorders initially mimic acute sensorineural hearing loss but finally manifest as different disease entities. Corticosteroids, antiviral agents, vasodilators, and hyperbaric oxygen therapy (HBOT) are the currently available treatment options for SSNHL, but their comparative efficacy is unclear. To date, the most widely used treatment for SSNHL is systemic and/or intratympanic corticosteroids. As another option, HBOT is a treatment that may relieve edema and ischemia by administering high-pressure oxygen into the inner ear to restore hearing. This presentation would provide an overview of the different causes and differential diagnosis of the different types of SSNHL as reported in the existing literature. An inner ear test battery in SSNHL patients helps determine its etiology, and provides comprehensive information on the affected territory to assess the involvement severity in the inner ear.

Special Program 13 Sensorineural Hearing Loss and Tinnitus**SP13-5****Long-term Speech Perception Outcome in Mandarin Speaking Post-lingual SNHL Deaf Adult After Cochlear implant**Lin Hung-Ching^{1,2}, Pei-Hsuan Ho²¹Department of Otolaryngology, Mackay Medical College, Taipei, Taiwan, ²Department of Audiology and Speech Language Pathology, Mackay Medical College, Taipei, Taiwan

Aim of study: To assess long-term (post-CI > 24 months) outcome of speech perception in Mandarin speaking post-lingual deaf adult after cochlear implant and probe those factors affecting results.

Material and methods: 52 adults CI recipients since 1995 to 2019 were recruited in one tertiary medical center. Objective outcome measure included close set (vowel sound and consonant sound discrimination) and open set (disyllable word and monosyllable word recognition). Subjective outcome evaluation had CAP & SIR.

Results: Duration of deafness had negatively correlated with vowel discrimination, consonant sound discrimination, disyllable word and monosyllable word recognition.

There were no significant difference among disyllable word and monosyllable word recognition between elder (> 65 Y/O) adult CI recipients and younger adult CI recipients.

Conclusion: Shorter duration of bilateral profound deafness among Mandarin speaking post-lingual deaf adult after cochlear implant can have good speech perception. Elder (> 65 Y/O) bilateral profound deaf adults still can have potential benefits of open-set speech perception after CI.

SP13-6**Animal study for the relationship between cochlear synaptopathy and tinnitus**

Kunio Mizutani, Katsuki Niwa, Takaomi Kurioka, Akihiro Shiotani

National Defense Medical College, Tokorozawa, Japan

Objective: Tinnitus is a phantom auditory sensation, which is mainly triggered by dysfunction of the peripheral auditory organ, such as cochlear disorders. Additionally, the central nervous system, specifically the limbic system, plays a crucial role in the generation and exacerbation of tinnitus. Therefore, to analyze the hypothesis that tinnitus has strong and specific association with the plastic changes in the limbic system, we assessed the neuronal plastic changes in the limbic system, including the hippocampus and the amygdala, in rats with single-sided tinnitus.

Methods: The cochlear damage was achieved by irradiating the cochlea with laser-induced shock wave (LISW). While both hearing loss and tinnitus were confirmed after exposure of rats to LISW, the degree of tinnitus was objectively measured using gap detection behavioral tests. Following the generation of hearing loss and tinnitus, plastic changes in the neurons of the limbic system were confirmed using a molecular marker (activity regulated cytoskeleton-associated protein; Arc).

Results: While the expression level of Arc-positive cells in the hippocampal CA1 showed an obvious increase in the hearing loss and tinnitus groups, a significant difference was found between the tinnitus and the control groups. In the dentate gyrus, although the largest number of Arc-positive cells was observed in the tinnitus group, there were no significant differences between the numbers of cells in the hearing loss and tinnitus groups compared to that in the control group.

Conclusion: Although a significant increase of Arc-positive cells in the hippocampal CA1 was observed between the tinnitus group and control, no obvious tendencies of Arc-positive cells in the limbic system were observed between the rats with and without tinnitus behavior.

Sponsored Session 1

Considerations in CI performance -factors contributing to a lifetime of hearing performance

SS01-1

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SS01-2

David R Friedmann

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Cochlear implants offer a unique opportunity for patients with poor speech discrimination who no longer benefit from hearing aids to hear and to remain engaged in society and life. Once identified as CI candidate there are a number of patient, device and surgical factors that are often considered as influencing a patient's outcomes with their CI. There are pre-operative factors such as age, duration of HL, progression of HL, audiometric thresholds etc that have been shown to be factors correlated to outcomes with CI, with shorter duration of HL (or implanting earlier) being recognised as one of the main factors contributing to improved outcomes. Considering that cochlear implants are intended to support a lifetime of hearing for patients, and that all CI patients will rely on their implants and electrical stimulation to hear over their lifetime, it's important to also understand the role that surgical and device factors play in supporting a patient's lifetime of hearing performance.

We review and discuss these factors and present a concept showing how, apart from contributing individually, these factors also have dependencies on each other and so potentially provide an additive effect when considering performance and outcomes over a patient's lifetime. We will also discuss and present data on the role of residual hearing in cochlear implantation. Concerns about residual hearing and the growing focus on short term audiometric outcomes sometimes distract from the benefits provided by cochlear implant, so reflecting on the who, how and why of preserving residual hearing, relative to preserving cochlea health and long-term patient outcomes with electrical stimulation, is an important area of clinical education and guidance.

Sponsored Session 2**SS02-1****Transcanal Endoscopic Ear Surgery (TEES) - Tips and Pitfalls -****Kunio Mizutari***Department of Otolaryngology, National Defense Medical College, Saitama, Japan*

In recent years, the use of endoscopes in otologic surgery has become common, and transcanal endoscopic ear surgery (TEES) is now being performed at institutions throughout Japan. TEES is applicable to various middle ear diseases because it allows observation and treatment at a magnification rate higher than that of a microscope with a wider field of view, but it has been pointed out as a disadvantage that it is difficult to use a drill, which is commonly used in otologic surgery under a microscope. To overcome this disadvantage, "powered TEES" using energy devices was established (Kakehata S, et al., *Otol Neurotol.* 2014;35:101-7.), and its application to relatively advanced cholesteatoma cases has been expanded. The most common device used for Powered TEES is a curved bar attachment with a non-rotating shaft at the end of a standard electric drill handpiece. The non-rotating bar has many merits, such as no skin entrapment, but the biggest problem is that the bar attachment does not come with an irrigation system for cooling and cleaning the drilling surface. To overcome this disadvantage, underwater endoscopic ear surgery (UWEES), which uses the endoscope cleaning system as a saline irrigation system in the ear canal, was developed (Yamauchi D, et al., *Laryngoscope.* 2014;124:2616-8.). The problems of heating the cutting surface and bone dust treatment by the curved bar were solved, and the curved bar could be used more easily. In particular, hydro-mastoidectomy, which enables mastoidectomy with a curved bar, was established to further expand the transcanal attico-antrotomy (Nishiike S, et al., *J Laryngol Otol.* 2019;133:248-250.). The indications for TEES have been further expanded.

In this seminar, I will explain the system and basic techniques necessary to perform TEES as clearly as possible for beginners. In addition, pitfalls and solutions that are likely to occur in surgeons with some experience in TEES will be explained as much as possible. In addition, UWEES using a new curved bar with an irrigation system, which has become recently available, will be demonstrated.

FP1-1

Usefulness of CT images reformatted in Poschl or Stenvers plane on SSCD

Taro Takanami, Mitsuya Suzuki

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Objective: Computed Tomography is an effective imaging method in the diagnosis of superior semicircular canal dehiscence. The aims of this study were: ① to show that reformat images are more accurate than standard planes for a diagnosis of SSCD, and ② to determine the prevalence of SSCD in Japan.

Methods: The present retrospective review examined 1,569 temporal CT scans performed in our department for any reason. Standard axial and coronal images revealed SSCD in 99 patients: 6.3%. We additionally analyzed reformatted Poschl and Stenvers images for the presence or absence of dehiscence, using the medical image processing software ZioStation2. Of the 99 cases, 25 patients:1.6% had SSCD in the Poschl plane, and 74 patients: 4.7% had SSCD in the Stenvers plane.

We defined 3 groups as follows:

Group 1: positive for SSCD in both Poschl and Stenvers planes: 25 patients

Group 2: positive only in the Stenvers plane :49 patients

Group 3: negative in both Poschl and Stenvers planes :25 patients

There was no positive only in the Poschl plane.

We also evaluated the following

①the feeling of ear fullness

②air bone gaps: AB GAP

③the feeling of dizziness

④cervical Vestibular Evoked Myogenic Potential: cVEMP

A comparative study was conducted to analyze the correlation between an SSCD diagnosis and to compare with findings in the reformatted images in Stenvers or Poschel plane.

Results: Ear fullness, dizziness, and AB Gap, were reported in twice as many people in group 1 than in the other groups. Further, patients positive for cVEMP were found only in Groups 1 and 2. The results suggest reconstruction image is useful for the final definitive diagnosis. Reformatted images on the plane of Poschl were highly specific reconstruction images and contributed to the final, definitive diagnosis, and the Stenvers images were more accurate than standard planes for detecting SSCD.

Conclusions: Standard planes can cause false-positive diagnoses of SSCD. The Stenvers plane can increase the positive predictive value for diagnosing SSCD, and the Poschl plane can significantly increase specificity for the final, definitive diagnosis.

