PROGRAM and ABSTRACTS

of the

One Hundred Forty-Eighth Annual Meeting

AMERICAN OTOLOGICAL SOCIETY, INC.

April 24 - 26, 2015

ROOM 302
Level 3

Hynes Convention Center
Sheraton Boston
Boston, MA

OFFICERS
JULY 1, 2014 - JUNE 30, 2015

PRESIDENT
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Harvard Medical School
Massachusetts Eye and Ear Infirmary
Massachusetts General Hospital
Boston, MA

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John W. House, M.D.
Paul R. Lambert, M.D.
Samuel H. Selesnick, M.D.
Roberto A. Cueva, M.D.

Accreditation Statement
This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education through the joint providership of the American College of Surgeons and the American Otological Society. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

Credit Statement
AMA PRA Category 1 Credits™
The American College of Surgeons designates this live activity for a maximum of *7.0 AMA PRA Category 1 Credits*™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

American College of Surgeons
Division of Education

American Otological Society, Inc.
Mission Statement

Purpose

The American Otological Society, created in 1868, is dedicated to fostering a dialog on and dissemination of, information pertaining to advances in evidence based diagnosis and management of otologic and neurotologic disorders. The focus on otologic and neurotologic disorders and scientific advances are translated to the provision of quality care that is consistent with the ACGME general competency areas and the Institute of Medicine competencies.

Target Audience

The primary target audience for the educational efforts of the American Otological Society is the current and potential members of the society. These members are physicians, otologists, residents, fellows, and researchers in the fields of otology and neurotology. Educational activities are also open to nurses, occupational and speech therapists and other healthcare professionals who are involved in the care of patients with otologic and neurotologic conditions.

Activities

The primary activity of the American Otological Society is the Annual Meeting that focuses on the advancement of the scientific and clinical evidence that supports advances in otologic and neurotologic care to patients. Additionally, non certified educational support and resources include the publication and dissemination of peer reviewed and evidence based content through the Otology & Neurotology Journal and support for research in otology/ neurotology and lateral skull base surgery and related disciplines.

Content

The content for the Annual Meeting and other related educational efforts are limited to the otologic and neurotologic evidence based science, clinical standards of care, and effects on communication.

Expected Results

The expected results are focused on enhancing knowledge translation and promoting competence for the membership and other identified target audiences. The Annual Meeting, the CME certified annual activity of the society, and the other scholarly activities such as the publication of the Journal and support for research provide a rich and robust environment for self assessment and reflection, access to resources for lifelong learning and opportunities for discussion and re-evaluation

2015 AOS Spring Meeting CME Activity Planning

Practice gaps in Otology are identified through polling the AOS membership at the close of each CME activity by way of an exit evaluation at the close of the activity; this evaluation is required to receive CME credit, so the response rate is good. The responses of the attendees are discussed in meetings of the AOS Council and Program Advisory committee. The evaluation is used as a tool to determine the success of the CME program in meeting program objectives, addressing professional practice gaps and educational needs. The responses are peer-reviewed by the Council prior to the next meeting to assist the Program Committee in developing future AOS Continuing Medical Education programs. The educational program is designed to address the topics identified as practice gaps through individual presentations and in depth panel discussions. Based on the response, the following data regarding professional practice gaps among attendees were noted:

- Clinicians are counseling their patients using information that is not current and does not reflect accurate state of the field knowledge. Hearing protection is of utmost importance in these patients.
- Lack of knowledge of state of the art neuro-imaging techniques and applications means that clinicians may be utilizing surgical procedures unnecessarily and may not be using resources as efficiently as possible.
- Patients are very distressed by tinnitus associated with unilateral sensorineural hearing loss. Since most interventions rely on sound input to suppress tinnitus and they are not candidates for this approach, the tinnitus continues to be very bothersome and in some cases life altering.
- Improved techniques would allow us to counsel appropriately and in some cases enhance performance.

AOS President, Dr. D. Bradley Welling, selected Dr. Joseph B. Nadol Jr. as the AOS Guest of Honor of the 148th AOS annual meeting. Dr. Nadol will kick off the scientific program on Saturday, April 25th at 1:30 P.M. with his presentation entitled, *"An Imperative for Otology"*. Program highlights include the Basic Science lecture entitled, *"Hidden Hearing Loss: Permanent Cochlear Nerve Loss after Temporary Noise-Induced Threshold Shift"*, presented by Dr. M. Charles Liberman. Dr. Hugh D. Curtin accompanied by Dr. Jennifer R. Melcher will address *"Issues in Imaging"*. Dr. Lawrence R. Lustig along with a superb panel of experts will wrap up the program Sunday with a panel entitled, *"Hurdles to Gene Therapy"*. Dr. Christine T. Dinh and Dr. Susan D. Emmett were selected as recipients of an *AOS Resident Research Travel Award.*

In addition, there are a vast number of oral presentations exploring the latest otological research and findings. Be sure to visit Exhibit Hall D, located on level 2 of the Hynes Convention Center where you will find an outstanding display of AOS poster submissions. Posters will be available for viewing on Friday & Saturday, 9:00-4:00. Recipients of the AOS/ANS combined poster awards will be announced at the close of the ANS Scientific program on Friday, April 24th at 5:00 P.M. The Combined Poster Reception/meet the Authors will take place Friday evening, April 24th in the Exhibit Hall from 5:30-7:00 P.M. The Exhibit Hall will remain open.

The American Otological Society (AOS) is committed to improving public health care through the provision of high-quality continuing medical education (CME) to our members.

To close the identified practice gaps, participants of this activity will need to learn:

- Attendees will evaluate hearing loss in persons with a history of noise exposure differently, and advise that even exposures that do not lead to immediate permanent hearing loss may predispose the patient to future damage and gradual loss.
- Attendees will use newer imaging techniques appropriately and cost effectively.
- Attendees will learn if the Baha implant for unilateral hearing loss also effectively treats unilateral tinnitus and practice accordingly.
- Attendees will be better able to counsel patients on expected implant performance, and will be able to use the information presented to more accurately program implant devices.

Learning Objective(s) - At the end of this activity, participants will be able to:

- Appropriately counsel patients who have suffered noise exposure on expectations for future hearing loss
- Order imaging tests that are most effective in diagnosing otologic disease
- Implant the Baha as appropriate for treatment for unilateral tinnitus associated with unilateral hearing loss
- Appropriately counsel patients who are scheduled to undergo cochlear implantation, and optimally program their devices.

How will this educational activity improve competence, practice performance, and patient outcomes?

Practitioners will have a more thorough understanding of the impact of noise on hearing, preferred and most effective and cost effective imaging techniques, best treatments for unilateral tinnitus, and best practices related to cochlear implantation.

Position Statement: Any presentations, conversations, exhibits, or other meeting communications, including descriptions of the use of drugs or devices, does not imply or constitute endorsement of any company, product, application, or use by the American Otological Society.

The following statement was read, submitted, and signed by every individual connected with this educational activity. Failure to comply disqualifies the individual from planning or speaking at any AOS Continuing Medical Education program.

In compliance with ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. All reported conflicts are managed by a designated official to ensure a bias - free presentation.

In accordance with the ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. Therefore, it is mandatory that both the program planning committee and speakers complete disclosure forms. **Members of the program committee were required to disclose all financial relationships and speakers were required to disclose any financial relationship as it pertains to the content of the presentations.** The ACCME defines a 'commercial interest' as "any entity producing, marketing, re - selling, or distributing health care goods or services consumed by, or used on, patients". It does not consider providers of clinical service directly to patients to be commercial interests. The ACCME considers "relevant" financial relationships as financial transactions (in any amount) that may create a conflict of interest and occur within the 12 months preceding the time that the individual is being asked to assume a role controlling content of the educational activity.

AOS is also required, through our joint providership partnership with ACS, to manage any reported conflict and eliminate the potential for bias during the activity. All program committee members and speakers were contacted and the conflicts have been managed to our satisfaction. However, if you perceive a bias during a session, please report the circumstances on the session evaluation form.

Please note we have advised the speakers that it is their responsibility to disclose at the start of their presentation if they will be describing the use of a device, product, or drug that is not FDA approved or the off - label use of an approved device, product, or drug or unapproved usage.

The requirement for disclosure is not intended to imply any impropriety of such relationships, but simply to identify such relationships through full disclosure, and to allow the audience to form its own judgments regarding the presentation.
Disclosure Information

PUBLICATION STATEMENT
The material in this abstract, (Name of Abstract), has not been submitted for publication, published, nor presented previously at another national or international meeting and is not under any consideration for presentation at another national or international meeting. The penalty for duplicate presentation/publication is prohibition of the author and co - authors from presenting at a COSM society meeting for a period of three years. Submitting Author's Signature (required)

All authors were advised that the submitted paper becomes the property of *Otology & Neurotology* and cannot be reprinted without permission of the Journal.

***Disclosures ***

American Otological Society, Inc. Statement

All authors, presenters, panelists, guest lecturers, Council members, Program Advisory Committee members, Administrative staff and any other contributing individuals who may be in a position to control content of a CME activity were required to complete a Disclosure/Conflict of Interest/Attestation declaration prior to consideration for presentation or appointment to a CME planning Committee. All potential conflicts of interest were resolved prior to participation in the planning of this activity.

Authors were instructed to read and sign the following Attestation statement.

1. I will disclose all relevant financial relationships to the AOS. disclose this information to learners verbally (for live activities) and in print.
2. The content and/or presentation of the information with which I am involved will promote quality or improvements in healthcare and will not promote a specific proprietary business interest of a commercial interest. Content for this activity, including any presentation of therapeutic options, will be well - balanced, evidence - based and unbiased.
3. I have not and will not accept any honoraria, additional payments or reimbursements beyond that which has been agreed upon directly with the AOS.
4. If I am presenting at a live event, I am aware that a CME monitor will attend the event to ensure that my presentation is educational, and not promotional, in nature. If presentation is found to be promotional in any way, I understand I will be ineligible to participate in an *AOS/ACS* joint provided CME accredited activity for a period up to two years.
5. If I am providing recommendations involving clinical medicine, they will be based on evidence that is accepted within the profession of medicine as adequate justification for their indications and contraindications in the care of patients. All scientific research referred to, reported or used in CME in support of justification of a patient care recommendation will conform to the generally accepted standards of experimental design, data collection and analysis.
6. If I am discussing specific healthcare products or services, I will use generic names to the extent possible. If I need to use trade names, I will use trade names from several companies when available, not just trade names from any single company.
7. If I am discussing any product use that is off label, I will disclose that the use or indication in question is not currently approved by the FDA for labeling or advertising.
8. If I have been trained or utilized by a commercial entity or its agent as a speaker (e.g., speaker's bureau) for any commercial interest, the promotional aspects of that presentation will not be included in any way with this activity.
9. If I am presenting research funded by a commercial company, the information presented will be based on generally accepted scientific principles and methods, and will not promote the commercial interest of the funding company.

FACULTY DISCLOSURES
(in alphabetical order)

American Otological Society Council 2014-2015

The following Council Members disclose:
Samuel H. Selesnick, MD
Medtronic ENT-Royalty
Debara L. Tucci, MD
Otonomy-Consultant
The following Council Members have nothing to disclose:
Carol A. Bauer, MD
Roberto A. Cueva, MD
John W. House, MD
Paul R. Lambert, MD
Steven A. Telian, MD
D. Bradley Welling, MD, PhD

Program Advisory Committee 2015

The following Committee Members disclose:
Simon I. Angeli, MD
Medtronic-Research grant
Charles C. Della Santina, MD
Labyrinth Devices LLC-CEO owner
MED-EL, Novartis-Consultant
David R. Friedland, MD, PhD
MED-EL-Consultant, Surgical advisory board
Best Doctors INC.-Consultant
David S. Haynes, MD
Stryker, Synthes, Advanced Bionics, Cochlear Corp, MED-EL, Grace Medical-Consultant
Advanced Bionics, Cochlear Corp-Advisory board
Robert F. Labadie, MD, PhD
Otoronix-Inventor
Cliff A. Megerian, MD
Cochlear Corp-Advisory board
Grace Medical-Intellectual property
Debara L. Tucci, MD– see above
P. Ashley Wackym, MD
Ear and Skull Base Center-Intellectual property
Legacy Health-Research
The following Committee Members have nothing to disclose:
Carol A. Bauer, MD
Michael E. Hoffer, MD
Akira Ishiyama, MD
Hung Jeffrey Kim, MD
D. Bradley Welling, MD, PhD

AOS Administrative Staff has nothing to disclose:
Kristen Bordignon
Ashley Westbrook

*****AOS Disclosures—Oral Presentations *****
Saturday April 25, 2015 - Scientific Session
Oral Presentations: Authors/Presenters
& Panel Participants
(listed in order of presentation)

1:45pm - GUEST OF HONOR LECTURE
The following individual has nothing to disclose:
Joseph B. Nadol Jr., MD

2:05pm
The following individuals disclose:
George B. Wanna, MD
Cochlear Americas, MED-EL, Advanced Bionics, Oticon Medical-Consultant
Alejandro Rivas, MD
Cochlear Americas, MED-EL, Advanced Bionics, Grace Medical-Consultant
Robert F. Labadie, MD, PhD
Advanced Bionics, Ototronix, Medtronix-Consultant
The following individuals have nothing to disclose:
Jack H. Noble, PhD
Rene H. Gifford, PhD
Mary S. Dietrich, PhD
Alex D. Sweeney, MD
Zhang Dongqing, MS
Benoit M. Dawant, PhD

2:13pm
The following individuals disclose:
Robert F. Labadie, MD, PhD
Advanced Bionics, Ototronix, Medtronix-Consultant
Rene H. Gifford, PhD
Advanced Bionics, Cochlear, MED-EL-Consultant
The following individuals have nothing to disclose:
Jack H. Noble, PhD
Andrea Hedley William, AuD
Linsey Sunderhaus, AuD
Benoit Dawant, PhD

2:21pm
The following individuals have nothing to disclose:
Renato Torres, MD
Guillaume Kazmitcheff, PhD
Evelyne Ferrary, MD, PhD
Olivier Sterkers, MD, PhD
Yann Nguyen, MD, PhD

2:29pm
The following individuals have nothing to disclose:
P. Ashley Wackym, MD
Heather T. Mackay, PsyD
Stuart D. Gardiner, PhD
Carey Balaban, PhD

3:15pm
The following individuals have nothing to disclose:
Michael W. Sim, MD
Gregory Mannarelli, AuD
Hussam K. El-Kashlan, MD
Steve A. Telian, MD
H. Alexander Arts, MD

3:23pm
The following individuals have nothing to disclose:
Andrew B. Baker, BS
Brendan P. O'Connell, MD
Shaun A. Nguyen, MD, MA
Paul R. Lambert, MD

3:31pm
The following individuals have nothing to disclose:
Thomas E. Linder, MD
Esther Troxler, MD
Gabriel Volcan, MD

3:39pm
The following individuals have nothing to disclose:
Marc L. Bennett, MD
Dongqing Zhang
Robert F. Labadie, MD, PhD
Alejandro Rivas, MD
Jack H. Noble, PhD

3:47pm
The following individuals have nothing to disclose:
Daniel S. Roberts, MD, PhD
Alisa Yamasaki, BA
Ahmad Sedaghat, MD, PhD
Edward Reardon, MD

3:55pm
The following individuals have nothing to disclose:
Matthew L. Carlson, MD
Brian A. Neff, MD
Michael J. Link, MD
John I. Lane, MD
Robert E. Watson, MD, PhD
Matt A. Bernstein, PhD
The following individual discloses:
Colin L. W. Driscoll, MD
Advanced Bionics, Cochlear Corp, MED-EL-Consultant

4:03pm
The following individuals have nothing to disclose:
Rémi Marianowski, MD, PhD
Adèle Pennanéach, MD
Marc Garetier, MD
Michel Ollivier, MD
Jean Ognard, MD
Philippe Mériot, MD

4:15pm - PANEL
The following individual has nothing to disclose:
Hugh D. Curtin, MD
The following individual discloses:
Jennifer R. Melcher, PhD
Deerfield Institute-Consultant

*****AOS Disclosures—Oral Presentations *****
Sunday April 26, 2015 - Scientific Session
Oral Presentations: Authors/Presenters
& Panel Participants
(listed in order of presentation)

7:35am
The following individuals have nothing to disclose:
Matthew G. Crowson, MD
Kristine Shulz, DrPH(c), MPH
The following individual discloses:
Debara L. Tucci, MD
Otonomy-Consultant

7:43am
The following individuals have nothing to disclose:
Shawn M. Stevens, MD
Paul R. Lambert, MD
Shaun A. Nguyen, MD
Ted A. Meyer, MD, PhD

7:51am
The following individuals have nothing to disclose:
Jameson K. Mattingly, MD
Nathaniel T. Greene, PhD
Herman A. Jenkins, MD
Daniel J. Tollin, PhD
The following individuals disclose:
James R. Easter, MS, PE
Cochlear Boulder LLC-Employee
Stephen P. Cass, MD, MPH
Cochlear-Surgeon's advisory Board, consultant

7:59am
The following individuals have nothing to disclose:
Yula A. Indeyeva, MD
Adrian Diaz, BS
Terence E. Imbery, MD
Daniel H. Coelho, MD

8:07am
The following individuals have nothing to disclose:
Hossein Mahboubi, MD, MPH
Saman Kiumehr, MD
Kasra Ziai, MD
Kanwar Kelley, MD
The following individual discloses:
Hamid R. Djalilian, MD
Mind Set Technologies-Stockholder

8:15am
The following individuals have nothing to disclose:
Duncan A. Meiklejohn, MD
C. Eduardo Corrales, MD
Nikolas H. Blevins, MD

8:30am - BASIC SCIENCE LECTURE
The following individual discloses:
M. Charles Liberman, PhD
Otonomy-Scientific advisory board

*****Disclosures—Oral Presentations*****
Sunday April 26, 2015
Scientific Session

9:00am
The following individuals have nothing to disclose:
Daniel Sacks, MD
Catherine Bixby, MS
Pamela Fall, MS
Kourosh Parham, MD, PhD

9:08am
The following individuals have nothing to disclose:
Mark J. van Tilburg, MD
John Guinan Jr., PhD
The following individuals disclose:
Barbara S. Herrmann, PhD
Natus Inc-Consultant
Steven D. Rauch, MD
Otonomy Inc, Sensonion Inc., Hoffman Laroche Inc.-Consultant

9:16am - RESIDENT RESEARCH TRAVEL AWARD
The following individuals have nothing to disclose:
Christine T. Dinh, MD
Si Chen, MD
John N. Dinh, BS
The following individuals disclose:
Esperanza Bas, PhD
MED-EL, Quark -Research & salary support
Fred F. Telischi, MD
MED-EL, Cochlear Corporation-Surgical advisory board
Thomas R. Van De Water, PhD
MED-EL-Research & salary support

9:24am
The following individuals have nothing to disclose:
Nopawan Vorasubin, MD
Quyen T. Nguyen, MD, PhD
Jeffrey P. Harris MD, PhD
Thomas H. Alexander, MD, MHSc

9:32am
The following individuals have nothing to disclose:
Hiroshi Nakanishi, MD, PhD
Yoshiyuki Kawashima, MD, PhD
Kiyoto Kurima, PhD
Julie Muskett, MS
Carmen C. Brewer, PhD
Andrew J. Griffith, MD, PhD

10:07am
The following individuals have nothing to disclose:
Liliana Colletti, PhD
Marco Mandalà, MD, PhD
Giacomo Colletti, MD
Vittorio Colletti, MD

10:15am
The following individuals have nothing to disclose:
Lingsheng Li, MHS
Yoon Sung, MHS
Barnett Shpritz, MA
David Chen, MD
Dane Genther, MD
Josh Betz, MS
The following individual discloses:
Frank R. Lin, MD, PhD
Cochlear Ltd-Consultant
Pfizer, Autifony- Scientific advisory board
Amplifon, MED-EL-Speaker

10:23am
The following individuals have nothing to disclose:
Kevin A. Strauss, MD
Robert O'Reilly, MD
Thierry Morlet, PhD
Yell Inverso, AuD, PhD
Liesl Looney, AuD
Christopher J. Goff, MD
Erin Field, PAC

10:31am - RESIDENT RESEARCH TRAVEL AWARD
The following individuals have nothing to disclose:
Susan D. Emmett, MD
Magteld Smith, PhD
Isaac M. Macharia, MBChB
Doreen Nakku, MD
Titus S. Ibekwe, MBBS
Wenfeng Gong, MSc
Howard W. Francis, MD
James E. Saunders, MD
The following individual discloses:
Debara L. Tucci, MD
Otonomy-Data and Safety Monitoring Board (DSMB), Consultant, Grant recipient, Principal Investigator

10:39am
The following individuals have nothing to disclose:
Kavita Dedhia, MD
Tina Worman, MS
Margaret A. Meredith, AuD, CCC-A
Jay T. Rubinstein, MD, PhD

10:47am
The following individuals disclose:
Peter L. Santa Maria, MBBS, PhD
Co-Inventor on patent discussed in study
Sungwoo Kim, PhD
Co-Inventor on patent discussed in study
Yunzhi P. Yang, PhD
Co-Inventor on patent discussed in study
The following individual has nothing to disclose:
Kendall Weierich

*****Disclosures—Oral Presentations*****
Sunday April 26, 2015
Scientific Session

10:55am
The following individuals have nothing to disclose:
Shin-ichi Kanemaru, MD, PhD
Rie Kanai, MD, PhD
Misaki Yamamoto, MD, PhD
Masaru Yamashita, MD, PhD

11:10am – PANEL
The following individuals disclose:
Lawrence R. Lustig, MD
Novartis Corp- Independent contractor
Lloyd B. Klickstein, MD, PhD
Novartis- Employment
Eric A. Pierce, MD, PhD
Vision Medicines-Advisory board member
Allergan, Editas Medicine, Isis Pharmaceuticals, ReNeuron, Novartis- Consultant
Hinrich Staecker, MD, PhD
Novartis- Principal investigator
The following individual has nothing to disclose:
Rachel Witten, MD

*****AOS Disclosures—Poster Presentations *****
(In numerical order F001-F030)

F001
Cochlear Implant Binding in Patients Undergoing 1.5T Magnetic Resonance Imaging
The following individuals have nothing to disclose:
Jeffrey D. Sharon, MD
Heather M. Weinreich, MD, MPH
Matthew W. Miller, MD, MS
Barbara Gottschalk, MSN, CRNP
Jaishri O. Blakeley, MD
John P. Carey, MD
The following individual discloses:
Howard W. Francis MD, MBA
Advanced Bionics-Advisory board

F002
Cochlear Implantation in Patients with Superficial Siderosis: A Review of 7 Cases
The following individuals have nothing to disclose:
Mara C. Modest, MD
Matthew L. Carlson, MD
George B. Wanna, MD
Colin L. W. Driscoll, MD

F003
Gastroesophageal Reflux Symptoms, Regular Use of Proton Pump Inhibitors and H2-Receptor Blockers, and Risk of Hearing Loss
The following individuals have nothing to disclose:
Brian M. Lin, MD
Sharon G. Curhan, MD
Konstantina M. Stankovic, MD, PhD
Gary C. Curhan, MD

F004
Transcanal Round Window Occlusion for Superior Semicircular Canal Dehiscence
The following individuals have nothing to disclose:
Colleen F. Perez, MD
Michael E. Hoffer, MD

F005
Utility of Vertebrobasilar Insufficiency Testing (VBIT) as a Component of Videonystagmography
The following individuals have nothing to disclose:
Norman J. Chan, MD
Taha A. Mur, MS
Kaitlin E. Palmer, MS
Bruce Zhang, MS
Paige M. Pastalove, AuD
Elizabeth Meenan, AuD
Pamela Roehm, MD, PhD

F006
High Resolution MRI Shows Presence of Endolymphatic Hydrops in Patients Still Symptomatic after Endolymphatic Shunt Surgery
The following individuals have nothing to disclose:
Isabelle Y. Liu, MD
Ali R. Sepahdari, MD
Gail Ishiyama, MD
Akira Ishiyama, MD

F007
Long-term Surgical and Audiometric Outcomes for Repair of Congenital Aural Atresia and Hypoplasia
The following individuals have nothing to disclose:
Harrison W. Lin, MD
Roberto A. Cueva, MD

F008
A Comparison of Outcomes between Functional Canal Wall Up vs Conventional Canal Wall Down Mastoidectomy for Cholesteatoma
The following individuals have nothing to disclose:
Wei-Chieh Chao, MD
Tali Rasooly, BA
Ilkka Kivekas, MD, PhD
Peter Forbes, PhD
Yi-Hsuan Wu, MD
Dennis Poe, MD, PhD

F009
A Modified Eustachian Tube Reconstruction with Transnasal Approach to Treat Patulous Eustachian Tube
The following individuals have nothing to disclose:
Yong Cui, PhD
Xiangdong Tu, BS
Jiandong Zhan, BS
Hongming Huang, MS
Qianhui Chen, PhD
Shaohua Chen, BS

F010
Surgical Anatomy of the Human Round Window Region: Implication for Cochlear Endoscopy through the External Auditory Canal
The following individuals have nothing to disclose:
Jung Eun Shin, MD, PhD
MaryBeth Cunnane, MD
Demetri Psaltis, MD
Konstantina M. Stankovic, MD, PhD

F011
Consistency and Modality in the Radiologic Diagnosis of Thin and Dehiscent Superior Semicircular Canals
The following individuals have nothing to disclose:
Samuel A. Spear, MD
Neal M. Jackson, MD
Christian E. Morel, MD
The following individual discloses:
Moises Arriaga MD, MBA-MED-EL-Consultant, Surgical advisory board; MED-EL, Cochlear, Advanced Bionics-Grants/ pending grants, support for temporal bone courses; Elselvier-Royalties

F012
Ex Vivo MR Histology of Nerve Fibers in a Human Temporal Bone by High-Resolution Diffusion Tensor Imaging Using 9.4 T MRI
The following individuals have nothing to disclose:
Masato Fujioka, MD, PhD
Keigo Hikishima, PhD
Naoki Oishi, MD, PhD
Yoshinori Kawai, MD
Hirotaka J. Okano, MD, PhD
Kaoru Ogawa, MD, PhD

F013
Review of a Single Surgeon's Stapes Cases Performed with a Nickel Titanium Prosthesis (2002-2014)
The following individuals have nothing to disclose:
Natalie Justicz, BA
Kevin K. Motamedi, MD
Douglas E. Mattox, MD

F014
Early Blind Sac Closure for the Treatment of Chronic Otitis Media
The following individuals have nothing to disclose:
Joseph P. Roche, MD
Oliver F. Adunka, MD
The following individual discloses:
Craig A. Buchman, MD
Cochlear Corp, Advanced Bionics-Surgical advisory board

F015
Feasibility of Transcanal Endoscopic Ear Surgery to Access Cholesteatoma in the Tympanic Sinus by Depth Classification
The following individuals have nothing to disclose:
Seiji Kakehata, MD, PhD
Tomoo Watanabe, MD, PhD
Tsukasa Ito, MD, PhD
Toshinori Kubota, MD, PhD
Kazunori Futai, MD, PhD
Takatoshi Furukawa, MD, PhD

F016
Is There a Right Ear Advantage in Congenital Aural Atresia?
The following individuals have nothing to disclose:
Matthew A. Hubbard, MD
Robert E. Reed, MD
Lincoln C. Gray, PhD
Bradley W. Kesser, MD

F017
Connecting the Heart and Ear: A Novel LVAD Powered through a Post-Auricular Pedestal
The following individuals have nothing to disclose:
Richard K. Gurgel, MD
Stephen H. McKellar, MD
Craig Selzman, MD

F018
Transcanal Endoscopic Ear Surgery for Pediatric Population with Narrow External Auditory Canal
The following individuals have nothing to disclose:
Tsukasa Ito, MD, PhD
Toshinori Kubota, MD, PhD
Tomoo Watanabe, MD, PhD
Kazunori Futai, MD, PhD
Takatoshi Furukawa, MD, PhD
Seiji Kakehata, MD, PhD

F019
The Presentation and Management of Tympanic Membrane Perforation with versus without Secondary Acquired Cholesteatoma
The following individuals have nothing to disclose:
James H. Clark, MB, BCh
Allen L. Feng, BS
Aisha Harun, MD
Howard W. Francis, MD, MBA