FP1-2

A review of 10 cases of endolymphatic sac surgery performed at our hospital

Fumihiro Mochizuki, Yusuke Ito, Manabu Komori

St.Marianna University of Medicine Hospital, Kawasaki, Japan

About 80% of patients with Meniere's disease will improve with conservative treatment, but the remaining 20% will have recurrent attacks of vertigo, worsening hearing, and increased tinnitus. In such cases, surgical treatment should be considered without delay. Surgical treatment can be broadly divided into two types: functional improvement surgery, which aims to control vertigo attacks by improving the inner ear environment, and vestibular disruption surgery, which aims to free the patient from vertigo by abolishing vestibular function. Endolymphatic sac surgery is a function-improving procedure.

We will introduce cases in which endolymphatic sac surgery was indicated, and present the short-term results of endolymphatic sacotomy on vertigo attacks and hearing changes.

Free Paper 1 Vestibular Disorder**FP1-3****cVEMP may contribute to the differentiation between vestibular migraine and Meniere's diseases****Takaki Inui, Shin-Ichi Haginomori, Tatsyri Kuriyama, Yusuke Ayani, Ryo Kawata***Department of Otorhinolaryngology - Head & Neck Surgery, Osaka Medical and Pharmaceutical University, Takatsuki, Japan*

[Purpose] Vestibular migraine (VM) and Meniere's diseases (MD) are both characterized by recurrent, episodic vertigo. It is sometimes difficult to differentiate VM and MD if vertigo is not associated with migrainous headache or hearing loss.

[Methods] We evaluated the results of vestibular examinations to differentiate VM and MD. The medical records of 23 patients were reviewed retrospectively; 12 diagnosed as having definite VM and 11 definite MD.

[Results and Discussion] Although there was no statistical difference at the incidence of canal paresis in caloric test between VM and MD, the asymmetry ratio (AR) of cervical vestibular evoked myogenic potentials (cVEMP) using 500 Hz short-tone burst stimuli was significantly higher in MD patients than that in VM ($p=0.04$, Fisher's exact probability test). The tuning properties in 500 Hz and 1,000 Hz short-tone burst stimuli of cVEMP tends to shift to a higher frequency in affected ears of MD patients than that in VM although the difference was not significant ($p=0.12$, Welch's t test). These differences can be explained by the report that severe endolymphatic hydrops was observed most frequently in saccule in the inner ear in the pathological investigation of temporal bone of patients with MD (Okuno and Sando, 1987).

[Conclusions] The present study indicate that the evaluation of dysfunctions in saccule, especially the AR in cVEMP may be helpful in the differential diagnosis between VM and MD.

FP1-4**Group Vestibular Rehabilitation Program: A Cost-Effective Treatment Option for Dizzy Patients****Jae Sang Han¹, Jung Mee Park², Yeonji Kim¹, Jae Hyun Seo¹, So Young Park¹, Shi Nae Park¹***¹Department of Otorhinolaryngology-Head and Neck Surgery, College of Medicine, The Catholic University of Korea, Seoul, Korea,**²Department of Otorhinolaryngology-Head and Neck Surgery, Gangneung Asan Hospital, College of Medicine University of Ulsan, Gangneung, Korea*

[Purpose] This study was performed to evaluate the effectiveness of group vestibular rehabilitation therapy (G-VRT) and to analyze the factors affecting outcomes.

[Methods] Medical records of 64 patients with persistent dizziness who received G-VRT in territory medical center between December 2019 and December 2020 were analyzed retrospectively. All patients received a modified version of Dr. Goto's G-VRT(1hr) by an ENT specialist, which consists of vestibulo-ocular training, static and dynamic training and a short lecture as a small group of 3 to 10 patients. All patients were encouraged to conduct VRT program 3 times a day for first 3 months with a daily recording of their performance in a provided diary. Dizziness handicap inventory(DHI), vestibular visual analog scale (VVAS), and functional level scales (FLS) as well as the compliance of the program were evaluated 3 months after G-VRT.

[Results and discussion] All scores of dizziness questionnaire were significantly improved after G-VRT; scores of DHI from 41.3 ± 20.2 to 23.5 ± 22.2 ($P < .001$), VVAS of dizziness from 4.9 ± 2.2 to 3.4 ± 2.2 ($P < .001$), VVAS of imbalance from 4.3 ± 2.5 to 32.2 ± 2.5 ($P < .001$) and FLS from 3.3 ± 1.0 to 2.5 ± 1.1 ($P < .001$), respectively. Patients with the higher DHI score showed the better therapeutic effect ($P < 0.05$). The average PR scores of all three semicircular canals significantly decreased from $16.7 (\pm 13.6)$ to $13.2 (\pm 15.3)$ ($P=0.03$).

[Conclusion] Considering its good therapeutic efficacy of G-VRT, we propose that it could be a good rehabilitation modality for dizzy patients. Further case-control studies in a larger group as well as comparative studies with generic or customized vestibular exercise will be needed to validate the clinical value of G-VRT.

FP1-5**Vestibular Function Assessment using Machine Learning and Wearable Sensors****Kuan-Chung Ting^{1,4,5}, Kai-Chun Liu², Yu-Chieh Lin³, Chia-Tai Chan³, Yu Tsao²**

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Purpose

The test of videonystagmography (VNG) is time-consuming, and the equipment is not common in primary clinics. The caloric test can induce discomfort for people with normal vestibular function. Other assessment approaches, such as Romberg test and Fukuda stepping test, for vestibular disorders are easy to perform in the primary clinics and inexpensive way. However, these balance tests rely on physicians' interpretation and are limited to lower reliability and sensitivity. We aim to propose an automatic vestibular function assessment system using wearable sensors and machine learning algorithms to support clinical evaluation and diagnosis.

Methods

Patients with peripheral type vertigo who visit ENT out-patient department are invited to join the study. All participants, at least 20 years of age, are received VNG and cervical vestibular evoked myogenic potential. Then they performed the Romberg, Tandem Romberg, Fukuda stepping, and tandem gait tests while wearing inertial sensors (APDM Inc.) on the forehead, waist, and bilateral ankles. Various kinematic features are extracted from the pre-processed segments of tests. The features with statistically significant parameters input four machine learning classifiers to detect vestibular hypofunction, including Support Vector Machine (SVM), Naive Bayes (NB), adaptive boosting (AdaBoost), and Random Forest (RF).

Results and discussion

This cross-sectional study was conducted on 20 adults with peripheral vertigo with a mean age of 35 years from a tertiary and academic medical center between March 2021 and November 2021. The control group had 16 participants with a mean age of 31 years. The Attenuation Coefficients of accelerations in crano-caudal axes of Fukuda stepping test between high body level and low body level, and the maximum accelerations in medio-lateral axes of eye close Romberg test are strong significant than the control group. For ML-based vestibular hypofunction detection, the proof-of-concept prototype using AdaBoost can achieve accuracy 80.6%, precision 82.4%, sensitivity 82.4%, and F1-score 82.4%. When all strong significant parameters are added, NB has the best result, with accuracy 83.3%, precision 88.9%, sensitivity 80.0%, and F1-score 84.2%.

Conclusions

The proposed approach has the potential to provide efficient examination tools for vestibular function assessment, not only helping clinicians enhance diagnostic accuracy but also developing telemedicine during the pandemic.

FP1-6**Diagnoses and treatment result for clinical types of Benign Paroxysmal Positional Vertigo****Delgerzaya Enkhtaivan¹, Jargalkhuu Erdenechuluun¹, Tergel Nayanjin¹, Baigal Minjuur¹, Sainbileg Chadraabal¹, Erdenechimeg Batbayar¹, Batkhisig Baasanbat¹, Tovuudorj Avirmed², Koo Ja Won³**

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Objective: To compare the clinical characteristics and treatment results of different clinical types of BPPV.

Methods: A total of 162 patients, who were diagnosed with BPPV between 2019 to 2021 at EMJJ ENT hospital's vestibular laboratory in Mongolia, were included in our study. The diagnosis of BPPV was made according to the 2017 AAO-HNS clinical practice guideline of BPPV. The clinical questionnaire, DHI questionnaire was taken, and videonystagmography was done in all patients. **Treatment:** We did with the posterior canal (PC) BPPV-Epley, the horizontal canal (HC) - BBQ roll, and the anterior canal (AC) -Yacovino maneuver. We evaluated the treatment results at 7, 14, and 30 days after.

Results: From a total of 162 patients, 62.4% had PC BPPV, 27.1% had HC BPPV, and 10.5% had AC BPPV. From the HC BPPV, 47.7% were geotropic, 52.3% were apotropic. There were 3.1% of multiple canals AC, which all included PC BPPV. The right side 59.3% was affected more than left 37% (p=.000), 2 cases (1.2%) of bilateral BPPV, and in 4 cases (2.4%), which were all AC BPPV, the side of the BPPV was not determined. The mean age was 50±11.7, the male to female ratio 1:4. When the relationship between the effectiveness and duration of the treatment was assessed, 123 (75.9%) recovered after 7 days. After 14 days, 29 (5.4%) recovered, 8 (4.9%) did not recover, and 2 (1.2%) canal conversion. After 30 days, 9 (5.4%) recovered and 1 (0.6%) did not recover. At the end of the study, out of a total of 162 people, 161 (99.4%) were successfully treated and 1 (0.6%) did not recover. When comparing treatment success rates of clinical types, 7 days later PC 77.2%, HC 77.29%, AC 64.7% (p=.064), 14 days after PC 75%, HC 70%, AC 85.7% (p=.477) and 30 days after PC 83.3%, HC 100%, AC 100% (p=.488). When comparing DHI score after the treatment to before treatment using paired-t-test (p= .000).