F020
Development of a Temporal Bone Simulator for Transcanal Endoscopic Ear Surgery
The following individuals have nothing to disclose:
Matthew M. Dedmon, MD, PhD
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F021
Skin Necrosis in a Magnet-based Bone Anchored Hearing Implant
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Daniel Jethanamest, MD
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F022
The Onset and Treatment of Otitis Media Associated with Eosinophilic Granulomatous Polyangiitis (EGPA)
The following individuals have nothing to disclose:
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F023
Clinical Impact of Ultra-high Resolution Inner Ear Magnetic Resonance Imaging
The following individuals have nothing to disclose:
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F024
Radiologic Variation of Round Window Anatomy: Implications for Cochlear Implantation and Inner Ear Drug Delivery
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F025
Comparison of Postoperative Pain between Transcanal Endoscopic Ear Surgery and Microscopic Ear Surgery
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F026
Benign Temporomandibular Joint Lesions Presenting as Masses in the External Auditory Canal
The following individuals have nothing to disclose:
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F027
Efficacy and Safety of Nanoparticle-mediated Steroid Delivery to the Inner Ear Following Acoustic Trauma
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F028
Development of Objective Measurement Method for the External Auditory Canal for Use in Transcanal Endoscopic Ear Surgery
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F029
Unilateral Sudden Sensorineural Hearing Loss in the Setting of West Nile Viral Meningitis: A Case Report and Literature Review
The following individuals have nothing to disclose:
Andrew M. Vahabzadeh-Hagh, MD,
Akira Ishiyama, MD

F030
Spontaneous Cerebral Spinal Fluid Leak during Tympanostomy Tube Placement: Intraoperative Findings of a Hyrtl's Fissure Repair
The following individuals have nothing to disclose:
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THE AMERICAN OTOLOGICAL SOCIETY WOULD LIKE TO THANK THE FOLLOWING MEMBERS FOR THEIR CONTRIBUTION TO THE 2015 AOS SCIENTIFIC PROGRAM

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Combined Poster Reception
AOS/ANS/ASPO/ARS/TRIO
Friday, April 24, 2015
5:30 pm - 7:00 pm
Exhibit Hall D - Level 2
Hynes Convention Center

AOS President's Reception & Banquet
Saturday, April 25, 2015

Reception - 6:30 pm
Constitution Ballroom Foyer

Dinner/Dance - 7:30 pm
Constitution Ballroom A & B

Formal attire/Black tie optional
{Advanced ticket purchase required
Members & Invited Guests only}

Upcoming meetings

149th AOS Spring Meeting
(in conjunction with COSM)
May 20-22, 2016
Hyatt Regency Chicago, Chicago, IL

AAO-HNSF Annual Meeting & OTO EXPO
September 27-30, 2015
Kay Bailey Hutchison Convention Center, Dallas, TX

The Abstract deadline for the AOS 149th Annual meeting is October 15, 2015.

Abstract Instructions and submission form will be available on website in July.
Website - www.americanotologicalsociety.org

All primary and contributing authors are required to complete a disclosure/conflict of interest statement at time of abstract submission in order for the abstract to be considered by the Program Advisory Committee.

Journal Requirements/Instructions to Primary Authors
Manuscripts are required of ALL ORAL presentations. Manuscripts must be submitted online **a minimum of four weeks** prior to the annual meeting, via the journal's website. Instructions for registering, submitting a manuscript, and the author guidelines can be found on the Editorial Manager site:
https://www.editorialmanager.com/on/

The journal of ***OTOLOGY & NEUROTOLOGY*** does not accept paper manuscripts. Manuscripts will be peer reviewed prior to the Annual meeting for conflict of interest review and resolution.

Failure to comply with the guidelines & requirements of the American Otological Society and the O&N Journal will result in the disqualification of your presentation.

For Society business, please forward all inquiries to:

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The following ACGME competency areas will be addressed throughout this CME activity.

Patient Care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.

Medical Knowledge about established and evolving biomedical, clinical, and cognate (e.g. epidemiological and social-behavioral) sciences and the application of this knowledge to patient care.

Practice-Based Learning and Improvement that involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care.

Interpersonal and Communication Skills that result in effective information exchange and teaming with patients, their families, and other health professionals.

Professionalism as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population.

Systems-Based Practice as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.

Saturday, April 25, 2015

1:00 **Business Meeting**
AOS new member introduction/All member photo
(Members Only)

1:30 **Scientific Program**
Open to registered Members and Non-members
(Badge required for admittance)

1:30 **Welcome & Opening Remarks by the President**
D. Bradley Welling, MD, PhD

Presidential Citations
John P. Carey, MD
Marlan R. Hansen, MD
John K. Niparko, MD
Lorne S. Parnes, MD
J. Thomas Roland, Jr., MD
Leonard P. Rybak, MD, PhD

AOS Guest of Honor Introduction

1:45 **GUEST OF HONOR LECTURE**
"An Imperative for Otology"
Joseph B. Nadol Jr., MD

2:05 **Impact of Intrascalar Electrode Location, Electrode Type, and Angular Insertion Depth on Residual Hearing in Cochlear Implant Patients**
George B. Wanna, MD
Jack H. Noble, PhD
Rene H. Gifford, PhD
Alejandro Rivas, MD
Mary S. Dietrich, PhD
Alex D. Sweeney, MD
Zhang Dongqing, MS
Benoit M. Dawant, PhD
Robert F. Labadie, MD, PhD

2:13 **Results of Post-Operative, CT-Based, Electrode Deactivation on Hearing in Pre-Lingually Deafened Adult Cochlear Implant (CI) Recipients**
Robert F. Labadie, MD, PhD
Jack H. Noble, PhD
Andrea Hedley William, AuD
Linsey Sunderhaus, AuD
Benoit Dawant, PhD
Rene H. Gifford, PhD

2:21 **Variability of the Mental Representation of the Cochlear Anatomy during Cochlear Implantation**
Renato Torres, MD
Guillaume Kazmitcheff, PhD
Evelyne Ferrary, MD, PhD
Olivier Sterkers, MD, PhD
Yann Nguyen, MD, PhD

2:29 **Cognitive and Neurobehavioral Consequences of Otic Capsule Defects**
P. Ashley Wackym, MD
Heather T. Mackay, PsyD
Stuart D. Gardiner, PhD
Carey Balaban, PhD

2:37 **DISCUSSION**

2:45 **BREAK WITH EXHIBITORS**

3:15 **High Frequency Hearing Loss after Stapedectomy**
Michael W. Sim, MD
Gregory Mannarelli, AuD
Hussam K. El-Kashlan, MD
Steve A. Telian, MD
H. Alexander Arts, MD

3:23 **Ossiculoplasty with Titanium Prostheses in Patients with Intact Stapes: Comparison of TORP vs. PORP**
Andrew B. Baker, BS
Brendan P. O'Connell, MD
Shaun A. Nguyen, MD, MA
Paul R. Lambert, MD

3:31 **Objective Measurements of Ossicular Chain Mobility Using the PalpEar® Instrument Intraoperatively**
Thomas E. Linder, MD
Esther Troxler, MD
Gabriel Volcan, MD

3:39 **Improved Anatomic Visualization of the Middle Ear Using Endoscopes**
Marc L. Bennett, MD
Dongqing Zhang
Robert F. Labadie, MD, PhD
Alejandro Rivas, MD
Jack H. Noble, PhD

3:47 **Tympanic Neurectomy for Intractable Otalgia**
Daniel S. Roberts, MD, PhD
Alisa Yamasaki, BA
Ahmad Sedaghat MD, PhD
Edward Reardon, MD

3:55 **Magnetic Resonance Imaging with Cochlear Implant Magnet in Place: Safety and Imaging Quality**
Matthew L. Carlson, MD
Brian A. Neff, MD
Michael J. Link, MD
John I. Lane, MD
Robert E. Watson, MD, PhD
Matt A. Bernstein, PhD
Colin L. W. Driscoll, MD

4:03 **Diagnostic Accuracy of Diffusion-Weighted MR Imaging versus Delayed Gadolinium Enhanced T1-Weighted Imaging in Middle Ear Recurrent Cholesteatoma: A Retrospective Study of 39 Patients**
Rémi Marianowski, MD, PhD
Adèle Pennanéach, MD
Marc Garetier, MD
Michel Ollivier, MD
Jean Ognard, MD
Philippe Mériot, MD

4:11 **DISCUSSION**

4:15 **PANEL – "Issues in Imaging"**
Hugh D. Curtin, MD – Moderator
Jennifer R. Melcher, PhD

5:00 **ADJOURNMENT**

6:30 **AOS PRESIDENT'S RECEPTION AND DINNER/DANCE**
(*Members and Invited Guests Only*)

Sunday, April 26, 2015

7:00 **Business Meeting**
(*Members Only*)
Committee Reports

7:30 **Scientific Program**
Open to registered Members and Non-members
(Badge required for admittance)

7:30 **Remarks by the President**
D. Bradley Welling, MD, PhD

7:35 **Provider and Patient Drivers of Ototopical Antibiotic Prescription Variability**
Matthew G. Crowson, MD
Kristine Shulz, DrPH(c), MPH
Debara L. Tucci, MD, MS, MBA

7:43 **Malignant Otitis Externa: A Novel Stratification Protocol for Predicting Treatment Outcomes**
Shawn M. Stevens, MD
Paul R. Lambert, MD
Shaun A. Nguyen, MD
Ted A. Meyer, MD, PhD

7:51 **Effects of Skin Thickness on Cochlear Input Signal using Transcutaneous Bone Conduction Implants**
Jameson K. Mattingly, MD
Nathaniel T. Greene, PhD
Herman A. Jenkins, MD
Daniel J. Tollin, PhD
James R. Easter, MS, PE
Stephen P. Cass, MD, MPH

7:59 **Tinnitus Management in Patients with Percutaneous Ossteointegrated Auditory Implants for Single Sided Deafness**
Yula A. Indeyeva, MD
Adrian Diaz, BS
Terence E. Imbery, MD
Daniel H. Coelho, MD

8:07 **Customized vs. Non-Customized Sound Therapy for Treatment of Tinnitus: A Randomized Crossover Clinical Trial**
Hossein Mahboubi, MD, MPH
Saman Kiumehr, MD
Kasra Ziai, MD
Kanwar Kelley, MD
Hamid R. Djalilian, MD

8:15 **Pediatric Semicircular Canal Dehiscence and Temporal Bone Development**
Duncan A. Meiklejohn, MD
C. Eduardo Corrales, MD
Nikolas H. Blevins, MD

8:23 **DISCUSSION**

8:30 **BASIC SCIENCE LECTURE**
"Hidden Hearing Loss: Permanent Cochlear Nerve Loss after Temporary Noise-Induced Threshold Shift"
M. Charles Liberman, PhD

9:00 **Using Biomarkers to Evaluate the Association between BPPV and Osteoporosis**
Daniel Sacks, MD
Catherine Bixby, MS
Pamela Fall, MS
Kourosh Parham, MD, PhD

9:08 **Increasing cVEMP Stimulation Rate Reduces Test Time and Patient Effort with Only Minor Changes in Test Results**
Mark J. van Tilburg, MD
Barbara S. Herrmann, PhD
John Guinan Jr., PhD
Steven D. Rauch, MD

9:16 **RESIDENT RESEARCH TRAVEL AWARD**
Dexamethasone Protects Against Apoptotic Cell Death of Cisplatin-exposed Auditory Hair Cells In Vitro
Christine T. Dinh, MD
Si Chen, MD
John N. Dinh, BS
Esperanza Bas, PhD
Fred F. Telischi, MD
Thomas R. Van De Water, PhD

9:24 **Dose Effect of Intratympanic Dexamethasone for Idiopathic Sudden Sensorineural Hearing Loss: 24 mg/mL is Superior to 10 mg/mL**
Nopawan Vorasubin, MD
Quyen T. Nguyen, MD, PhD
Jeffrey P. Harris MD, PhD
Thomas H. Alexander, MD, MHSc

9:32 **Progressive Nonsyndromic Hearing Loss Associated with Mutation of the NLRP3 Gene and Alteration of Innate Immunity**
Hiroshi Nakanishi, MD, PhD
Yoshiyuki Kawashima, MD, PhD
Kiyoto Kurima, PhD
Julie Muskett, MS
Carmen C. Brewer, PhD
Andrew J. Griffith, MD, PhD

9:40 **DISCUSSION**

9:45 **INTERMISSION**

10:07 **Abnormal Rhomboid Lip in Children with Cochlear Nerve Deficiency Fitted with Auditory Brainstem Implantation**
Liliana Colletti, PhD
Marco Mandalà, MD, PhD
Giacomo Colletti, MD
Vittorio Colletti, MD

10:15 **The Studying Multiple Outcomes after Aural Rehabilitative Treatment (SMART) Study: Study Design and Baseline Results**
Lingsheng Li, MHS
Yoon Sung, MHS
Barnett Shpritz, MA
David Chen, MD
Dane Genther, MD
Josh Betz, MS
Frank R. Lin, MD, PhD

10:23 **Cost Effectiveness of Genetic Diagnosis and Telemedicine to Provide Cochlear Implantation to Children within Medically Underserved Plain Populations**
Kevin A. Strauss, MD
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Thierry Morlet, PhD
Yell Inverso, AuD, PhD
Liesl Looney, AuD
Christopher J. Goff, MD
Erin Field, PAC

10:31 **RESIDENT RESEARCH TRAVEL AWARD**
GDP Matters: Cost Effectiveness of Cochlear Implantation and Deaf Education in Sub-Saharan Africa
Susan D. Emmett, MD
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Magteld Smith, PhD
Isaac M. Macharia, MBChB
Doreen Nakku, MD
Titus S. Ibekwe, MBBS
Wenfeng Gong, MSc
Howard W. Francis, MD, MBA
James E. Saunders, MD

10:39 **Patterns of Long-term Hearing Loss in Hearing Preservation Cochlear Implant Surgery**
Kavita Dedhia, MD
Tina Worman, MS
Margaret A. Meredith, AuD, CCC-A
Jay T. Rubinstein, MD, PhD

10:47 **Heparin Binding Epidermal Growth Factor Like Growth Factor Heals Chronic Tympanic Membrane Perforations with Advantage of Fibroblast Growth Factor 2 and Epidermal Growth Factor in an Animal Model**
Peter L. Santa Maria, MBBS, PhD
Kendall Weierich
Sungwoo Kim, PhD
Yunzhi P. Yang, PhD

10:55 **Regenerative Treatment for the Tympanic Membrane Perforation with Cholesteatoma, Tumor, and Sever Calcification**
Shin-ichi Kanemaru, MD, PhD
Rie Kanai, MD, PhD
Misaki Yamamoto, MD, PhD
Masaru Yamashita, MD, PhD

11:03 **DISCUSSION**

11:10 **PANEL – "Hurdles to Gene Therapy"**
Lawrence R. Lustig, MD – Moderator
Lloyd B. Klickstein, MD, PhD
Eric A. Pierce, MD, PhD
Hinrich Staecker, MD, PhD
Rachel Witten, MD

12:00 **INTRODUCTION OF INCOMING AOS PRESIDENT**
Debara L. Tucci, MD, MS, MBA

12:05 **CLOSING REMARKS/ADJOURNMENT**
D. Bradley Welling, MD, PhD

2:05 pm

Impact of Intrascalar Electrode Location, Electrode Type, and Angular Insertion Depth on Residual Hearing in Cochlear Implant Patients

George B. Wanna, MD; Jack H. Noble, PhD
Rene H. Gifford, PhD; Alejandro Rivas, MD
Mary S. Dietrich, PhD; Alex D. Sweeney, MD
Zhang Dongqing, MS; Benoit M. Dawant, PhD
Robert F. Labadie, MD, PhD

Objective: To evaluate the relationship between intrascalar electrode location, electrode type (lateral wall, perimodiolar, and midscala), and angular insertion depth on residual hearing in cochlear implant (CI) recipients.

Setting: Tertiary academic hospital

Patients: Adult CI patients with functional pre-op residual hearing with pre and post-op CT scans.

Intervention: Audiological assessment after CI.

Main outcome measures: Electrode location, angular insertion depth, residual hearing post-CI, and word scores with CI [consonant-nucleus-consonant (CNC)].

Results: Forty-five implants in thirty-seven patients (8 bilateral) were studied. Thirty-eight electrode arrays (84.4%) were fully inserted in scala tympani (ST), 6 (13.3%) crossed from ST to scala vestibuli (SV), and 1 (2.2%) was completely in SV. Twenty-two of the 38 (57.9%) with full ST insertion maintained residual hearing at 1 month compared with 0 of the 7 (0%) with non-full ST insertion (p=0.009). In the full ST group, neither age, sex or electrode type demonstrated statistically significant associations with hearing preservation (p=0.624, 0.744 and 0.929, respectively). The median angular insertion depth was 450˚ (range 308˚-591˚) with no significant difference between the hearing and non-hearing preserved groups (p=0.398).

Conclusion: Scalar excursion is a strong predictor of losing residual hearing. However, neither age, sex, electrode type or angular insertion depth were correlated with hearing preservation in the full ST group. Techniques to decrease the risk of electrode excursion from ST are likely to result in improved residual hearing and CI performance.

Define Professional Practice Gap: Preserving residual hearing in cochlear implant patients offers the benefits of electroaccoustic stimulation. Many factors can affect hearing preservation in cochlear implant patients. To date, the clinical data regarding factors that influence residual hearing in cochlear implants recipient is scarse.

Learning Objective: To evaluate the relationship between intrascalar electrode location, electrode type (lateral wall, perimodiolar, and midscala), and angular insertion depth on residual hearing in cochlear implant (CI) recipients.

Desired Result: 1- Hearing Preservation can be accomplished with all type of electrodes; 2- Scalar Excursion is a strong predictor of losing residual hearing; 3- Age, sex, electrode type and angular insertion depth were not correlated with heairng preservation in patient with full scala tympani insertion.

IRB Status: Approved

2:13 pm

Results of Post-Operative, CT-Based, Electrode Deactivation on Hearing in Pre-Lingually Deafened Adult Cochlear Implant (CI) Recipients

Robert F. Labadie, MD, PhD; Jack H. Noble, PhD
Andrea Hedley William, AuD; Linsey Sunderhaus, AuD
Benoit Dawant, PhD; Rene H. Gifford, PhD

Objective: To test the use of a novel CI programming technique on prelingually-deafened, adult CI recipients.

Study design: Prospective unblinded study.

Setting: Tertiary referral center

Patients: 23 experienced adult CI recipients with prelingual onset of SNHL.

Intervention(s): Temporal-bone CT scans were used as input to a series of semi-automated computer algorithms which estimate the location of electrodes in reference to the modiolus. This information was used to selectively deactivate sub-optimally located electrodes, i.e. those for which the distance from the electrode to the modiolus was further than a neighboring electrode to the same site. Patients used the new program exclusively for 3-5 weeks.

Main outcome measure(s): Minimum Speech Test Battery (MSTB), consonant recognition, and spectral modulation detection (SMD).

Results: On average 35% of electrodes were deactivated. On average, MSTB and consonant recognition did not show significant differences for the reprogrammed ear. SMD significantly improved as a result of reprogramming ($X^2=4.3$, $p=0.038$) consistent with improved spatial selectivity. For approximately half of patients who did demonstrate improvement for MSTB and consonants, the changes were substantial (e.g. CNC words increased by median 16%, up to 28 percentage points). Ultimately 17 of 23 (74%) elected to keep the new map due to perceived benefit often substantiated by objective improvement on either MSTB, consonants, and/or SMD.

Conclusions: Knowledge of the geometric relationship between CI electrodes and the modiolus appears to be useful in adjusting CI maps even for pre-lingually deafened adults. Long-term improvements may be observed resulting from improved spatial selectivity and spectral resolution.

Define Professional Practice Gap: Lack of awareness of alternative methods for programming prelingual cochlear implant (CI) recipients.

Learning Objective: To become aware of an image-based CI programming technique and its potential use on prelingual CI recipients.

Desired Result: To provide results of audiological performance after reprogramming and to provide information about how this technique may be available to other CI recipients.

IRB Status: Approved

2:21 pm

Variability of the Mental Representation of the Cochlear Anatomy during Cochlear Implantation

Renato Torres, MD; Guillaume Kazmitcheff, PhD
Evelyne Ferrary, MD, PhD; Olivier Sterkers, MD, PhD
Yann Nguyen, MD, PhD

Hypothesis: The mental representation of the cochlea anatomy is related to surgeons' experience in cochlear implantation (CI).

Background: During the surgery, the absence of visual landmark for intracochlear anatomy can complexify the first two surgical steps: localization of the electrode array penetration zone through the round window and/or the cochleostomy and alignment of insertion axis with the basal turn.

Methods: A mastoidectomy and posterior tympanotomy was prepared in five different models of artificial temporal bones (TB). Each TB was then registered on a magnetic navigation system with a cone-beam CT. The evaluation was performed with a neuronavigated tool as followed: 1) localization of the penetration zone into the cochlea related to round window niche; 2) measurement of the optimal insertion axis according the surgeon mental representation and comparison with basal turn axis. Sixteen surgeons were evaluated (senior otologist; > 50 CI surgery n=3; junior otologist; no CI experience n=7 and residents n=6). Each surgeon was tested in each TB.

Results: Localization of the penetration zone of the array was round window, inferior, anterior and superior, anterior-inferior in 52.5%, 15%, 12.5%, 11% and 9% respectively. Experts had better approximation of the optimal insertion axis than fellows and residents in axial plane (7±1.5° vs. 14±1.7°; p=0.017 vs. 15±1.5°; p=0.002 respectively) and in coronal plane (-6±1.5° vs. -13±1.7°; p=0.009 vs. -17±1.9°; p<0.001 respectively).

Conclusions: This study suggest that mental representation of the cochlea is dependent on both otological and CI surgical experience. It can be improved with training to increase CI surgery quality.

Define Professional Practice Gap: A traumatic surgery during cochlear implantation enhances residual hearing preservation. During the surgery, the absence of visual landmark for intracochlear anatomy can complexify mental representation of the optimal cochlear implant insertion axis. The aim of our study was to assess
the lack of contemporary knowledge on the mental representation of the cochlea anatomy by surgeons with various experiences.

Learning Objective: The learning objective is to understand how navigation systems can be used as a training tool to better learn cochlear anatomy to enhance its mental representation and thus cochlear implant surgery quality.

Desired Result: We would like the attendees to improve their awareness on cochlear implant array insertion axis by preoperative imaging analysis and training on artificial or temporal bone specimen with navigation systems.

IRB Status: Exempt

2:29 pm

Cognitive and Neurobehavioral Consequences of Otic Capsule Defects

P. Ashley Wackym, MD; Heather T. Mackay, PsyD
Stuart D. Gardiner, PhD; Carey Balaban, PhD

Objective: Patients with peripheral vestibular dysfunction have cognitive impairment. Pre- and postoperative quantitative measurement of cognitive function in a cohort of patients with otic capsule defects and superior canal dehiscence (SCD) symptoms were systematically studied.

Study design: Prospective patient series.

Setting: Tertiary referral center.

Patients: There were 17 patients (13 adults, 4 children) with clinical SCD spectrum who underwent surgical management.
Interventions: Neuropsychology test batteries were performed preoperatively and every three months postoperatively for up to one year. These included: Beck's Depression Inventory-II (BDI-II); Delis-Kaplan Executive Function System (D-KEFS); Wide Range Intelligence Test (WRIT FSIQ); and Wide Range Assessment of Memory and Learning (WRAML-2), including the four domains of verbal memory, visual memory, attention/ concentration and working memory.

Main outcome measures: Pre- vs three months postoperative (post-3) and post-3 vs most recent cognitive and neurobehavioral function were compared statistically.

Results: There was a highly significant improvement in BDI-II at pre- vs post-3 ($p=0.0006$) but no further improvement at most recent ($p=0.68$). There was a statistically significant improvement of D-KEFS at post-3 ($p=0.023$) as well as at most recent ($p=0.023$). For the WRAML-2 (pre- vs post-3; post-3 vs most recent): verbal ($p=0.02$; $p=0.008$); visual ($p=0.24$; $p=0.10$); attention/concentration ($p=0.05$; $p=0.048$); and working memory ($p=0.27$; $p=0.007$). There were no changes in IQ scores.

Conclusions: Overall there was a marked improvement in cognitive and neurobehavioral function postoperatively. The delay in performance improvement measured in some domains may represent brain reorganization. Delayed improvement in specific domains may represent an opportunity for additional intervention to accelerate recovery.

Define Professional Practice Gap: 1. Lack of awareness of the magnitude of cognitive dysfunction in patients with otic capsule defects and the capacity for recovery after repair.

Learning Objective: 1. To demonstrate that objective standardized neuropsychology test instruments can be used to quantify improvement in function after surgical intervention; 2. To understand the degree of cognitive and neurobehavioral dysfunction produced by otic capsule defects.

Desired Result: 1. Attendees will be able to refer patients for objective neuropsychology testing before and after treatment to demonstrate the effectiveness of their surgical intervention.

IRB Status: Approved

3:15 pm

High Frequency Hearing Loss after Stapedectomy

Michael W. Sim, MD; Gregory Mannarelli, AuD
Hussam K. El-Kashlan, MD; Steve A. Telian, MD
H. Alexander Arts, MD

Objectives: Anecdotal evidence suggests that perioperative antioxidant treatment may reduce the risk of high frequency hearing loss (HFHL) after stapedectomy. This study sought to determine the incidence of HFHL after stapedectomy, and to compare the postoperative hearing outcomes of small fenestra (SF) versus partial stapedectomy (PS) techniques.

Study Design: Retrospective case review.

Setting: Tertiary referral center.

Patients: Otosclerosis patients who underwent from March 25, 1994 to May 21, 2012 with available preoperative and postoperative audiograms were included. There were 232 patients, 97 male and 135 female, with 270 stapedectomies available for analysis.

Interventions: Patients underwent stapedectomy via SF or PS.

Main Outcome Measures: Preoperative and postoperative mean pure-tone bone conduction thresholds (BCT) at 1000Hz, 2000Hz, 4000Hz, and air conduction threshold (ACT) at 8000Hz.

Results: The incidence of postoperative HFHL was 3.5% at 4000Hz and 7.2% at 8000Hz. There was no change in mean preoperative to postoperative BCT at 4000Hz (-0.1dB, p=0.9). There was a decrease in mean ACT, and thus improved hearing, at 8000Hz (-2.3dB, p=0.02). SF provided improved hearing outcomes at 8000Hz compared to PS (-4.1dB vs. +0.3dB, p=0.03). PS provided improved hearing outcomes at 1000 Hz and 2000 Hz compared to SF (-8.7dB vs. -3.4dB, p<0.001; -9.9dB vs. -6.3dB, p=0.005; respectively).

Conclusions: The incidence of postoperative HFHL was very low in this study. As a result, it will be difficult for a study to demonstrate a beneficial effect of antioxidant therapy in this setting. SF improved results at the higher frequencies compared to PS, but PS had better outcomes in the lower frequencies.

Define Professional Practice Gap: Inconsistencies in the literature regarding the incidence of postoperative high frequency hearing loss after stapedectomy

Learning Objective: To determine the incidence of postoperative high frequency hearing loss after stapedectomy in a single tertiary institution, and to compare the postoperative hearing outcomes of small fenestra technique with partial stapedectomy

Desired Result: Postoperative counseling on what results to expect after stapedectomy.

IRB Status: Approved

3:23 pm

Ossiculoplasty with Titanium Prostheses in Patients with Intact Stapes: Comparison of TORP vs. PORP

Andrew B. Baker, BS; Brendan P. O'Connell, MD
Shaun A. Nguyen, MD, MA; Paul R. Lambert, MD

Objectives: To compare hearing outcomes and complications observed in patients undergoing ossiculoplasty with an intact stapes using either titanium partial ossicular replacement prosthesis (PORP) or titanium total ossicular replacement prosthesis (TORP).

Study Design: Review of prospectively acquired database.
Setting: Tertiary hospital.

Patients: Included surgical patients undergoing ossicular chain reconstruction from 2003-2014.
Intervention: Ossicular reconstruction surgery.

Outcomes: Short-term (<6 months) air-bone gap (ABG) and speech reception threshold (SRT), as well as extrusion rate (mean follow up of 18.6 months).

Results: A total of 72 cases performed on 68 patients had sufficient audiometric data to be included for analysis, including 48 cases performed with titanium PORP and 24 cases performed with titanium TORP. Mean post-operative ABG was 15.3dB in the PORP group and 21.5dB in the TORP group (P=0.066). Mean post-operative SRT was 20.0dB with PORP and 32.4dB with TORP (P=0.027). Post-operative ABG $\leq$ 20dB was achieved in 64.6% of PORP cases and 62.5% of TORP cases (P=0.862). Mean ABG closure was 17.1dB with PORP compared to 10.9dB with TORP (P=0.511). Extrusion occurred in 4 PORP cases (7.7%) and 3 TORP cases (10.7%) (P=0.691).

Conclusion: This is the first study comparing titanium PORP/TORP reconstruction with an intact stapes. Titanium PORP showed significantly lower post-operative SRT compared to TORP; however, no significant difference was seen in post-operative ABG, ABG closure, or success rate of surgery (defined as post-operative ABG $\leq$ 20dB). PORP reconstruction may have better short-term audiometric outcomes; however, TORP reconstruction is a viable alternative depending on anatomical considerations.