Discussion: The treatment success rate was 99.4% and most of them (75.9%) were successfully treated with repositioning maneuver alone at 7 days. There was no difference between clinical types regarding treatment success rate, ranging from 67% to 100%.

Conclusion: Patients who had a longer duration of symptoms underwent unnecessary diagnostic tests and develop additional psychologic problems. When we compared the characteristics and treatment between the three clinical types of BPPV there was no statistically significant difference.

Free Paper 1 Vestibular Disorder**FP1-7****A Reliability Analysis of Upright Head Roll Test for Lateral Semicircular Canal BPPV****Jae-Hyun Seo¹, Jae Sang Han¹, Jae Hong Han¹, Min Ju Kang¹, So-Hyun Kim¹, Dong-Hee Lee², Shi Nae Park¹, Kyoung-Ho Park¹**¹Department of Otolaryngology Head & Neck Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea, ²Department of Otolaryngology Head & Neck Surgery, Uijongbu St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Uijongbu-si, Korea

Objectives: The upright head roll test (UHRT), which observes nystagmus caused by head rotations in the roll plane in the upright sitting position, is a novel diagnostic maneuver for lateral semicircular canal benign paroxysmal positional vertigo (LSC-BPPV). The aim of this study is to assess the efficacy of the UHRT for proper determination of the subtype of LSC-BPPV by comparing the supine head roll test (SHRT).

Methods: Between January 2014 and June 2021, we screened 1452 videonystagmography with abnormal UHRT or SHRT results. After the screening, a total of 827 cases were analysed retrospectively.

Results: A total of 232 (28.1%) cases showed direction-changing nystagmus (DCPN) on SHRT or UHRT, and 595 (71.9%) results were not. Compared with SHRT, the sensitivity of UHRT was 72.2% and the specificity was 97.9%, which showed substantial reliability. (Cohen's kappa = 0.75) The percent agreement of the two tests for differential diagnosis of LSC-BPPV variants was 93.7 %, and the inter-test reliability was 'almost perfect'. (Cohen's kappa = 0.84). However, the reliability of determining the pathologic side between the two tests was 'fair'. (Cohen's kappa: canalolithiasis = 0.28, cupulolithiasis = 0.27) The intensity of nystagmus in UHRT was relatively weaker than in SHRT. (P < .001).

Conclusion: UHRT is a reliable test for diagnosing LSC-BPPV and distinguishing the subtypes. However, the limitation of UHRT was revealed in discriminating the affected side due to weaker intensity of nystagmus than SHRT. Therefore, additional maneuvers should be considered to differentiate the affected side.

FP1-8**The effect of osteoporotic drugs on the changes of otoconial layer in ovariectomized mice****Takahiro Nakata, Eriko Nishihara, Masahiro Okada, Naohito Hato***Ehime University Graduate School of Medicine, Toon, Japan*

[Purpose] Benign paroxysmal positional vertigo (BPPV) is one of the most common peripheral vestibular diseases. In animal model, estrogen deficiency caused by bilateral ovariectomy (OVX) has been reported to lead to morphological changes in otoconia. In addition, it has been reported that the occurrence and/or recurrence of BPPV is associated with osteopenia/osteoporosis. Therefore, it is suggested that peri-menopause conditions that cause deterioration of serum levels of estrogen are primarily responsible for the disturbance of calcium metabolism and may induce changes in otolith organs. In this study, we investigated the effect of osteoporotic drugs on the changes of otoconial layer in OVX mice.

[Methods] Ovariectomy (OVX) or sham operation was performed at 8 weeks old female C57BL/6J mice. In sham operation, ovaries were recognized visually and not ovariectomized. Estrogen (17beta-estradiol), selective estrogen receptor modulator (SERM), or placebo was administered subcutaneously to OVX mice. Four weeks after surgery, the femurs underwent bone mass density (BMD) measurements. The volume of the utricle otoconial layer was measured using micro-CT scan images.

[Results] BMD of femur was significantly decreased after OVX. Administration of estrogen or SERM prevented the deterioration of BMD. The volume of otoconial layer was significantly increased in the OVX group compared to sham. This morphological changes of otoconial layer were not seen in estrogen and SERM group.

[Conclusions] The changes of otoconial layer after OVX was prevented by the administration of estrogen or SERM. These results suggest that these osteoporotic drugs may be effective for occurrence/recurrence of BPPV.

Effect of defective bone calcium metabolism on otolith formation in zebrafish

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[Background] Benign paroxysmal positional vertigo (BPPV) is the most frequent peripheral vertigo disorder. It occurs more frequently in the elderly and is more common in women. The reason for this is thought to be related to the decrease in female hormones associated with menopause. Low female hormone levels affect bone and calcium metabolism, leading to bone loss and osteoporosis. A similar condition may occur in the formation of otoliths, which are composed of calcium carbonate, fibrous and proteins. In other words, it is speculated that osteoporosis patients may have immature otolith formation, which may cause otoliths to detach easily from macula. In fact, previous reports that observed otoliths in osteoporosis model mice have reported changes in otolith density and size.

We used zebrafish for several reasons. They are easy to breed, easy to exposure drugs, and the larvae are transparent, so otoliths can be observed from the body surface. In addition, zebrafish have a semicircular canal just like humans. They have two otolith organs, saccule and utricle. However, unlike mammals, which have countless otoliths, they have only one otolith for each. They have no cochlea, and it is thought that auditory perception occurs in the saccule and postural equilibrium perception occurs in the utricle.

[Purpose] In the present study, we investigated the effect of drugs that causes abnormal calcium metabolism on otoliths formation of zebrafish embryos.

[Methods] Since hair cells and otoliths can already be identified morphologically at the first day post-fertilization (dpf), we started the drug (dexamethasone and cadmium) exposure at 2dpf and checked otoliths at 5dpf and 8dpf. In addition, we dissolved whole zebrafish larvae to measure the calcium concentration instead of measuring the bone mass of them.

[Results] The otoliths in the utricle were significantly larger in larvae exposed to dexamethasone compared to the control group. Cadmium-exposed larvae had significantly smaller otoliths in both the saccule and utricle. Calcium levels were 82% of control in the dexamethasone group and 41% of control in the cadmium group.

[Discussion] These results suggested that the pathology causing abnormal bone and calcium metabolism affected otolith formation as well as bone loss. We need further studies to reveal the association between immature otoliths formation and the ease of detachment from macula.

Free Paper 2 Auditory Implants

FP2-1

Cochlear Implant Surgery in the Elderly

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There are many problems associated with cochlear implant surgery in the elderly. The first is a delay in intervention for hearing loss, which results in insufficient information reaching those eligible for surgery. Furthermore, many people are resistant to the invasiveness of surgery. These issues need to be improved through educational activities on cochlear implant surgery. On the other hand, the actual surgery differs from that of younger patients in that many of them have pre-existing diseases. In addition, there is data showing that the older the patient is, the worse the results are. This paper will discuss the surgical cases at our hospital, their backgrounds, surgical techniques, devices, and outcomes.

FP2-2

Cochlear Implantation Outcomes in Patients with Auditory Neuropathy Spectrum DisorderPei-Hsuan Lin^{1,2}, Tien-Chen Liu¹, Chuan-Jen Hsu^{1,3}, Hung-Pin Wu³, Che-Ming Wu⁴, Chen-Chi Wu¹*¹Department of Otolaryngology, National Taiwan University Hospital, Taipei, Taiwan, ²Department of Otolaryngology, National Taiwan University Hospital Yunlin Branch, Yunlin, Taiwan, ³Department of Otolaryngology Head and Neck Surgery, Taichung Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Taichung, Taiwan, ⁴Department of Otolaryngology-Head and Neck Surgery, Chang Gung Memorial Hospital, Chang Gung University, Linkou, Taiwan*

[Purpose]

With diverse etiologies and clinical features of auditory neuropathy, the management is often challenging and the outcomes with cochlear implants (CIs) are variable. This study aimed to investigate the CI outcomes in auditory neuropathy spectrum disorder patients with different etiologies.

[Methods]

Thirty-six patients (50 ears) with ANSD who received CI between 2000 and 2021 were included in our cohort. Medical histories were ascertained, and imaging studies and genetic examinations were performed for etiology analyses. Serial behavioral and speech audiometries were performed after the surgery, and CI outcomes were evaluated using both the Categories of Auditory Performance (CAP) and Speech Intelligibility Rating (SIR) scores.

[Results]

By etiology analysis, 18 patients (27 ears), 1 patient (1 ear), 1 patient (2 ears), 1 patient (1 ear), and 10 patients (12 ears) were confirmed to have bi-allelic *OTOF* mutations, *WFS1* mutation, *OPA1* mutation, prematurity, and cochlear nerve deficiency (CND), respectively. Five patients (7 ears) were found without definite etiologies. The first ears were implanted at 3.9±4.9y. The aided behavioral thresholds improved in all patients after the surgery with an average of 28.9±8.4 dB, and the speech audiometry yielded good results in most of the patients. The median CAP and SIR scores of all patients were 5 and 3, respectively. Patients with *OTOF*, *WFS1*, and *OPA1* showed good outcomes with CAP and SIR scores 6-7 and 3-5, respectively, while patients with CND revealed suboptimal CAP and SIR scores (2-5 and 1-3, respectively).

[Conclusions]

Aided hearing thresholds improved in all patients, however, the speech performance varied. Good CI outcomes were observed in patients with selected etiologies of ANSD, particularly patients with *OTOF*, *WFS1*, and *OPA1* mutations. Patients with CND have suboptimal outcomes after the surgery. Identifying etiologies in ANSD patients is crucial before surgery and can aid in prognosis prediction.

FP2-3**Comprehensive Prediction Model, Including Genetic Testing, for the Outcomes of Cochlear Implantation****Ji Hyuk Han¹, Sung Huhn Kim^{1,2}, In Seok Moon^{1,2}, Sun Young Joo^{2,3}, Jung Ah Kim^{2,3}, Heon Yung Gee^{2,3}, Jinsei Jung^{1,2}, Jae Young Choi^{1,2}**

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Background: Despite growing interest in the genetic contribution to cochlear implantation outcomes, only few studies with limited samples have examined the association of cochlear implantation outcomes with genetic etiologies. We analyzed cochlear implantation outcomes using known predictors and genetic testing results to obtain a comprehensive understanding of the impact of genetic etiologies.

Method: We retrospectively reviewed the medical records and images of patients who underwent cochlear implantation and genetic testing at a single tertiary medical institution, between May 2008 and December 2020. After excluding those whose speech test results were unavailable, and those in whom the implant was removed due to complications, such as infection or device failure, 203 patients were included in this study. The participants were categorized into adult (≥ 19 years), child (2–18 years), and infant (< 24 months) groups. Outcomes were measured based on Categories of Auditory Perception, monosyllable, disyllable, and sentence scores. For the infant group, the Infant–Toddler Meaningful Auditory Integration Scale score was used.

Results: Among the 203 participants, a causative genetic variant was identified in 117 (57.6%) individuals. The presence of a causative variant was significantly associated with better cochlear implantation outcomes in the infant group ($\beta = 0.23$; 95% confidence interval, 0.01 to 0.47; p -value = 0.044), but not in the child and adult groups. In the genetically confirmed patients without cochlear malformation, genetic variants involving the spiral ganglion was a poor prognostic factor in the child group ($\beta = -57.24$; 95% confidence interval, -90.63 to -23.75; p -value = 0.004).

Conclusions: The presence of known genetic etiology of hearing loss was associated with better cochlear implantation outcomes in the infant group, but not in the child and adult groups. A neural-type genetic variant was a poor prognostic factor in the genetically diagnosed child subgroup without cochlear malformation. Careful genetic counseling should be performed before cochlear implantation.

FP2-4**Simultaneous cochlear implant after resection of intracochlear schwannoma in NF2 patients****Zhihua Zhang^{1,2,3}, Jianqing Chen^{1,2,3}, Huan Jia^{1,2,3}, Wan Zhaoyan^{1,2,3}, Hao Wu^{1,2,3}**

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Objective: Intracochlear schwannomas (ICS) are uncommon tumors in Neurofibromatosis type 2 (NF2) and are mainly associated with multiple internal auditory meatus (IAM) and cerebellopontine angle (CPA) tumors. They usually induce profound hearing loss which can be rehabilitated by cochlear implantation (CI). The aim of this study was to analyze the long-term outcomes of CI during the unpredictable evolution of NF2 disease.

Patients and Methods: Two ears (two patients) with intracochlear schwannomas that underwent CI at a single tertiary referral center. Their clinical data, imaging, and surgical findings were analyzed.

Results: Two ears (Two patients) were implanted with CI. Two patients were with NF2 having transmodiolar invasion of the inner ear from a vestibular schwannoma (VS). In these two cases, intracochlear tumor was removed with basal membrane intact and a full electrode insertion was achieved. In both cases, the ipsilateral internal auditory canal and inner ear could be visualized on postoperative magnetic resonance imaging (MRI) for tumor surveillance. The postoperative cochlear implant performance and hearing outcome are satisfactory.

Conclusions: Surgical removal of an intracochlear schwannomas through a partial cochleostomy with cochlear implantation in a single-stage procedure is feasible in NF2 patients. Postoperative MRI surveillance is still adequate after CI and patients could achieve good open-set speech perception performance.

Free Paper 2 Auditory Implants

FP2-5

Evaluation of the bone marrow area around the mastoid cavity of the infants

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Because there is growing evidence that the superior language outcomes are obtained with early cochlear implantation (CI) than prolonged hearing deprivation, CI surgery should be performed at lower ages if the general body conditions allow for the anesthesia and surgery. In case of Japan, the new application criteria for CI (2014) decreased the minimum ages of the patients for CI surgery from 1 year and a half to one year old. On the other hand, the CI surgery for the younger infants needs the dissection of the mastoid cavity surrounded by the bone marrow. For the CI surgeons, the temporal bone dissection surrounded by the bone marrow may be stressful because of not only the loss of blood, but also the increased surgical risks derived from the narrow operative field. To investigate the normal development of the bone marrow, the hearing-impaired infants who underwent the computed tomography (CT) were extracted, and then the areas of both the bone marrow and the aeration in the temporal bones of the infants were measured by ImageJ. Our findings revealed that the area of bone marrow had the negative correlation with the months after birth ($r=-0.55$, $p=0.00019$), and the area of aeration had the positive correlation with the months after birth ($r=0.78$, $p=1.9E-09$). In conclusion, the earlier CI surgery increases the chances of dissection into the bone marrow, therefore, it is required to plan the timing of surgery considering both the body conditions and speech development. Temporal bone CT should be considered for the candidate of early CI surgery.

FP2-6

Auditory brainstem implant for congenital hearing loss: preliminary results of 50 casesHao Wu^{1,2,3}, Huan Jia^{1,2,3}, Zhihua Zhang^{1,2,3}, Yun Li^{1,2,3}*¹Department of Otolaryngology, Head & Neck Surgery, Shanghai Ninth People's Hospital, affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China, ²Ear Institute, Shanghai Jiaotong University School of Medicine, Shanghai, China, ³Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases (14DZ2260300), Shanghai, China*

Aim: To describe the current situation and outcomes of pediatric auditory brainstem implant (ABI) in young children with congenital deafness in china mainland.

Material and Methods: Retrospective study from a cohort of pediatric ABI surgery by the Neurotology team of Shanghai Ninth People's Hospital. All cases operated between January 2019 to January 2022 were included. The general medical data, inner ear /auditory nerve malformation type, audiological results and surgical results were collected.

Results: 50 cases were studied, with mean age at ABI surgery 3.3 ± 1.4 years, 23 males and 27 females, and 45 in right side and 5 in the left. Their radiological assessments of operated side revealed 6 Michel deformity, 11 rudimentary otocyst, 19 cochlear aplasia, 3 cochlear hypoplasia, 11 cochlear aperture abnormalities. The interne auditory canal was narrow in 17 ears, and absent (facial canal) in 12 ears. All ABI surgery were successfully performed, without severe post-operative complications, but 1 CSF leakage with surgical management at 1 month later, and another electrode array displacement with revision surgery at six months later. Mean follow-up duration was 14.3 ± 8.5 months in 39 cases who had mapped on . Except 1 case, all of these children regained sound perception after first mapping. The auditory abilities generally improved progressively, IT-MAIS score was 17.3 ± 9.7 and 24.4 ± 12.2 , CAP was 2.7 ± 1.4 and 3.4 ± 1.7 , MUSS was 5.6 ± 4.9 and 11.0 ± 7.0 , SIR was 1.1 ± 0.3 and 1.4 ± 0.5 , at 6 and 12 months respectively.

Conclusion: ABI can be safely implanted in young children with congenital hearing loss, and can effectively restore the hearing and promote speech development.

FP2-7**Experimental study on the safety and efficacy of domestic auditory brainstem implant system**

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Objective: To evaluate the safety and efficacy of the domestic auditory brainstem implant (ABI) system [Nurotron, WH-01A (SD) type] based on non-human primates.

Methods: Three healthy adult male cynomolgus macaques (*Macaca Fascicularis*) aged 5-7 years with normal hearing underwent ABI surgery via suboccipital retrosigmoid approach. ABI electrode array were implanted on the surface of cochlear nucleus after transecting the auditory nerve during surgery, and ensured by electrically evoked auditory brainstem responses (eABR). Postoperative eABRs were evaluated at 1 month (n=3), 2 months (n=3) and 6 months (n=1) after surgery. The animals were euthanized after the last eABR measurement. The implanted electrode was taken out, and the subcutaneous fascia tissues around the extracranial part of ABI device and the brain tissues around the implanted electrode were collected and analyzed through hematoxylin-eosin staining.

Results: All three animals tolerated the surgical procedure well and intraoperative eABRs were evoked in at least one electrode contact. After surgery, all animals presented slight balance disorder and recovered within 3 d. Other postoperative complications including infection, cerebrospinal fluid leakage, facial paralysis, dysphagia and dyspnea were not observed. The results of eABRs presented good response in at least one contact before euthanasia. Histological examinations showed the electrode was embedded in fibrous tissue. A few gliosis was observed on electrode tissue interface at 2 months and 6 months after operation.

Conclusion: The domestic ABI can be safely implanted onto the cochlear nucleus in non-human primates, without obvious adverse reactions in the short and medium term after operation, and the auditory electrophysiological response can be stable till 6 months postoperatively.