Define Professional Practice Gap: The defined practice gap exists when surgeons consider placement of a titanium TORP vs. PORP prosthesis in patients with an intact stapes. Since there is no published literature on this subject, the decision is made purely by the experiences of the surgeon.

Learning Objective:1. There is a lack of contemporary knowledge as to the outcomes of ossicular chain reconstruction with titanium prosthesis in patients with an intact stapes; 2. There have been no published studies to date analyzing the difference between titanium TORP and PORP placement in these patients; 3. This study seeks to be the first study to examine audiometric outcomes in patients with an intact stapes undergoing ossicular chain reconstruction with either titanium TORP or PORP.

Desired Result: This presentation will provide attendees with knowledge of audiometric outcomes with titanium prosthesis for ossciular chain reconstruction in patients with an intact stapes. This information will help to guide surgical decision making with regards to TORP vs. PORP prosthesis in the reconstruction of these patients.

IRB Status: Approved

3:31 pm

Objective Measurements of Ossicular Chain Mobility Using the PalpEar® Instrument Intraoperatively

Thomas E. Linder, MD; Esther Troxler, MD
Gabriel Volcan, MD

Objective: The judgement of a normal or impaired mobility of middle ear ossicles is based on intraoperative palpation and depends on the surgeon's experience. In collaboration with Sensoptic we have developed a PalpEar® hook which enabels the surgeon to record force and vector during his standard palpation of each ossicle at surgery.

Setting: Tertiary referral center

Patients: Normative Data of ossicular chain mobility were acquired during cochlear implant surgeries and ossiculoplasties.

Interventions: The PalpEar® device records from a 2.5mm 45o hook the force and vector direction used to move an ossicle for its minimal excursion. Series of palpations were recorded and the surgeon's subjective estimate of mobility was noted.

Main Outcome measure: Data series from patients with a functionally normal ossicular chain (e.g. CI-Surgeries) were compared to series from patients with otosclerosis and fixed stapes before and after separation of the IS-joint.

Results: Technical adjustments were made initially to improve the instrument handling. The malleus-incus complex in a normal chain required a mean force of 4.1g, in otosclerosis patients before separation of the IS-joint 9.7gf and after disarticulation 7.3gf. The normal stapes moved already at 2.1gf whereas in otosclerotic patients 15,3gf were required.

Conclusion: It is technically feasible to record intraoperatively small movements of middle ear ossicles. The data are consistent with the surgeon's own impression of normal and impaired mobility. Semi-objectively measuring middle ear ossicular movements can help in defining partial fixation and may also provide further insight into the expected audiological outcome of ossiculoplasties.

Define Professional Practice Gap: In ossiculoplasties there are still too many variables involved in the final outcome for the patient. One issue may be the mobility of the remaining ossicles prior to the reconstruction. This study investigates an easily applicable method of objectively measuring vibration patterns of middle ear ossicles and may become an interesting subject for further evaluation of normal and abnormal movements (both as fixations or as hyper mobility)

Learning Objective: Improve the awareness for normal and abnormal mobility of the ossicular chain prior to any reconstruction by patient's own ossicles or middle ear prosthesis. Until now, the surgeon's experience determined the proper method for an ossiculoplasty. A more objective recording of ossicular movements may help in understanding poor and good results after ossiculoplasties.

Desired Result: 1. Introduction of a new instrument; 2. Awareness of differences in ossicular motion; 3. Discussion on the utility of the device, stimulating also new application modes.

IRB Status: Approved

3:39 pm

Improved Anatomic Visualization of the Middle Ear Using Endoscopes

Marc L. Bennett MD; Dongqing Zhang
Robert F. Labadie MD, PhD; Alejandro Rivas, MD
Jack H. Noble, PhD

Hypothesis: Middle ear visualization is a critical part of cholesteatoma dissection. While a microscope offers good visualization of the middle ear and surrounding areas, endoscopes offer improved visualization.

Background: Cholesteatomas are benign lesions that form in the middle ear. Traditionally, cholesteatomas are removed with the aid of a microscope. Endoscopes have the potential to increase visualization. We have developed methods to use CT images to quantify the percentage of each region of the middle that can be visualized with microscopes and endoscopes.

Methods: A semi-automatic atlas-based algorithm was used to segment the middle ear in CT images of 6 subjects. The middle ear was carefully delineated into the regions of the mesotympanum, hypotympanum, Eustachian tube, epitympanum, sinus tympani, facial recess, and antrum. Views from a microscope and 0, 30, and 45 degree endoscopes were simulated, and the surface area that was visible of each region was estimated.

Results: Endoscopes offers better visualization of the middle ear than a microscope and viewable area increases with higher angled endoscopes. These differences were found to be statistically significant using two-tailed Wilcoxon signed-rank test at ($p<0.05$).

Conclusions: To the best of our knowledge, this work presents the first approach for estimating surface areas of the middle ear that can be visualized with both microscopes and different angles of endoscopes. This increased visualization we have found angled scopes to offer suggests that the use of angled scopes may lead to decreased recurrence rates for cholesteatoma.

Define Professional Practice Gap: the lack of awareness of visualized middle ear volumes; the lack of awareness of improved middle ear visualization with endoscopes; improved cholesteatoma dissection outcomes with endoscopes

Learning Objective: Observers will learn what percentage of middle ear volumes are visualized with a standard microscope. In addition, the observers will understand the improved visualization with endoscopes especially in surrounding volumes of the middle ear.

Desired Result: Observers will understand which middle ear volumes are well visualized with traditional microscopes and which volumes are better visualized with endoscopes. Observers will understand combination of visualization techniques to decrease recurrence rates.

IRB Status: Approved

3:47 pm

Tympanic Neurectomy for Intractable Otalgia

Daniel S. Roberts, MD, PhD; Alisa Yamasaki, BA
Ahmad Sedaghat MD, PhD; Edward Reardon, MD

Objective: The goals of this study were to analyze whether tympanic neurectomy is a successful surgical option in patients with intractable otalgia.

Setting: Tertiary referral center

Study Design: Retrospective single institution study from the experience of a single surgeon.

Patients: Records of 17 adult patients with intractable unilateral otalgia of likely glossopharyngeal origin were reviewed with IRB approval.

Interventions: Patients who responded to a tympanic nerve block were considered for tympanic neurectomy. Eleven patients underwent the procedure.

Main Outcome Measure: The presence of persistent otalgia was evaluated.

Results: Persistent otalgia was present for an average of 17.75 months (standard error: 8.9 months) prior to an intervention. Narcotic medication was used in 45% of patients prior to surgery. Patients received a median number of one (range: 1-3) tympanic nerve block prior to tympanic neurectomy to evaluate candidacy for surgery. Intractable otalgia resolved in 5/11 (45.5%) after one surgery with an average follow-up of 28.2 months (range 2-60). A significant reduction in pain occurred in 5/11 patients (45.5%) after an initial surgery with an average follow-up of 37.1 months. One patient received no benefit from the procedure. Revision surgery occurred in 3/11 patients and 5 patients received additional blocks after the initial surgery. All together 7/11 patients received complete resolution of pain and an additional 3/11 patients received partial benefit using our algorithm for treatment of intractable otalgia of glossopharyngeal origin.

Conclusions: Intractable otalgia treated with tympanic neurectomy is a viable treatment option in cases of failed medical management. These findings provide important information that will aid clinicians in counseling chronic otalgia patients.

Define Professional Practice Gap: Tympanic neurectomy for intractable otalgia is a procedure that is not widely utilized by otologic surgeons.

Learning Objective: The learning objective is to familiarize otologic surgeons with this surgery.

Desired Result: This report with provide important information that will aid clinicians in counseling chronic otalgia patients about the utility of tympanic neurectomy.

IRB Status: Approved

3:55 pm

Magnetic Resonance Imaging with Cochlear Implant Magnet in Place: Safety and Imaging Quality

Matthew L. Carlson, MD; Brian A. Neff, MD
Michael J. Link, MD; John I. Lane, MD
Robert E. Watson, MD, PhD; Matt A. Bernstein, PhD
Colin L. W. Driscoll, MD

Objective: To evaluate the safety and image quality of 1.5-Tesla MRI in patients with cochlear implants and retained internal magnets.

Study Design: Retrospective case series

Setting: Single tertiary academic referral center

Patients: All cochlear implant recipients undergoing 1.5-Tesla MRI without internal magnet removal

Intervention(s): MRI after tight headwrap application

Main outcome measures: Patient tolerance, complications, and characteristics of imaging artifact

Results: Nineteen ears underwent a total of 34 MRI scans. One subject experienced two separate episodes of polarity reversal in the same device from physical realignment (i.e., flipping) of the internal magnet. Three patients were discovered to have canting of the internal magnet after imaging. In all three cases the magnet could be reseated by applying gentle firm pressure to the scalp until the magnet "popped" back into place. In patients receiving head MRI, the ipsilateral internal auditory canal and cerebellopontine angle could be visualized without difficulty in 94% of cases. There were no episodes of cochlear implant device failure or soft tissue complications.

Conclusion: 1.5-Tesla MRI is safe and well tolerated by most patients with cochlear implants. In nearly all cases, imaging artifact does not impede evaluation of the ipsilateral skull base. A small percentage of subjects may experience magnet displacement despite tight headwrap application. If canting, or mild displacement of the internal magnet occurs, an attempt at reseating can be made by applying gentle firm pressure to the scalp over the internal magnet. If conservative measures fail, the magnet should be surgically repositioned to minimize interruption of device use and to prevent scalp complications.

Define Professional Practice Gap: Lack of contemporary knowledge regarding the safety and imaging quality of MRI with an internal cochlear implant magnet in place.

Learning Objective: To understand the safety and feasibility of MRI in patients with retained internal cochlear implant magnets.

Desired Result: Attendees will be aware of the safety and imaging quality of MRI in patients with retained internal cochlear implant magnets in order to understand the utility of this practice and to counsel patients regarding the risks.

IRB Status: Approved

4:03 pm

Diagnostic Accuracy of Diffusion-Weighted MR Imaging versus Delayed Gadolinium Enhanced T1-Weighted Imagingin Middle Ear Recurrent Cholesteatoma: A Retrospective Study of 39 Patients

Rémi Marianowski, MD, PhD; Adèle Pennanéach, MD
Marc Garetier, MD; Michel Ollivier, MD
Jean Ognard, MD; Philippe Mériot, MD

Objective: MR imaging using Diffusion Weighted (DW) images and delayed gadolinium enhanced T1 weighted images is evolving into an alternative to second look surgery in detection of recurrent cholesteatomas. The aim of this study was to retrospectively compare the DW images, the post-gadolinium T1 weighted images and the combination of both methods in this indication.

Patients and methods: We retrospectively evaluated the MR examination of 39 patients clinically suspected for a recurrent cholesteatoma. Patients in the study underwent DW sequences, delayed gadolinium enhanced T1 weighted sequences as well as standard uninjected protocol using T1 and T2 sequences. Three blinded radiologists evaluated three data sets: a set of post-gadolinium T1 weighted images, a set of DW images and a set of the combination of both methods. The interobserver agreement was evaluated and the diagnostic accuracy of each method was described by sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV). The performances of the three techniques were also evaluated using ROC curves, from which the AUC were compared. Results were compared with surgical results or a two-year follow-up.

Results: The overall sensitivity and specificity were respectively 63 % and 71 % for the post-gadolinium T1 weighted images, 88 % and 75 % for the DW images and 84 % and 75 % for the combined images. The PPV and NPV were respectively 89 % and 33 % for the post-gadolinium T1 weighted images, 93 % and 62 % for the DW images and 93 % and 55 % for the combined images. The sensitivity and the NPV were significantly different between the three methods ($P < 0.0001$ and $P = 0.027$). There was no statistically significant difference in specificity or PPV between the three methods ($P = 0.931$ and $P = 0.650$). The diagnostic accuracy evaluated with the AUC showed no statistically significant difference between the DW images and the combined images ($P = 0.433$).

Conclusion: MR imaging reliably identifies those patients suspected for recurrent cholesteatoma who require a surgical second look by using DW MR imaging. The combination with delayed gadolinium enhanced T1 weighted sequences does not significantly increases the diagnostic accuracy of the examination.

Define Professional Practice Gap: Lack of awareness

Learning Objective: To understand what imaging technic can achieve diagnosis with accuracy

Desired Result: Change their practice

IRB Status: Approved

7:35 am

Provider and Patient Drivers of Ototopical Antibiotic Prescription Variability

Matthew G. Crowson, MD; Kristine Shulz, DrPH(c),MPH
Debara L. Tucci, MD, MS, MBA

Objective: To determine if provider and patient characteristics contribute to variation in the prescription of topical antimicrobial drops for acute and chronic ear infections.

Study design: Retrospective Case Review

Setting: Large Academic Hospital Network

Patients: Records of 2,146 adults and children presenting with acute and chronic otologic infections from 2009-2013.

Interventions: Clinical and financial record review of prescription, patient, provider, and institution variables.

Main outcome measures: Quantitative and qualitative analysis of diagnosis, prescription type, patient demographics and health insurance status, healthcare provider type and setting.

Results: Otitis externa and acute otitis media were the most common diagnoses. Non-OHNS providers served 82% of all patients. OHNS providers prescribed proportionally less fluoroquinolone, and more brand-name antibiotics compared to non-OHNS providers. Adults were more likely to receive a non-fluoroquinolone antibiotic and a generic prescription versus pediatric patients. Patients who self-identified as 'white' ethnicity received proportionally more fluoroquinolone prescriptions than patients who identified as 'non-white,' but there was no difference in provider type. The proportion of fluoroquinolone prescriptions was significantly higher in patients from low-poverty counties, however poverty level was not associated with patients seeing a particular provider type. The majority of our patients had commercial insurance, followed by Medicaid. Medicare patients had the lowest proportion of fluoroquinolone antibiotic prescriptions, and were less likely to receive fluoroquinolone prescriptions versus Commercial insurance. Non-insured patients received proportionally more generic versus brand prescriptions than insured patients.

Conclusions: Our results indicate potential provider, patient demographic, and financial factors producing considerable variability in the prescribing patterns for topical antibiotics for common otologic infections.

Define Professional Practice Gap: Lack of awareness and contemporary research of specific patient and provider characteristics that may influence the topical antibiotic prescribed for common otologic infections.