FP2-8**Effect of Bonebridge™ on Tinnitus in Patients with Asymmetric Hearing Loss or Single-Sided Deafness**

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Purpose: The objective of this study is to investigate the effect of an active transcutaneous bone conduction implant (BCI) of Bonebridge™ (Med-El Corporation, Innsbruck, Austria) on tinnitus in patients with asymmetric hearing loss or single-sided deafness.

Methods: Medical records and tinnitus questionnaires of patients with asymmetric hearing loss who received Bonebridge by a single surgeon at Seoul St. Mary's Hospital from 2017 to 2021 were reviewed retrospectively. Audiologic evaluation and tinnitus questionnaires were conducted before and after surgery

Results and Discussion: A total of 17 patients were included in this study. Of the 17 patients, 8 patients had single-sided deafness (SSD), and 9 patients had asymmetric hearing loss (AHL). Thirteen patients (76.47%) had tinnitus before surgery, while 4 patients did not have tinnitus before surgery. No patient showed newly developed tinnitus after surgery. After the Bonebridge™ implantation, 3 patients (23.08%) showed a complete resolution of tinnitus. All patients showed statistically significant improvement in hearing level after surgery. The mean tinnitus handicap inventory (THI) score and visual analogue scale (VAS) score for effect on life showed a statistically significant decrease after surgery, from 43.07±28.23 to 29.73±25.70 ($P < 0.05$), and 4.67±2.90 to 3.20±3.28 ($P < 0.05$), respectively. 6 SSD patients with tinnitus showed marginally significant decrease of mean THI score from 48.3±25.3 to 33.7±23.6 after implantation ($P=0.075$), and 7 AHL patients with tinnitus showed statistically significant decrease of mean THI score from 50.9±24.7 to 34.6±27.5 ($P < 0.05$) and marginally significant decrease of VAS for effect on life from 5.4±2.1 to 3.1±3.0 ($P=0.074$). Patients with tinnitus on the implanted side showed statistically significant decrease of mean THI score and marginally significant decrease of VAS for effect on life after the Bonebridge™ implantation from 53.1±23.4 to 37.4±15.0 ($P < 0.05$) and 5.7±2.7 to 3.4±3.4 ($P=0.068$), respectively. Patients with tinnitus on the non-implanted side and bilateral tinnitus also showed improvement of tinnitus after implantation.

Conclusions: BCI seems to be effective in suppressing tinnitus in the patients with single-sided deafness or asymmetric hearing loss. Along with directive counseling, sound therapy with Bonebridge™ can induce a cure of tinnitus.

Free Paper 3 Middle Ear & EAC**FP3-1****Otitis media with ANCA-associated vasculitis: A multicenter study in Japan****Kan Kishibe**^{1,2}, **Shinya Morita**^{2,3}, **Tadao Yoshida**^{2,4}, **Naohiro Yoshida**^{2,5}, **Yasuaki Harabuchi**^{1,2}¹Asahikawa Medical University, Asahikawa, Japan, ²Intractable Otitis Media Working Group of The Japan Otological Society, Tokyo, Japan, ³Hokkaido University Graduate School of Medicine, Sapporo, Japan, ⁴Nagoya University Graduate School of Medicine, Nagoya, Japan, ⁵Jichi Medical University Saitama Medical Center, Saitama, Japan

OBJECTIVE: We aimed to analyze clinical features and treatment outcomes of otitis media caused by antineutrophil cytoplasmic antibody (ANCA) -associated vasculitis (AAV), i.e., otitis media with AAV (OMAAV).

METHODS: We conducted the survey of OMAAV between December 2013 and March 2019 from 22 institutions which had many OMAAV cases in previously survey in 2013. We collected the clinical information of the patients with OMAAV, which the institutions evaluated. A clinical diagnosis of OMAAV was made when the following three criteria (A, B, C) were fulfilled. A) Experience of suffering from intractable otitis media with effusion or granulation, resistance to antibiotics, and insertion of the tympanic ventilation tube, accompanied by progressive hearing loss over less than two months. B) At least one of the following four findings; 1) positivity for serum MPO- or PR3-ANCA; 2) histopathology consistent with AAV; 3) diagnosis of AAV by the presence of other involvements before the occurrence of ear symptoms; 4) at least one sign/symptoms of AAV-related involvements other than ear (eye, nose, pharynx/larynx, lung, kidney, facial palsy, hypertrophic pachymeningitis, and the others). C) exclusion of the other intractable otitis media.

RESULTS: One hundred and thirty-seven patients diagnosed with OMAAV were enrolled. The characteristics of the patients were as follows: (1) predominantly female (69%) and old (median: 71 years); (2) predominantly myeloperoxidase (MPO) -ANCA-positive (68%), followed by proteinase 3 (PR3) -ANCA-positive (15%), both ANCA-negative (14%), and both ANCA-positive (4%); (3) observed accompanying facial palsy (10%), and hypertrophic pachymeningitis (12%) were complicated; (4) ear symptoms were hearing loss (88%), tinnitus (31%), otorrhea (21%), otalgia (20%), and vertigo (18%); (5) the rate of the hearing level at initial visit was 20% of 40dB<, 28% of 40-60dB, 35% of 60-90dB, 17% of 90dB≥; (6) the most common initial treatment was prednisolone and immunosuppressive drugs in 58 patients (45%), and steroids alone in 72 patients (55%); (7) the hearing improvement rate in the patients treated with steroid plus immunosuppressant was significantly higher than that in the patients with steroid alone (47% vs. 20%, p<0.0001).

CONCLUSION: We recommend the combination of steroids and immunosuppressants for OMAAV therapy since it was more effective in improving the hearing prognosis.

FP3-2**Labyrinthine calcification in ears with OMAAV: a report of two cases****Tadao Yoshida**, **Masumi Kobayashi**, **Satofumi Sugimoto**, **Michihiko Sone***Department of Otorhinolaryngology, Nagoya University Graduate School of Medicine, Nagoya, Japan*

Otitis media with antineutrophil cytoplasmic antibody-associated vasculitis (OMAAV) has been proposed as a new type of otitis media. The hearing loss caused by OMAAV can be expected to improve with early detection and intervention, but if it continues to worsen and leads to deafness, it is challenging to recover the patient's hearing. When bilateral deafness occurs, cochlear implant (CI) surgery is the only way to improve hearing. Here, Case 1 showed unilateral cochlear calcification, and Case 2 showed bilateral cochlear calcification. In Case 1, CI surgery was performed on the ear lacking calcification, and in Case 2 it was performed on the ear with milder calcification. In Case 2, granulation was present from the tympanic space to the mastoid, the round window was closed, and the basal turn of the cochlea was narrowed. Such calcification of the cochlea caused by OMAAV has not been reported so far. It is essential to detect these changes by computed tomography scans at an early stage and to perform CI surgery at an appropriate time, because hearing improvements are not expected in patients who become deaf because of OMAAV.

FP3-3

The diagnostic utility of extracellular trap cell death-derived products as biomarkers for OMAAV

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Introduction: Early diagnosis at the otitis media stage is crucial to achieving good survival and hearing outcomes for otitis media with antineutrophil cytoplasmic antibody (ANCA) -associated vasculitis (OMAAV). However, it remains difficult to definitively diagnose otitis media with OMAAV until progression to the systemic organs due to ANCA-negative cases and the low rate of histopathological identification. Thus, the identification of biological markers for the discrimination of OMAAV from different types of otitis media, such as otitis media with effusion (OME) and eosinophilic otitis media (EOM), is required.

Objective: This study aimed to quantify the cell-free deoxyribonucleic acid (DNA), citrullinated-histone H3 (cit-H3) -DNA complex, and myeloperoxidase (MPO) -DNA complex as extracellular trap cell death (ETosis) -derived products in the middle ear fluid, and to identify diagnostic biomarkers for the discrimination of OMAAV from OME and EOM.

Materials and Methods: OMAAV patients were eligible for inclusion in this analysis. Patients with OME and EOM were examined as controls. All samples were obtained from the middle ear fluid in patients with OMAAV, OME or EOM. The fluid samples were aspirated from the middle ear through the anterior-inferior portion of the tympanic membrane using a 1-ml tuberculin syringe with a 24- or 26-gauge needle under a microscope. The levels of cell-free DNA, cit-H3-DNA complex and MPO-DNA complex in the fluid samples were quantified using an enzyme-linked immunosorbent assay.

Results: Patients with OMAAV showed significantly higher levels of MPO-DNA complex compared to patients with OME ($p < 0.001$ and $p < 0.001$, respectively) and EOM ($p < 0.001$ and $p < 0.001$, respectively), regardless of the serum ANCA status at the time of sampling. Meanwhile, there were no significant differences in the values of cell-free DNA or cit-H3-DNA complex between the OMAAV and EOM patients.

Conclusion: The findings of this study suggest that the detection and quantification of MPO-DNA complex in the otitis media fluid can be utilized to discriminate OMAAV from OME and EOM regardless of the serum ANCA status. It should be noted that it is possible for cell-free DNA and cit-H3-DNA complex in fluid samples to be derived from dead cells other than neutrophils that undergo ETosis.