Learning Objective:
1. To describe the variation in prescription practices of both non-Otolaryngology and Otolaryngology providers for topical antibacterial drops as it relates to socioeconomic and demographic factors of the patient.
2. To describe the variation in provider prescription practices of antibiotic drops used for otologic infections within a large academic health system.
3. To discuss the potential areas for future research and intervention in potential disparities in the prescription of common ototopical antibiotics as it relates to patient health insurance status.

Desired Result: It is the authors' hope that attendees will consider the variability inherent to the prescription of common ototopical antibiotics for common otologic infections. This variability may be, in part, driven by provider and patient factors that could influence the plan of care.

IRB Status: Approved

7:43 am

Malignant Otitis Externa: A Novel Stratification Protocol for Predicting Treatment Outcomes

Shawn M. Stevens, MD; Paul R. Lambert, MD
Shaun A. Nguyen, MD; Ted A. Meyer, MD, PhD

Objectives: 1) Stratify malignant otitis externa (MOE) into severe and non-severe disease categories. 2) Predict treatment courses and outcomes based on this stratification.

Setting: Tertiary Center

Patients: Retrospective review 2004-2013; 28 patients.

Inclusion: diagnosis by senior authors, radiographic evidence of disease, admission for IV antibiotics/debridement, minimum 1 year follow-up.

Interventions: Severe group stratification if two or more of following: CNVII palsy, fungal positive culture, relapse, surgery performed, major radiographic findings. All other patients stratified to non-severe group.

Main outcome measures: Cure, alive/refractory disease, death by disease, death by other cause. Secondary measures: antibiotic duration, number of disease related admissions.

Results: 43% (12/28) and 57% (16/28) of patients stratified into the severe and non-severe groups. The severe group had significantly more adverse, disease specific outcomes than the non-severe group (7/12 vs. 0/16; $p = 0.002$). Disease specific mortality was 42% and 0% in the severe and non-severe groups respectively. The severe group had longer antibiotic courses (12.8 vs 6.9 weeks; $p=0.01$) and more disease related admissions/relapses (1.6 vs 1, $p<0.001$). Only 4/12 severe group patients achieved cure. All but two non-severe patients achieved cure with those two dying of other causes.

Conclusions: A subgroup of MOE may exist that is not amenable to parenteral antibiotics and local debridement alone. A combination of clinical and radiographic findings may be useful for stratifying patients into severe/non-severe categories. Patients with severe disease may be more likely to die of their disease and have worse treatment courses such that additional surgical intervention may be indicated.

Define Professional Practice Gap: 1. Lack of knowledge; 2. Potential inadequacy of the current standard of care in treating newly defined severe cases of malignant otitis externa.

Learning Objective: 1. Learn clinical and radiographic findings that are associated with poorer survival and treatment outcomes in patients with malignant otitis externa; 2. Learn a novel algorithm for stratifying patients with malignant otitis externa into severe and non-severe disease categories based on systematic review of the literature; 3. Gain awareness that severe class MOE patients may have worse survival and treatment outcomes when compared to non-severe patients when the current standard of care is applied.

Desired Result: 1. Attendees should be able identify severe cases of malignant otitis externa at any point in the treatment course based on readily available clinical information and acknowledge that these patients are at higher risk for poor outcomes; 2. When encountering severe cases of malignant otitis externa, attendees may consider more aggressive/earlier surgical intervention beyond the current standard of care treatment (parenteral antibiotics with local debridement)

IRB Status: Approved

7:51 am

Effects of Skin Thickness on Cochlear Input Signal using Transcutaneous Bone Conduction Implants

Jameson K. Mattingly, MD; Nathaniel T. Greene, PhD
Herman A. Jenkins, MD; Daniel J. Tollin, PhD
James R. Easter, MS, PE; Stephen P. Cass, MD, MPH

Hypothesis: Intracochlear sound pressures (PIC) and velocity measurements of the stapes, round window, and promontory (VS/RW/Prom) will show frequency dependent attenuation using transcutaneous magnet-based bone-conduction implants (TCBCI) in comparison to direct-connect skin-penetrating abutments (DCBCI).

Background: TCBCIs have recently been introduced as alternatives to DCBCIs. Clinical studies have demonstrated elevated high-frequency thresholds for TCBCIs as compared to DCBCIs; however, little data exists examining the direct effect of skin thickness on the cochlear input signal during bone conduction hearing.

Methods: Four full-cephalic human cadaveric specimens were prepared, and PIC was measured in the scala vestibuli and tympani with fiber-optic pressure probes (FISO, Inc.) concurrently with VS/RW/Prom via laser Doppler vibrometry (Polytec, Inc.). Titanium implants were placed bilaterally connected to a DCBCI or TCBCI. Soft tissue flaps with varying thicknesses (no flap, 3, 6, and 9 mm) were placed successively between the magnetic plate and sound processor magnet. A bone-conduction transducer coupled to custom software provided pure tone stimuli between 20 Hz–15 kHz.

Results: Stimulation via the abutment produced the largest response magnitudes. The TCBCI showed similar PIC and VS/RW/Prom with no intervening flap, and non-linear reduction of magnitude with increasing flap thickness above 500 Hz. Phase is comparable to the acoustic baseline at low frequencies across flap thicknesses, but steepens at higher frequencies as flap thickness increases suggesting a longer group delay.

Conclusions: These response magnitudes and phase effects should be taken into account when selecting patients for a BCI, and further suggest potential cues for sound localization.

Define Professional Practice Gap: Limited understanding of the effect of skin flap thickness on the auditory performance of magnet-based bone conduction implants.

Learning Objective: Understand the difference in bone conducted cochlear input signal between transcutaneous magnet-based and skin-penetrating bone conduction implants.

Desired Result: Optimize patient selection for transcutaneous and percutaneous bone conduction implants.

IRB Status: Approved

7:59 am

Tinnitus Management in Patients with Percutaneous Osteointegrated Auditory Implants for Single Sided Deafness

Yula A. Indeyeva, MD; Adrian Diaz, BS
Terence E. Imbery, MD; Daniel H. Coelho, MD

Objective: To determine the effects, if any, of percutaneous osteointegrated auditory implants (OAI) on tinnitus in patient with single sided deafness (SSD)

Study Design: Prospective cohort series

Setting: Tertiary academic referral center, single surgeon

Patients: Adult OAI recipients with unilateral severe to profound sensorineural hearing loss (SNHL) in the implanted ear.

Intervention: Percutaneous OAI

Main Outcome Measure(s): The Tinnitus Reaction Questionnaire (TRQ) and the Tinnitus Handicap Inventory (THI) were recorded pre-implantation, and at 6 and 12 months following device activation.

Results: Ten eligible patients were enrolled. The mean pre-operative TRQ and THI scores for all subjects were 32.80 ± 23.41 and 37.00 ± 22.75, respectively. Both scores decreased significantly 6 months after device activation, with TRQ mean of 19.67 ± 21.73 ($p=0.0012$) and THI mean of 27.11 ± 23.41 ($p=0.0592$). After 12 months, the downward trend continued with TRQ mean of 17.30 ± 20.67 ($p=0.0008$) and THI mean of 21.70 ± 23.02 ($p=0.0116$). Subgroup analysis comparing patients with severe SNHL SSD to those with profound SNHL SSD demonstrated a decrease in TRQ and THI scores at 12 months for both groups, but was only statistically significant for the severe SNHL group ($n=7$).

Conclusions: OAI use in SSD is associated with a statistically significant decrease in tinnitus as measured by the TRQ and THI. The reasons for this are likely multifactorial, though possibly due to stimulation of residual cochlear function in the SSD ear. Further study of a larger cohort is ongoing.

Define Professional Practice Gap: There currently exists a paucity of evidence-based literature addressing the various modalities of tinnitus management. The mechanisms of tinnitus suppression are poorly understood.

Learning Objective: The learning objective of this presentation is to describe the effects of percutaneous osteointegrated auditory implants (OAI) on tinnitus in patients with single sided deafness, as measured by Tinnitus Reaction Questionnaire (TRQ), measure of psychological distress scale and Tinnitus Handicap Inventory (THI), a measure of tinnitus' impact on daily living.

Desired Result: The desired result of the talk is for the audience to become aware of the utility of percutaneous osteointegrated auditory implants in management of tinnitus, and be able to identify and treat, patients most likely to benefit from this treatment option.

IRB Status: Expedited Review

8:07 am

Customized vs. Non-Customized Sound Therapy for Treatment of Tinnitus: A Randomized Crossover Clinical Trial

Hossein Mahboubi, MD, MPH; Saman Kiumehr, MD
Kasra Ziai, MD; Kanwar Kelley, MD
Hamid R. Djalilian, MD

Objective: (1) To determine the long-term efficacy of a customized sound and music therapy, and (2) to compare its efficacy to that of generic white noise.

Setting: Tertiary care medical center

Patients: Subjects with chronic tinnitus

Intervention(s): Subjects were randomized to receive either the customized sound therapy (three narrow band noise bars at the tinnitus frequency and two subharmonics) mixed with music or generic white noise for 2 hours per day. Subjects were switched to the other treatment after 3 months.

Main outcome measure(s): Visual Analog Scale (VAS) and completed the Tinnitus Handicap Inventory (THI) and Beck Anxiety Inventory (BAI). The minimum masking level (MML) and residual inhibition (RI) were obtained.

Results: Eighteen subjects (90%) completed the study. Mean age was 53 years ± 11 and mean tinnitus duration was 118 months ± 99. After 3 months of customized sound therapy, the mean loudness decreased from 6.4 ± 2.0 to 4.9 ± 1.9 ($p=0.001$), THI decreased from 42.8 ± 21.6 to 31.5 ± 20.3 ($p<0.001$), mean BAI decreased from 10.6 ± 10.9 to 8.3 ± 9.9 ($p=0.01$), and MML decreased from 22.3 dB SL ± 11.6 to 17.2 dB SL ± 10.6 ($p=0.005$). The percentage of subjects with complete RI increased from 6% to 22% ($p=0.001$). After 3 months of white noise therapy, only BAI and MML slightly decreased.

Conclusion: Customized sound therapy can decrease the loudness and THI scores of tinnitus patients. The results are better than white noise therapy in most categories.

Define Professional Practice Gap: Despite the high prevalence of tinnitus and its potential significant effect on quality of life, there is a paucity of randomized clinical trials studying tinnitus therapies to assist clinicians with management and develop practice guidelines. While drugs exist that treat comorbidities (e.g., depression, anxiety, and insomnia) and can reduce global suffering, none of the existing drugs is specific for tinnitus and no drug has received FDA approval for this purpose. Other options include sound therapies and behavioral therapies.

Learning Objective: The audience will learn about different options available for tinnitus therapy. The new advances in sound therapy will be reviewed and a novel customized sound therapy will be introduced. Evidence will be provided regarding the efficacy of common sound therapies in the setting of a randomized clinical trial.

Desired Result: The findings of this study will help physicians, audiologists and scintists with managing tinnitus patients They will also learn about novel sound therapy treatments available. This clinical trial will provide the auidence with evidence-based data regarding the long term efficacy of sound therapies and compares the outcomes in customized vs. non-customized therapies.

IRB Status: Approved

8:15 am

Pediatric Semicircular Canal Dehiscence and Temporal Bone Development

Duncan A. Meiklejohn, MD; C. Eduardo Corrales, MD
Nikolas H. Blevins, MD

Objectives: To determine the incidence of radiographic superior semicircular canal dehiscence (SSCD) and posterior semicircular canal dehiscence (PSCD), as well as the thickness of the temporal bone overlying the canals in children ages 0-7 years.

Study Design: Retrospective chart review.

Setting: Tertiary referral center.

Patients: Children less than 7 years old who underwent high-resolution computed tomography (CT) scan including the temporal bones between 1998 and 2013.

Intervention(s): CT images were reviewed. Patient demographics were tabulated.

Main Outcome Measure(s): Rates of SSCD and PSCD and in the thickness of the temporal bone, with comparison across age groups and across right and left sides.

Results: Incidence of SSCD was 12%, 5%, 3%, and 0% and PSCD was 17%, 2%, 1%, and 0% in children <6 months, 6-12 months, 1-3 years, and 3-7 years, respectively. SSCD was statistically more common before 1 year of age. Incidence of PSCD was significantly increased in children less than 6 months old. Bone thickness overlying both the SSC and the PSC increased with increasing age. PSC bone was significantly thicker than SSC bone in all age groups older than 12 months. After 3 years of age, PSC bone was thicker on the left and SSC bone thicker on the right.

Conclusions: Radiographic dehiscence of the canals is common in neonates, and incidence decreases with increasing age as the bone overlying the canals increases in thickness. There is right vs. left asymmetry in bone thickness. (Note: This study is ongoing; additional data may be available in the manuscript.)

Define Professional Practice Gap: Lack of knowledge of prevalence of pediatric semicircular canal dehiscence on CT scan and clinical significance.

Learning Objective: Define prevalence of pediatric semicircular canal dehiscence on CT scan and implications for practice.

Desired Result: Awareness that radiographic dehiscence of the semicircular canals is a common finding in infants. Improved understanding of the factors leading to symptomatic semicircular canal dehiscence in adult patients.

IRB Status: Approved

9:00 am

Using Biomarkers to Evaluate the Association between BPPV and Osteoporosis

Daniel Sacks, MD; Catherine Bixby, MS
Pamela Fall, MS; Kourosh Parham, MD, PhD

Hypothesis: We hypothesized that levels of a BPPV biomarker, Otolin-1, would correlate with those of the more general bone turnover markers seen in osteoporosis, aminoterminal propeptide of protocollagen type I (P1NP) and aminoterminal telopeptides of collagen (sNTX), thus supporting a link between the two diseases.

Background: Otolin-1 is a scaffolding protein exclusively expressed in the inner ear, which we have previously demonstrated to correlate with BPPV. Recent literature has linked BPPV and osteoporosis based upon DEXA scan results, but given that it can take up to one year for bone density changes to manifest on DEXA scans, there is a temporal incongruence between BBPV and osteoporosis which makes exploration of a causal relationship difficult. Serum markers, however, can reflect bone-related changes in the more acute setting.

Methods: Levels of Otolin-1, P1NP, sNTX and Vitamin D were measured from serum samples of postmenopausal women with BPPV and osteoporotic controls without otologic complaints.

Results: P1NP and NTX levels were strongly correlated ($r=0.53$), but Otolin-1 levels lacked a statistical correlation with either marker. There was a moderately positive correlation between levels of Otolin-1 and Vitamin D ($r=0.43$).

Conclusion: Contrary to our hypothesis, there was no significant correlation between Otolin-1 and P1NP/sNTX, calling into question either the utility of Otolin-1 as a BPPV biomarker or the connection between BPPV and osteoporosis. This has practical implications given the potential to treat recurrent BPPV attacks with osteoporosis therapies. P1NP and sNTX do correlate well with each other indicating their utility as indices of osteoporosis.

Define Professional Practice Gap: The majority of physicians do not appreciate the association of BPPV and osteoporosis and the implications of such a connection for the treatment of BPPV.

Learning Objective: This presentation will evaluate the association between BPPV and osteoporosis with particular attention to biomarkers which have been identified for the two disease processes.

Desired Result: Attendees will gain an understanding of the current theories regarding the association of BPPV and osteoporosis, as well as an appreciation for the emerging field of otologic biomarkers. This will enable them to keep their practice patterns up to date with future discoveries in this realm, which could have direct clinical applications.

IRB Status: Approved

9:08 am

Increasing cVEMP Stimulation Rate Reduces Test Time and Patient Effort with Only Minor Changes in Test Results

Mark J. van Tilburg, MD; Barbara S. Herrmann, PhD
John Guinan Jr., PhD; Steven D. Rauch, MD

Objective: To assess the difference in cVEMP outcome using 13/sec instead of 5/sec stimulation rates to reduce the time needed for testing

Study design: Prospective cohort study

Patients: Seven healthy adult volunteers

Intervention: Subjects underwent cervical vestibular evoked myogenic potential (cVEMP) testing at 500, 750 and 1000Hz using stimulation rates of 5 and 13 stimuli per second and 90dBHL (123dB pSP) tone bursts. At 750Hz, cVEMP threshold was also determined. At least 200 sweeps were recorded for each cVEMP measurement.

Main outcome measures: cVEMP threshold, peak-to-peak amplitude, interaural asymmetry ratio and coefficient of variation.

Results: cVEMP responses were present at all frequencies in all subjects. The time needed to obtain 200 sweeps at a 5/sec stimulation rate was 40 seconds and 15.8 seconds at 13/sec. All subjects reported that the test burden was much higher for the slower stimulation rate. No difference in threshold was found. The mean normalized peak-to-peak amplitude at 90dBHL was approximately 30% larger at the 5/sec stimulation rate, but the difference in amplitude was not significant at every frequency. The interaural asymmetry ratio and the coefficient of variation of the peak-to-peak amplitude were similar for the two test conditions at all frequencies.

Conclusion: A 5/sec stimulation rate results in larger normalized peak-to-peak amplitudes compared to a stimulation rate of 13/sec, however the size of the increase does not affect cVEMP threshold nor cVEMP amplitude variability. Given the substantial reduction in patient effort and test time at the faster stimulation rate with a minimal change in test outcome, the 13/sec stimulation rate is recommended for cVEMP testing.

Define Professional Practice Gap: Most clinics world wide use a stimulation rate of 5/sec for recording cVEMPs. We purpose to use 13/sec since this barely alters the outcomes but reduces the test burden and test time for the patient substantially. Only 15 seconds of contraction of the neck muscle are needed using 13/sec, compared to 40 second when using 5/sec. This not only means better compliance from the patients but also shorter testing time, in our protocol 21 minutes using 5/sec vs. 8 minutes using 13/sec.

Learning Objective: Optimize cVEMP testing

Desired Result: Change the stimulation rate of their cVEMP equipment to save both patients and testers substantial time and effort.

IRB Status: Approved

9:16 am

RESIDENT RESEARCH TRAVEL AWARD

Dexamethasone Protects Against Apoptotic Cell Death of Cisplatin-exposed Auditory Hair Cells In Vitro

Christine T. Dinh, MD; Si Chen, MD
John N. Dinh, BS; Esperanza Bas, PhD
Fred F. Telischi, MD; Thomas R. Van De Water, PhD

Hypothesis: Dexamethasone (DXM) protects against cisplatin-induced auditory hair cell (HC) loss and apoptosis in rat organ of Corti (OC) explants in vitro by abrogating levels of oxidative stress, NADPH-Oxidase-3 (NOX-3), and tumor necrosis factor-alpha (TNFa).

Background: Intratympanic DXM has protective effects against cisplatin-induced hearing loss in a few animal studies and one clinical trial. However, levels of protection with intratympanic DXM vary significantly between studies, which may not be a result of the intrinsic properties of DXM but rather the diffusion of DXM into the inner ear. The molecular mechanisms and degree of DXM protection against cisplatin ototoxicity are currently unknown.

Methods: OC explants from 3-day-old rats were cultured with no treatment or various concentrations of cisplatin (2,5,10μM) and DXM (75,150,300μg/ml) in vitro (n=6 per condition/time-point/experiment). HC viability and TUNEL assay were performed after 96hrs in vitro and levels of oxidative stress, NOX-3, and TNFa were observed with confocal microscopy after 48 hrs in vitro. ANOVA with Tukey post hoc testing was performed, $p<0.05$ significant.

Results: Cisplatin initiated dose-dependent losses of outer HCs in basal turns of exposed explants ($p<0.05$). DXM protected against cisplatin (2μM)-induced outer HC loss in a dose-dependent manner with complete protection at 300 μg/ml of DXM ($p<0.01$). DXM (150μg/ml) significantly reduced levels of oxidative stress, NOX-3, TNFa, and apoptosis in explants exposed to cisplatin (2μM, $p<0.05$).

Conclusion: DXM protects against cisplatin-induced auditory HC loss in rat OC explant by reducing levels of oxidative stress, NOX-3, TNFa, and apoptosis with complete protection achieved at 300μg/ml of DXM.

Define Professional Practice Gap: Cisplatin is a chemotherapeutic agent used in the treatment of solid organ tumors such as those seen in head and neck, ovarian, testicular, cervical, and lung malignancies. This drug can produce dose-limiting, bilateral, and often irreversible hearing loss in a majority of patients. Currently, there is no treatment for the prevention of cisplatin ototoxicity, which occurs in 75-100% of patients that receive cisplatin chemotherapy. There are several therapeutic drugs that can protect against cisplatin-induced hearing loss; however, these agents are given systemically and can interact with the chemotherapeutic properties of cisplatin and affect cancer survival.

Learning Objective: There are only a few published studies of small sample size that suggest intratympanic dexamethasone can abrogate hearing threshold shifts in high frequencies following cisplatin exposure in vivo, and there is only one human clinical trial published that demonstrates some protection with intratympanic dexamethasone. There is a lack of contemporary knowledge on the molecular mechanisms behind dexamethasone protection against cisplatin ototoxicity and this information is important in interpreting the several inconsistencies in the literature regarding effectives of intratympanic dexamethasone against cisplatin induced hearing loss.

Desired Result: This study supports the use of dexamethasone as a potential therapy against cisplatin induced ototoxicity. Dexamethasone protects against cisplatin induced auditory hair cell loss in vitro in a dose dependent manner. Discrepancies in hearing outcome after intratympanic steroids against cisplatin induced hearing loss in published animal and human studies may be due to the relative amount of dexamethasone that diffuses across the round window and not the intrinsic properties of dexamethasone itself. Further studies regarding intratympanic dexamethasone dosing and dexamethasone drug delivery systems may improve hearing outcomes after cisplatin exposure.

IRB Status: Approved

9:24 am

Dose Effect of Intratympanic Dexamethasone for Idiopathic Sudden Sensorineural Hearing Loss: 24 mg/mL Is Superior to 10 mg/mL

Nopawan Vorasubin, MD; Quyen T. Nguyen, MD, PhD
Jeffrey P. Harris MD, PhD
Thomas H. Alexander, MD, MHSc

Objective: To compare outcomes in patients with idiopathic sudden sensorineural hearing loss (ISNNHL) treated with intratympanic (IT) dexamethasone (DEX) at either 10 mg/mL or 24 mg/mL.

Study Design: Retrospective case series.

Setting: Tertiary referral center.

Patients: 38 adults with ISSNHL.

Interventions: In addition to concurrent prednisone taper, patients received a series of IT DEX injections over 2 weeks with either 10 mg/mL or 24 mg/mL.

Main outcome measure: Greater than 30 dB improvement in pure-tone average (PTA).

Results: Baseline characteristics were similar between groups. Mean follow-up was 10 weeks. 10 of 19 patients (53%) treated with 24 mg/mL had greater than 30 dB improvement in PTA, compared to 4 of 19 (21%) treated with 10 mg/mL (p=0.0436). Speech discrimination (SD) improvement was similar between groups. The interval between onset and initiation of IT DEX significantly affected outcome, with earlier treatment resulting in greater improvement in PTA and SD (linear regression effect size for PTA 1.9 dB/day, p=0.0009; effect size for SD 3.4%/day, p=0.0006). Logistic regression confirmed that IT DEX dose and interval to starting treatment were both independent predictors of PTA outcome. Change in PTA was not significantly affected by age, gender, pre-treatment hearing levels, presence of vertigo, or tinnitus.

Conclusions: To our knowledge this is the first demonstration of superiority of IT DEX at 24 mg/mL for the treatment of ISSNHL, with significantly better recovery of PTA. Our data suggests treatment should be initiated as soon as possible. A prospective randomized trial to confirm the optimal dose is warranted.

Define Professional Practice Gap: The optimal dose of intratympanic corticosteroid for treatment of idiopathic sudden sensorineural hearing loss has not been identified. Data comparing dose effect for dexamethasone at 24 mg/mL vs. 10 mg/mL has not been previously reported.

Learning Objective: 1. To understand the potential for improved hearing recovery with high-dose intratympanic dexamethasone (24 mg/mL), compared to a lower dose (10 mg/mL). 2. To better understand the impact of interval between onset of symptoms and initiation of treatment.

Desired Result: 1. Consider treating with high dose dexamethasone. 2. Provide support for a randomized, controlled trial to confirm the optimal dose.

IRB Status: Approved

9:32 am

Progressive Nonsyndromic Hearing Loss Associated with Mutation of the NLRP3 Gene and Alteration of Innate Immunity

Hiroshi Nakanishi, MD, PhD
Yoshiyuki Kawashima, MD, PhD
Kiyoto Kurima, PhD; Julie Muskett, MS
Carmen C. Brewer, PhD; Andrew J. Griffith, MD, PhD

Objective: To characterize the auditory phenotype of autosomal dominant nonsyndromic DFNA34 hearing loss (HL) caused by a missense substitution in the NLRP3 gene. NLRP3 encodes the eponymous protein component of the NLRP3 inflammasome that functions in the innate immune response.

Study Design: This study was approved by the joint NINDS/NIDCD IRB. Clinical evaluation of family members with DFNA34 HL linked to the p.Arg918Gln mutation of NLRP3. Medical history interview, physical and audiological examinations were performed. Additional audiological reports were obtained from other health care centers and retrospectively reviewed for a subset of subjects.

Setting: Federal biomedical research facility.

Patients: Eight affected members of a North American family segregating DFNA34 HL.

Main Outcome Measures: Pure-tone thresholds, rates of pure-tone threshold progression, and speech recognition scores.

Results: All affected family members had bilateral, symmetric, sensorineural HL with an onset in the late 2nd to 4th decade of life. Slowly progressive HL started at the high frequencies and low- and middle-frequencies were affected with advancing age, resulting in sloping moderate HL. The average annual threshold deterioration was 0.8-1.1 dB/year with the most rapid deterioration at lower frequencies. Speech recognition scores ranging from 60-100% were consistent with cochlear, but not retrocochlear, etiology.

Conclusions: DFNA34 has late onset and slow rates of progression compared to other autosomal dominant nonsyndromic HL phenotypes. Its phenotype may make the diagnosis of hereditary HL difficult. But it is important to suspect and diagnose DFNA34, since anakinra, an interleukin -1beta receptor antagonist, may be effective to prevent progression of HL.

Define Professional Practice Gap:To date, 145 loci and 82 genes responsible for nonsyndromic hearing loss (HL) have been identified (http://hereditaryhearingloss.org/ accessed 07.10.2014). Of these, 30 genes are associated with autosomal dominant nonsyndromic HL (DFNA). The vast majority of DFNA alleles cause postlingual progressive sensorineural HL for which there are no surgical or medical options for treatment. Here, we present evidence that a mutation in NLRP3 gene causes progressive nonsyndromic DFNA34 HL. NLRP3 mutations alter innate immunity and may potentially be treated with anakinra administration.

Learning Objective: To show that a mutation in NLRP3 gene cause progressive nonsyndromic DFNA34 HL, and to demonstrate that abnormal function of the innate immune response can cause sensorineural HL.

Desired Result: DFNA34 has late onset and slow rates of progression compared to other DFNA phenotypes. Its phenotype may make the diagnosis of hereditary HL difficult. But we encourage clinicians to suspect and diagnose DFNA34, since anakinra, an interleukin-1beta receptor antagonist, is an FDA-approved treatment for systemic auto-inflammatory diseases caused by NLRP3 mutations.

IRB Status: Approved

10:07 am

Abnormal Rhomboid Lip in Children with Cochlear Nerve Deficiency Fitted with Auditory Brainstem Implantation

Liliana Colletti, PhD; Marco Mandalà, MD, PhD
Giacomo Colletti, MD; Vittorio Colletti, MD

Objective: Investigate the prevalence and implications of abnormal rhomboid lips (RL) that make auditory brainstem implantation (ABI) surgery in children a difficult procedure.

Study design: Retrospective study.

Setting: Tertiary academic medical center.

Patients: Seventy children with cochlear nerve deficiency (CND) and associated cochlear malformations ranging in age from 8 months to 10 years at implantation underwent.

Intervention(s): ABI surgery trough a modified retrosigmoid approach.

Main outcome measure: The individual surgical videos of each child were analytically examined by four independent individuals to define the types and frequency of abnormalities of the RL.

Results: The membranous structure forming the RL varied greatly in size, thickness and transparency. In 72% of children the RL extended laterally over the lower cranial nerves, inhibiting the view of the foramen of Luschka (FL) and necessitating section of the RL to access the lateral recess and fit the ABI on the cochlear nuclei.

Conclusions: In children with CND an abnormally large RL adhering to the IX and X cranial nerves, obliterating the FL and simulating a tough protruding cyst can make the fitting of the ABI a challenging procedure that should be handled in experienced centers.

Define Professional Practice Gap: Lack of contemporary knowledge

Learning Objective: Microanatomy of the foramen of Luschka and adjacent areas for safe exposure and improved access to the lateral recess and cochlear nuclei.