FP3-4

Surgical interventions in patients with eosinophilic otitis media with the use of biological drugs

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Background: Eosinophilic otitis media (EOM) is an intractable otitis media with a highly viscous middle ear effusion and is usually associated with bronchial asthma. Surgical management of EOM has been believed to be contraindicated, because middle ear surgery is considered a risk factor for deafness. In addition, eosinophilic inflammation will easily relapse after surgery. Recently, some biological drugs can be used for the treatment of bronchial asthma and eosinophilic rhinosinusitis, and showed effectiveness to control the diseases and associated EOM. Here we report 7 patients of EOM with eardrum perforation treated with biological drugs, followed by surgical interventions such as myringoplasty and tympanoplasty.

Patients and methods: Eight ears of 7 patients with EOM with eardrum perforation associated with bronchial asthma were included in the study. Before the surgery, they were treated with biological drugs; mepolizumab (anti-IL5 antibody) in two, benralizumab (anti-IL5 receptor(R) antibody) in three, and dupilumab (anti-IL4R antibody) in two. The condition of EOM of these patients was well controlled by these biological drugs. Then we performed myringoplasty under local anesthesia in 7 ears of 6 patients, and tympanoplasty under general anesthesia in 1 patient. The biological drugs were continuously administered to all the patients postoperatively. The status of EOM of each patient was assessed using a severity score, temporal bone CT and pure tone audiometry during the course.

Results: Patients' severity scores decreased after the use of biological drugs. Five ears out of 8 ears operated on had total closure of the perforation, while 3 ears had pinhole perforation postoperatively. There was no change in the severity score before and after surgery. None showed relapse of EOM or deterioration of bone conduction hearing level after the surgery. Air conduction hearing level showed significant improvement in most of the patients. There was no difference in the rate of improvement among biological drugs.

Conclusion: Surgical interventions for EOM is currently indicated if patients show a good response to biological drugs for a long time. Our findings suggest that biological drugs can be used before and after surgical interventions for EOM.

Free Paper 3 Middle Ear & EAC**FP3-5****Effect of Pneumococcal Conjugate Vaccine on Prevalence of Otitis Media with Effusion****Chisei Satoh¹, Michiko Toizumi², Minoru Hara³, Ken-ichi Kaneko¹, Lay-Mynt Yoshida², Yoshihiko Kumai¹**¹Department of Otorhinolaryngology, Nagasaki University Hospital, Nagasaki, Japan, ²Department of Pediatric Infectious Diseases, Institute of Tropical Medicine, Nagasaki University, Nagasaki, Japan, ³Department of Otorhinolaryngology, Kamio Memorial Hospital, Tokyo, Japan**Purpose**

Otitis media with effusion (OME) is common in young children and is associated with *Streptococcus pneumoniae* infection. We aimed to determine the impact of pneumococcal conjugate vaccine (PCV) introduction on the prevalence of OME and OME associated with vaccine-type (VT) or non-VT.

Methods

Population-based cross-sectional surveys were conducted in pre- (2016) and post-PCV periods (2017, 2018, and 2019) at selected communes in Nha Trang, Vietnam. For each survey, we randomly selected 60 children aged 4-11 months and 60 aged 14-23 months from each commune. Nasopharyngeal sample collection and tympanic membrane examination by digital otoscope were performed. *S. pneumoniae* was detected and serotyped by *lytA* qPCR and microarray. Odds ratios (OR) and 95% confidence intervals (CIs) were calculated using Firth's logistic regression, stratified by age group.

Results

Over the four surveys, 2089 children had a bilateral ear examination. Compared to pre- PCV, the prevalence of OME reduced in 2018 (OR 0.51, 95%CI 0.28-0.93) and in 2019 (OR 0.53, 95%CI 0.29-0.97) among the <12-month-olds, but no significant reduction among the 12-23-month-olds. The prevalence of OME associated with VT pneumococcus decreased in the <12-month-olds in 2018 and 2019 (2018: OR 0.14, 95%CI 0.03-0.55; 2019: OR 0.20, 95%CI 0.05-0.69). The prevalence of OME associated with non-VT pneumococcus increased in the 12-23-month-olds in 2017 (OR 3.09, 95%CI 1.47-7.45).

Conclusion PCV10 introduction was associated with a substantial reduction of OME prevalence in infants.

FP3-6**EGFR/PDPK1 axis in squamous cell carcinoma of the external auditory canal****Naotaro Akiyama¹, Tomomi Yamamoto-Fukuda², Mamoru Yoshikawa¹, Hiromi Kojima²**¹Toho University School of Medicine, Tokyo, Japan, ²Jikei University School of Medicine, Tokyo, Japan**Background**

External auditory canal (EAC) squamous cell carcinoma (SCC) is a rare disease. Epidermal growth factor receptor (EGFR) is related to the invasion and metastasis in head and neck SCC. The phosphoinositide-dependent protein kinase-1 (PDPK1), the effector of EGFR, accelerates tumor cell growth through anti-apoptotic signaling. In this study, we investigated the EGFR/PDPK1 axis in the EACSCC.

Methods

Immunohistochemistry of EGFR and PDPK1 were demonstrated in human EACSCC specimens. All patients were treated surgically at the Department of Otorhinolaryngology, Jikei University Hospital. The study protocol was approved by the Human Ethics Review Committee of Jikei University School of Medicine, and signed informed consent was obtained from all the patients for this study (approval number 31-139 9638). We transfected the EGF-expression vector locally and then conducted a PDPK1 inhibitory experiment. Immunohistochemistry of EGF, EGFR, PDPK1, and Ki67 was performed in this model. To detect apoptotic cells, immunohistochemistry of cleaved caspase-3 and terminal deoxy(d) -UTP nick end labeling (TUNEL) assays were performed. The experiments were conducted in 14 male BALB/c mice (6 weeks, 30-35 g). The animal care and experimental procedures were performed in accordance with the Guidelines for Animal Experimentation of Jikei University with approval guidelines (No. 2015-139C5).

Results

Overexpression of EGFR and PDPK1 was revealed immunohistochemically in human EACSCC specimens. The growth of protuberant lesions was observed in the mouse EAC in which EGF-expression vector was transfected, and EGF, EGFR, PDPK1, and Ki67 labeling indexes (LIs) were increased. Moreover, PDPK1 inhibition induced normal epithelial appearance in the EAC. EGF, EGFR, PDPK1, and Ki67 LIs were decreased, and cleaved caspase-3 and TUNEL LIs were increased in the EAC.

Discussions and conclusions

It was suggested that the EGFR/PDPK1 axis plays an important role in EACSCC, and the PDPK1 inhibitor could reduce the EACSCC inducing apoptosis. These results indicated that PDPK1 could be a new therapeutic target of EACSCC.

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FP4-1**Neuroprotective Effect of Valproic Acid on Salicylate-Induced Tinnitus****Chul Ho Jang¹, Angj Song², Gwang-Won Cho², Karthikeyan A Vijayakumar², Changjong Moon³, Mary Jasmin Ang³, Jahae Kim⁴, Ilyong Park⁵**

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High-dose salicylate induces temporary moderate hearing loss and the perception of a high-pitched tinnitus in humans and animals. Previous studies demonstrated that high doses of salicylate increase N-methyl-d-aspartate (NMDA) receptor levels, resulting in a rise in Ca²⁺ influx and induction of excitotoxicity. Glutamate excitotoxicity is associated with failure in the maintenance of calcium homeostasis, mitochondrial dysfunction, and production of reactive oxygen species (ROS). Valproic acid (VPA) is widely used for the management of bipolar disorder, epilepsy, and migraine headaches, and is known to regulate NMDA receptor activity. In this study, we examined the beneficial effects of VPA in a salicylate-induced tinnitus model in vitro and in vivo. Cells were pretreated with VPA followed by salicylate treatment. The expression levels of NMDA receptor subunit NR2B, phosphorylated cAMP response element-binding protein-an apoptosis marker, and intracellular levels of ROS were measured using several biochemical techniques. We observed increased expression of NR2B and its related genes TNF α and ARC, increased intracellular ROS levels, and induced expression of cleaved caspase-3. These salicylate-induced changes were attenuated in the neuronal cell line SH-SY5Y and rat cortical neurons after VPA pretreatment. Together, these results provide evidence of the beneficial effects of VPA in a salicylate-induced temporary hearing loss and tinnitus model.

FP4-2**Patient experience in participating in the development of a clinical protocol for tinnitus****Akbota Seitkali, Lyazzat Kosherbayeva, Aigul Medeulova***Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan*

Introduction

To achieve the goals of universal health coverage, the role of health technology assessment (HTA) and clinical guidelines (CG) is paramount in optimizing patient care and delivering effective therapies based on proven technologies. Involvement of patient vaspecialistslues and preferences important issue which have to be reflected in HTA and CG process. The clinical guideline process in Kazakhstan started in beginning of 2000, while HTA implementation in early 2010. However, only a few times patient involved in implementation of clinical protocol process.

The purpose is to study the patient experience in the development of a clinical guidelines for tinnitus.

Methods

At the first stage, a working group was created, which included 1.1. general practitioners, therapists, otorhinolaryngologists, surdologists, neurologists, neurosurgeons, vascular surgeons, psychologists, psychiatrists, maxillofacial surgeons, public health specialists. Within the framework of the discussion, it was decided to invite two patients with tinnitus to the development of the CG. The choice of this direction is due to the lack of a CG for tinnitus in Kazakhstan. In this regard, the process of diagnosis and treatment is often lasted.

Results

Meetings with patients were organized three times. At the initial stage to study their experience in receiving treatment, a second meeting was sent to discuss the first draft of the CG, and at the third after receiving a review. We have explained the role of the patient in the clinical protocol development process. They were faced with the task of how convenient the presented treatment algorithm was for them, and the developers received information about the patient's experience in receiving treatment, to analyze how other patients might face difficulties at different stages of receiving care.

During the discussion, patients expressed their interest and willingness to participate in the development of clinical protocols. also noted that they gained a better understanding of the complexity of the process and the importance of teamwork.

Conclusions It was the first experience of patient inclusion in the development of CG in Kazakhstan. Positive dynamics was received on the part of patients, which determines the importance of teamwork

Free Paper 4 Audiology**FP4-3****Children with unilateral hearing loss notice more difficulty under mask-wearing life.****Hiromi Kanazawa, Kubota Yamato, Masahiro Sawa, Yoshihiko Esu, Naohiro Yoshida***Jichi Medical University Saitama Medical Center, Saitama, Japan*

[Background] Mask-wearing life is prevalent as the protection for COVID-19. Most people with not only bilateral hearing loss but also unilateral hearing loss (UHL) have difficulty in auditory communication.

[purpose] To measure the changes of listening comprehension between before and after mask-wearing life especially in classroom, we are conducting a questionnaire survey of healthy UHL children and trying to fit hearing aids in the impaired ear for those who wish to do.

[Patients & method] Six children with UHL participated in this study (male: 4, female: 2). Their average age is 14.3 years old (10.0-19.1). Three had mild to moderate conductive hearing loss after tympanoplasty and attended outpatient clinic every seasonal holiday. The other three patients came for treatment during the COVID-19 epidemic; two had congenital hearing loss and the other had sudden onset hearing loss with moderate sensorineural deafness and mixed hearing loss. Hearing aids were loaned to the patients, and speech tests in noise were performed one month later (according to the Japanese Society of Audiology 67-5). On the other hand, in terms of the school environment, the participants were asked five questions on a visual analog scale before wearing a mask, after wearing a mask, and using a hearing aid. Q1: When the classroom is noisy, can you hear my friends' voices? Q2: Can you hear the teacher's questions? Q3: Did you notice your friend calling you from behind? Q4: Do you have trouble keeping up in class? Q5: Did you fail the test?

[results] All children were satisfied with their hearing aids. 5 children were given speech tests. The score Q1-3 of the questionnaire with hearing aid was better than before wearing the mask.

[discussion] Hearing impairment in both ears is thought to contribute to the academic, social, and communication problems often seen in childhood UHL. Most children noticed a change in auditory communication before and after wearing the mask. Younger children were less likely to notice the changes, but older children felt them. It was thought necessary to develop communication support for children with unilateral hearing loss as well as bilateral hearing loss.

FP4-4**Predicting treatment outcome in immune mediated inner ear disease through clinical characteristics****Che Hsuan Lin^{1,2}***¹Taipei Medical University Hospital, Taipei, Taiwan, ²Taipei Medical University School of Medicine, Taipei, Taiwan*

Immune mediated inner ear disease (IMIED) has been defined as a condition of bilateral sensorineural hearing loss (SNHL). The main clinical manifestation is unilateral or bilateral SNHL that progresses over several weeks to months. Fluctuating hearing performance is common, but the overall process is a gradual deterioration of auditory function. In addition, 80% of patients often have other clinical symptoms such as dizziness, tinnitus, and aural fullness, which also made it difficult to difference between bilateral Meniere's disease and IMIED. Therefore, some studies also included bilateral Meniere's disease in the study, because the two had many overlaps in clinical manifestations. IMIED is part of the group of neurosensory hearing loss with less than 1% of all SNHL cases. In 80% of cases, it is presented as bilateral even though the second involved ear can occur months or years later. The incidence is less than five cases per 100,000 per year with female predominant. Among 15-30% of cases with a systemic autoimmune disease.

The process of diagnosing IMIED includes complete history taking, physical examination, repeated audiogram, MRI, serology tests. Although there are no uniformly accepted criteria for diagnosing IMIED, the presence of bilateral SNHL of 30 dB or more at any frequency with evidence of progression in at least one ear on two serial audiograms performed less than 3 months apart is often used for case definition. The mainstream treatment for IMIED is corticosteroids. However, not all patients with IMIED benefit from steroid use. Initially about 70% of cases may respond to steroid treatment, but over time the effect may decrease, resulting in an actual effect of only 14%. The various clinical manifestations and fluctuating hearing changes are also pain points in treatment. IMIED has always been a difficult problem in the field of audiology.

Through a retrospective analysis of 11 cases of bilateral fluctuating hearing loss patients fitting criteria of IMIED in Taipei Medical University Hospital from 2016 to 2021, we use complete clinical characteristics including age, gender, initial hearing loss status and frequency, ear-related symptoms, the response of steroid therapy, the time interval between the onset of the bilateral ears, and past medical history to analyze possible prognostic factors that influence the outcome. We hope this study can provide clinicians a reference for the treatment of IMIED.

FP4-5**Biallelic p.V371 variant in *GJB2* is associated with increasing incidence of hearing loss with age**

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Purpose: This study aimed to quantitatively assess the incidence of hearing loss in relation to age in individuals with biallelic p.V371 variant in *GJB2*.

Methods: Population screening of the biallelic p.V371 variant was performed in 30,122 individuals aged between 0 and 97 years in Shanghai. Hearing thresholds of the biallelic p.V371 individuals and the controls were determined by click auditory brainstem response or pure tone audiometry.

Results and Discussion: Biallelic p.V371 was detected in 0.528% (159/30,122) of the subjects. Of the biallelic p.V371 newborns, 43.91% (18/41) passed their distortion-product otoacoustic emissions-based newborn hearing screening or had hearing thresholds lower than 20 decibel above normal hearing level. The older newborns had elevated hearing thresholds, with increasing incidence of 9.52%, 23.08%, 59.38%, and 80.00% for moderate or higher grade of hearing loss in age groups of 7 to 15 years, 20 to 40 years, 40 to 60 years, and 60 to 85 years, respectively. Their hearing deteriorated at a rate of 0.40 dB hearing level per year on average; males were more susceptible, and deterioration occurred preferentially at higher sound frequencies.

Conclusion: The biallelic p.V371 variant is associated with steadily progressive hearing loss with increasing incidence over the course of life. Most of the biallelic p.V371 individuals may develop significant hearing loss in adulthood and, can benefit from early diagnosis and intervention through wide-spread genetic screening.

FP4-6**Role of Dichotic Digit Test for the Early Diagnosis of Alzheimer's Disease**

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Alzheimer's disease, a major cause of dementia has a profound impact on health, society and economy. Given that there is no cure and brain changes occur a decade before the symptoms of Alzheimer's disease appear, early diagnosis, appropriate intervention and slowing the disease progression is a practical strategy. We hypothesized that the dichotic digit test (DDT) could predict the onset of Alzheimer's disease. A prospective study was conducted to determine whether DDT could play this role. Participants were enrolled in the Korean Brain Aging Study for the Early Diagnosis and Prediction of Alzheimer's disease (KBASE) prospective cohort. Subjects who had normal cognitive function and underwent amyloid-PET were enrolled in this study. Gender, age, education level, ApoE4 positivity, and cognitive function test results were collected. Subjects were divided into two groups with and without amyloid deposition on amyloid-PET: amyloid (-) and amyloid (+) group. The amyloid (+) group is expected to develop Alzheimer's disease in the future. Pure tone audiometry, speech audiometry, auditory brainstem response (ABR), distortion product otoacoustic emission (DPOAE) test, and dichotic digit test with one digit (DDT1) were performed. A total of 38 and 12 subjects were included in the amyloid (-) and amyloid (+) groups, respectively. There was no significant difference between the two groups in age, gender, education level, and cognitive function test results, except for ApoE4 positivity in clinical characteristics and cognitive function test results. In univariable logistic analysis, only ApoE4 positivity showed a significant association with the amyloid (+) group. There was no significant difference between the two groups, except for DDT1 and ABR in the audiological tests. In univariable logistic regression analysis, the difference between the better ear score of DDT1 and the ABR wave V latency showed significant association. Multivariable logistic regression analysis was performed using DDT1 better scores, ABR wave V latency differences, and ApoE4 positivity that showed significant association in univariable logistic regression analysis. A DDT1 better ear score and ApoE4 positivity showed a significant association. Amyloid deposition may affect the central auditory pathway itself before cognitive decline appears. Alzheimer's disease can be predicted by evaluating the central auditory pathway, specifically using the DDT1.

Free Paper 5 Middle Ear Surgery & Facial Nerve**FP5-1****Latency shift in compound muscle action potentials during electroneurography in facial palsy****Yusuke Ayani, Shin-Ichi Haginomori, Takaki Inui, Ryo Kawata***Osaka Medical and Pharmaceutical University, Takatsuki, Japan*

Objective: Electroneurography (ENoG) reliably predicts the prognosis of facial palsy. However, the results of ENoG are dependent on the location, where the wave is detected, as a compound muscle action potential (CMAP) arising from the facial muscles. To minimize errors in prognostic prediction, we analysed the latencies of facial CMAPs.

Materials and methods: Fifty-seven patients with unilateral peripheral facial palsy and 24 healthy volunteers were enrolled. Amplitudes, negative peak latencies (NPL), and rise latencies (RL) of CMAPs were measured on the paralysed and healthy sides in patients and in healthy volunteers. The relationships of these latencies with ENoG values and the lowest House-Brackmann (H-B) scores were also analysed.

Results: The amplitude of CMAP on the paralysed side was smaller, and NPL and RL were longer, than those on the healthy side in patients and healthy volunteers ($p < 0.01$). In patients, there was no difference in NPL between the ENoG $< 40\%$ group and the ENoG $\geq 40\%$ group. Conversely, there was a significant difference in RL between the ENoG $< 40\%$ group and ENoG $\geq 40\%$ group ($p = 0.03$). No relationships were observed between NPL or RL and the lowest H-B score.

Conclusions: NPL and RL of CMAP on the paralysed side were equivalent or longer than those on the healthy side. During ENoG for facial palsy, CMAP should be measured on the healthy side first, and then detected (and the amplitude measured) on the paralysed side with reference to CMAP latency on the healthy side, to reduce errors in detecting facial CMAPs.

FP5-2**Differential diagnosis study of geniculate ganglion venous malformation and schwannoma****Zhaoyan Wang^{1,2,3}, Yongchuan Chai^{1,2,3}, Zhang Zhihua^{1,2,3}, Jianqing Chen^{1,2,3}, Huan Jia^{1,2,3}, Hao Wu^{1,2,3}***¹Department of Otolaryngology, Head & Neck Surgery, Shanghai Ninth People's Hospital, affiliated to Shanghai Jiaotong University School of Medicine, Shanghai, China, ²Ear Institute, Shanghai Jiaotong University School of Medicine, Shanghai, China, ³Shanghai Key Laboratory of Translational Medicine on Ear and Nose Diseases, Shanghai, China*

Objective: It is very important to distinguish between geniculate ganglion venous malformation (GGVM) from schwannoma (GGS) because the management strategy for the two lesions are different. The aim of this study was to evaluate temporal bone high-resolution CT (HRCT) and MR imaging findings distinguishing these two lesions.

Materials and Methods: Nineteen patients with unilateral geniculate ganglion lesions, including 9 GGVMs and 10 GGSs confirmed by postoperative pathology, were studied. In addition to high-resolution HRCT and conventional MRI, we performed a dynamic contrast study after bolus administration of the contrast material. Lesion size, involved other FN segments, signal intensity, homogeneity, the contrast enhancement spread pattern on MRI, characteristics of bone destruction on HRCT and clinical symptoms were retrospectively evaluated.

Results: For the contrast enhancement spread pattern of the tumor on dynamic MRI study, all 9 GGVMs typically showed "point-to-side" pattern, while "side-to-side" spread pattern was observed in all 10 GGSs. The difference in the contrast-enhancement spread pattern features between the two types of lesions was statistically significant ($P < 0.0001$). Six GVMs (5/9) showed honeycomb-like change ("honeycomb sign") on HRCT, but none of the GGSs (0/10) had this change, which was statistically significant ($P < 0.01$). In addition, lesion size, involvement of other FN segments, homogeneity on T2-weighted imaging and the enhancement pattern were statistically significant between them ($p < 0.05$).

Conclusions: GGVM and GGS have different CT and MR imaging features that could be helpful in the differentiation between the lesions. The contrast-enhancement spread pattern on dynamic MRI is the most reliable finding distinguishing GGVM and GGS. The "honeycomb" sign on HRCT is another reliable finding distinguishing the two tumors, but the sensitivity is not very high. In addition, clinical symptoms, lesion size, involvement of other FN segments, homogeneity on T2-weighted imaging and the enhancement pattern might also play a role in distinguishing GGVM.

FP5-3**Outcomes of outer and middle ear congenital malformation reconstructive surgery**

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According to WHO, outer and middle ear severe malformation occurs approximately 2.35-7 in 10,000 birth by 2018. According to L.Thom (1994) et al., study outer ear malformation occurs 1.1 in 3800 birth, 5 in 10000 birth had unilateral outer and middle ear malformation, 4 in 10000 birth had bilateral outer and middle ear malformation and 2 in 10000 birth had outer and middle ear malformation associated with other organ problem. We selected 128 people aged 4-26 with congenital outer and middle ear malformation who were visited EMJJ hospital between 2008-2018, and 52 (40.7%) were 4-6 years old, 32 (25.1%) of them were 8-12 years old, 30 (23.3%) were 14-18 years old, 14 (10.9%) were 21-26 years old and 78 (60.9%) had bilateral ear malformation.

In audiology hearing test, 98 (76.5%) had air conduction of 55-60dB, 25 (39.1%) had air conduction of 65-80dB and 5 (3.9%) had mixed hearing loss.

In 42 (32.8%) canalplasty, in 22 (17.1%) tympanomandibular and middle cranial fossa approach and 64 (50.1%) trans-antrum approach were used to create new external auditory canal. In canalplasty patients, 28 (66.6%) had healing with primary intention and auricular canal narrowed by 2-2.5mm post operation and 14 patients went under canal widening surgery after 12-24 months. Post-operative hearing threshold increased with 15-20dB in 21 (49.9%) patients but 8 (19.1%) had no improvement.

In tympanomandibular and middle cranial fossa approach patients, 8 (36.3%) had narrowing of new auricular canal in 3-6 months and 4 patients went under second stage surgery. Post-operative hearing threshold improved with 10-15dB in 40%.

In 64 trans-antrum approach surgery patients, 8(12.5%) patients' auricular canal narrowed by 2-2.5mm post operation and 6 patients went under canal widening surgery. Post-operative hearing threshold in these patients increased with 15-20dB in 58 (90.6%) patients and hearing threshold improved significantly in patient went under repeated surgery.

FP5-4**Outcome of endoscopic tympanoplasty**

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According to the World Health Organization report, 23.4% of world's population are having various types of hearing impairment and of which 56% have various middle ear disease. Particularly in the underdeveloped and developing countries, middle ear related hearing impairment is relatively high and the major management is tympanoplasty.

The technique of endoscopic middle ear surgery was intensely developing since 1999 and we have conducted study with endoscopic middle ear surgery on 35 patients with conductive hearing loss and audiology test results of air conduction of >25dB and air bone gap of > 15dB were chosen in tympanoplasty surgery.

All patients' ossicular chain was checked from manubrium of malleus to oval window through incus and stapes. Among patients with tympanic membrane perforation, 22 (78.5%) has central tympanic membrane perforation, 4 (14.3%) had attic tympanic membrane perforation and 2 (7.2%) had inferior marginal tympanic membrane perforation. Post-operative hearing improvement is 80% in surgical reconstruction of ossicular chain with titanium prosthesis. Even though, post-operative wound recovery time of endoscopic tympanoplasty is relatively short, the duration of operation is relatively long.

Free Paper 5 Middle Ear Surgery & Facial Nerve**FP5-5****Effects of fibrous collagen/CDHA/hUCS biocomposites on bone tissue regeneration****Chul Ho Jang¹, Wonjin Kim², GeunHyung Kim²***¹Chonnam National University Medical School, Gwangju, Korea, ²Sungkyunkwan University, College of Biotechnology and Bioengineering, Suwon, Korea*

Collagen- and bioceramic-based composites have been widely used in hard tissue engineering because they are analogous to the organic/inorganic constituents of native bones. However, biocomposites based on collagen and bioceramics show low mechanical stiffness and limited osteogenic activities. To elevate the low biophysical and biological activities, we have introduced a new biocomposite structure. Herein, we propose a biocomposite mimicking not only the physical structure of the extracellular matrix (ECM) structure but also the biochemical components of native bone tissues. Several components including fibrillated collagen, calcium-deficient hydroxyapatite (CDHA) obtained from α -tricalcium phosphate hydrolysis, and human umbilical cord serum (hUCS) were used to generate a unique structure of the biocomposite. The 3D-printed composites were topographically similar to the nanofibrous ECM and exhibited a mechanically stable structure. We also evaluated

the in vitro biocompatibilities of the biocomposite using human adipose stem cells and found that the collagen/hUCS/CDHA scaffold accelerated the in vitro osteogenic differentiation of human adipose-derived stem cells and in vivo osteogenesis in a mastoid obliterated rat model.

FP5-6**ASC/chondrocyte-laden alginate hydrogel/PCL hybrid scaffold for auricle regeneration****Chul Ho Jang¹, YoungWon Koo², GeunHyung Kim²***¹Chonnam National University Medical School, Gwangju, Korea, ²Sungkyunkwan University, Department of Bio-Mechatronics, Suwon, Korea*

Tissue engineering using adipose derived stem cells (ASCs) has become one of the most promising treatments for defective articular cartilage owing to the stability and dynamic differentiation of ASCs. In this study, we fabricated a 3D hybrid scaffold using poly(ϵ -caprolactone) (PCL) to support the mechanical properties of the regenerating auricle cartilage, and injected a cell-laden alginate hydrogel, containing a mixture of ASCs and chondrocytes, into the PCL scaffold. Using the cell-laden 3D auricle structure, the in vitro chondrogenesis of the ASCs with and without the presence of chondrocytes was examined. Additionally, the feasibility of utilizing the 3D cell-laden auricle structure for cartilage tissue engineering was evaluated in a rat model. In our in vitro and in vivo experiments, we observed that as the ASCs were co-cultured with the chondrocytes, chondrogenic differentiation was encouraged, and the regeneration of cartilage was significantly increased. .

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