Desired Result: Infants and children with severe cochlear or cochlear nerve pathology not suitable to cochlear implantation should be counselled for an ABI that should be handled in experienced centers

IRB Status: Approved

10:15 am

The Studying Multiple Outcomes after Aural RehabilitativeTreatment (SMART) Study: Study Design and Baseline Results

Lingsheng Li, MHS; Yoon Sung, MHS
Barnett Shpritz, MA; David Chen, MD
Dane Genther, MD; Josh Betz, MS
Frank R. Lin, MD, PhD

Objective: To describe the rationale and design of the Studying Multiple Outcomes after Aural Rehabilitative Treatment (SMART) Study and present preliminary results from baseline data.

Study design: Prospective observational study

Setting: Academic otolaryngology clinic

Patients: One hundred and fifty-three patients ≥ 50 years receiving hearing aids (HA) or cochlear implants (CI) were recruited before intervention (baseline) and are being followed every 6 months for up to 1 year after intervention.

Intervention: HA or CI

Outcomes: A standardized outcome battery assessing cognition, social isolation, communication, depression, health-related quality of life, and physical functioning.

Results: Of the 153 participants aged 50-97 years (mean=71.4, SD=9.8) who completed baseline evaluations, 88 were receiving HA's and 65 were receiving CI's. Compared to CI participants at baseline, HA participants scored higher on the Benton Visual Retention Test ($p<0.01$), the D-KEFS Verbal Fluency Test ($p=0.01$), and the Salthouse Comparison Test ($p=0.01$). Fifteen participants were cognitively impaired. Compared to HA participants, CI participants, on average, had significantly greater loneliness and social isolation and poorer hearing and communicative function across a range of standardized outcomes metrics.

Conclusions: Standardized outcome measures of cognitive, social, and mental health functioning commonly used in gerontology appear sensitive to hearing impairment and are feasible to implement in clinical studies of hearing loss. Results from the SMART study will provide the preliminary data needed to conduct a definitive randomized clinical trial investigating the role of aural rehabilitative treatments on reducing declines in cognitive, mental, and physical functioning in older adults.

Define Professional Practice Gap: Lack of knowledge of impact of hearing loss on the overall functioning of older adults Lack of knowledge about how to investigate the impact of hearing rehabilitative treatments on older adults

Learning Objective: 1) To understand the impact of hearing loss on older adults; 2) To understand what outcomes can be assessed after hearing rehabilitative treatments

Desired Result: Attendees will be able to better counsel their patients on the potential impact of hearing loss on communicative, cognitive, and social functioning and the current state-of-the-art knowledge with respect to the role of hearing rehabilitative treatments

IRB Status: Approved

10:23 am

Cost Effectiveness of Genetic Diagnosis and Telemedicine to Provide Cochlear Implantation to Children within Medically Underserved Plain Populations

Kevin A. Strauss, MD; Robert O'Reilly, MD
Thierry Morlet, PhD; Yell Inverso, AuD, PhD
Liesl Looney, AuD; Christopher J. Goff, MD
Erin Field, PAC

Objective: To report the cost effectiveness of a streamlined cochlear implantation strategy utilizing population-based mutant allele detection, novel home listening and spoken language (LSL) techniques, and remote implant programming via telemedicine to treat children from medically underserved Amish and Mennonite (Plain) populations.

Study Design: Retrospective review.

Methods: We studied 11 children (ages 3.2 ± 1.9 years) who had congenital hearing loss and underwent cochlear implantation. We compared costs of a streamlined approach for uninsured Plain patients (i.e. genetic evaluation, surgery, and habilitation) to standard costs for our outbred general pediatric implant population.

Results: Plain patients were implanted at an average of 2.1 ± 1.3 years (range 0.7-4.5 years). Mean follow-up was 13.4 ± 10.6 months and cumulative cohort follow up was 12.1 patient-years. Six patients were implanted bilaterally. Etiology of hearing loss was determined in 73% prior to implantation (GJB2c.35delG, N=6; SLITRK6 c.1240c>T, N=1; congenital cytomegalovirus infection, N=1; unknown, N=3). The 8 youngest patients had a definitive etiological diagnosis and younger chronological age was associated with earlier age at implantation (Spearman correlation coefficient=0.90, P=0.0004). Streamlined population-specific allele detection and selective imaging reduced per-patient costs by $9,000 and $3,000-$8,000, respectively, whereas coordination of early genetic diagnosis with home LSL techniques and remote programming realized cost savings of up to $112,257 per patient (total cohort savings of $1.4 million, or $115,000 per patient per year).

Conclusion: Early identification of genetic hearing loss and novel approaches to habilitation and programming make cochlear implantation affordable, feasible, and effective among selected underserved populations.

Define Professional Practice Gap: 1. Cochlear implantation (CI) is costly, requiring extensive pre-op diagnostic testing and evaluation as well as frequent post-operative outpatient visits; 2. Deaf children from uninsured or otherwise medically underserved populations often lack access to cochlear implantation; 3. Leveraging population-specific genetic knowledge with a novel CI implementation strategy could improve access to CI for medically underserved populations.

Learning Objective: 1. Understand obstacles to CI for patients from uninsured and/or medically underserved populations; 2. Recognize role of affordable genetic testing in streamlining the pre-operative evaluation; 3. Determine the value of novel, low-cost home listening and spoken language techniques and habilitation therapy to achieve good post-operative speech and language outcomes; 4. Recognize the role of telemedicine in improving access to care for rural, financially disadvantaged families.

Desired Result: 1. Improve access to CI for medically underserved populations; 2. Empower families to take a more active role in the post-operative habilitation process; 3. Expand the role for telemedicine in post-operative CI optimization.

IRB Status: Approved

10:31 am

RESIDENT RESEARCH TRAVEL AWARD

GDP Matters: Cost Effectiveness of Cochlear Implantation and Deaf Education in Sub-Saharan Africa

Susan D. Emmett, MD; Debara L. Tucci, MD
Magteld Smith, MDS; Isaac M. Macharia, MBChB
Doreen Nakku, MD; Titus S. Ibekwe, MBBS
Wenfeng Gong, MSc; Howard W. Francis, MD
James E. Saunders, MD

Hypothesis: Cochlear implantation and deaf education are cost effective in Sub-Saharan Africa.

Background: Cost effectiveness of pediatric cochlear implantation has been well established in developed countries but is not understood in low-resource settings, where access to the technology has traditionally been limited. With the incidence of profound congenital sensorineural hearing loss 5-6 times higher in low/middle-income countries than the US and Europe, developing cost effective management strategies in these settings is critical.

Methods: Cost estimates were obtained from experts in Nigeria, South Africa, Kenya, and Uganda using known costs and published data. A validated Disability Adjusted Life Years (DALY) model was applied to each country using 3% discounting and 10-year length of analysis. Sensitivity analysis was performed to evaluate the effect of implant cost, audiology and speech therapy salaries, and probability of device failure. Cost effectiveness was determined using the WHO standard of cost effectiveness ratio/gross domestic product (CER/GDP)<3.

Results: Cochlear implantation was cost effective in South Africa and Nigeria, with CER/GDP of 1.10 and 2.59, respectively, but not in Kenya or Uganda, with CER/GDP of 4.36 and 3.74. Deaf education was cost effective in all countries investigated, with CER/GDP ranging from 0.80-1.67. The most influential factor in the sensitivity analysis, particularly in lower GDP countries Kenya and Uganda, was implant cost.

Conclusions: Cochlear implantation and deaf education are equally cost effective in the lower-middle and upper-middle income economies of Nigeria and South Africa. Implant cost may have a greater impact in the low-income economies of Kenya and Uganda.

Define Professional Practice Gap: Cost effectiveness of cochlear implantation and deaf education are not well defined in low-resource settings such as Sub-Saharan Africa.

Learning Objective: 1. To improve awareness of the high burden of congenital sensorineural hearing loss in low- and middle-income countries and the need for cost effective management strategies to address this burden; 2. To understand how gross domestic product affects the cost effectiveness of cochlear implantation in low resource settings; 3. To discuss potential strategies to overcome the impact of GDP on cost effectiveness of cochlear implantation.

Desired Result: Heightened awareness of the need for cost effective management strategies of congenital sensorineural hearing loss in low resource settings and increased understanding of potential strategies to improve the cost effectiveness of cochlear implantation in lower GDP economies.

IRB Status: Exempt

10:39 am

Patterns of Long-term Hearing Loss in Hearing Preservation Cochlear Implant Surgery

Kavita Dedhia, MD; Tina Worman, MS
Margaret A. Meredith, AuD, CCC-A
Jay T. Rubinstein, MD, PhD

Objective: To describe patterns of hearing loss in patients with low-frequency residual hearing following cochlear implantation.

Study Design: Retrospective chart review

Setting: Tertiary referral center

Patients: Cochlear implant candidates with immediate post-operative residual low-frequency hearing

Interventions: Hybrid or traditional cochlear implant

Main outcome measure: Audiograms to measure post-operative hearing

Results: Of the 166 patients reviewed, 16 ears met the inclusion criteria. The age ranged from 3 years 2 months to 86 years. Etiology was unknown (n=7), presbycusis(n=4), genetic(n=3), acoustic trauma (n=1), and measles virus(n=1). The Nucleus Hybrid S8 and S12 (n=7) was the most common electrode array, followed by Nucleus 422(n=4), Nucleus Contour Advance (n=2), Med-El Flex 28(n=2), and Advanced Bionics Mid Scala (n=1). Cochleostomy was performed in 9, and round window approach in 7 patients. Average follow up was 21 months (1 week- 68 months). Post-operative loss was mixed in 8 and purely sensorineural in 8. The most common pattern of loss was gradual decline (n=8), half of which became stable over time. Three had stable hearing after initial post-op loss. One had sudden loss at 9 months during air travel that did not recover. Four had only one post-operative audiogram: two with residual hearing only at 125Hz, one with residual hearing at 125 and 250Hz, and one had minimal change from pre-op.

Conclusions: Some long-term hearing preservation was achieved in 94% of patients with immediate post-operative hearing preservation. The most common pattern of hearing loss was gradual decline in hearing, half of the patients stabilized between 17 and 68 months post-operatively.

Define Professional Practice Gap: More patients are now having cochlear implant surgery that have residual low frequency hearing. There are many articles that discuss low frequency hearing preservation after hearing preservation implant surgery. However, the pattern of the long term hearing loss has not yet been defined in the literature.

Learning Objective: To discuss the patterns of hearing loss, in patients with hearing preservation surgery.

Desired Result: They will be able to understand that patients who have hearing preservation after, hearing preservation surgery with implants, may continue to have a decline in hearing with time. These patients should be monitored with audiograms.

IRB Status: Approved

10:47 am

Heparin Binding Epidermal Growth Factor Like Growth Factor Heals Chronic Tympanic Membrane Perforations with Advantage of Fibroblast Growth Factor 2 and Epidermal Growth Factor in an Animal Model

Peter L. Santa Maria, MBBS, PhD; Kendall Weierich Sungwoo Kim, PhD; Yunzhi P. Yang, PhD

Hypothesis: That heparin binding epidermal growth factor like growth factor (HB-EGF) heals chronic tympanic membrane (TM) perforations at higher rates than fibroblast growth factor 2 (FGF2) and epidermal growth factor (EGF) in an animal model.

Background: A non-surgical treatment for chronic TM perforation would benefit those unable to access surgery or those unable to have surgery, as well as reducing the cost of tympanoplasty. Growth factor (GF) treatments have been reported in the literature with variable success with the lack of a suitable animal providing a major obstacle.

Methods: The GFs were tested in a previously validated mouse model of chronic TM perforation. A bio absorbable hydrogel polymer was used to deliver the GF at a steady concentration as it dissolved over four weeks. A control (polymer only, n=18) was compared to polymer loaded with HB-EGF (5ug/ml, n=18), FGF2 (100ug/ml, n=19) and EGF (250ug/ml, n=19). Perforations were inspected at four weeks.

Results: The healing rates, as defined as one hundred percent perforation closure, were control (6/18, 27.8%), HB-EGF (15/18, 83.3%), FGF2 (6/19, 31.6%) and EGF (3/19, 15.8%). There were no differences between FGF2 ($p=0.80$) and EGF ($p=0.31$) with control healing rates. HB-EGF ($p= 0.000001$) showed a significant difference for healing. The HB-EGF healed TMs showed layers similar to a normal TM, whilst the other groups showed a lack of epithelial migration.

Conclusions: This study confirms the advantage of HB-EGF over two other commonly used growth factors and is a promising non-surgical treatment of chronic TM perforations.

Define Professional Practice Gap: Lack of understanding of the mechanisms of action and efficacy of various growth factor treatments for chronic tympanic membrane perforation.

Learning Objective: Understanding tympanic membrane wound healing and its relation to mechanism of action and efficacy of various growth factor treatments for chronic tympanic membrane perforation.

Desired Result: To be able to critically evaluate growth factor treatments for chronic tympanic membrane perforations.

IRB Status: Approved

10:55 am

Regenerative Treatment for the Tympanic Membrane Perforation with Cholesteatoma, Tumor, and Sever Calcification

Shin-ichi Kanemaru, MD, PhD; Rie Kanai, MD, PhD
Misaki Yamamoto, MD, PhD; Masaru Yamashita, MD, PhD

Background: We developed a new regenerative treatment for large Tympanic membrane (TM) perforations without the need for conventional surgical therapy. In this treatment, we applied to patients with cholesteatoma, tumor, and sever calcification of TM.

Methods: 25 patients (Age:9-85,M=10,F=15) were selected from patients with/without TM perforation. There were patients with 10 cholesteatomas, 3 tumors and 12 severe calcifications of TM. They classified into three groups based on the necessary size for regeneration of TM perforation: below 1/3 as Grade I (n=4), from 1/3 to 2/3 as Grade II (n=13) and over 2/3 as Grade III (n=8). Materials used for the TM repair were a gelatin sponge with b-FGF and fibrin glue. After removal of lesions through TM perforation, a gelatin sponge immersed in b-FGF was placed over the perforation. Fibrin glue was dripped over the sponge. The effectiveness of this therapy was evaluated 6 months after the treatment. The treatment of TM repair was repeated up to 4 times for cases in which complete closure of the TM perforation was not achieved after one round of the treatment.

Results: Complete closure of the TM perforation was achieved in 92% (n=23/25). The average hearing levels of all patients with successful TM repair were improved or maintained. No serious sequelae were observed in any patient.

Conclusions: This new regenerative therapy is useful for the patients with not only simple TM perforation but also above diseases without conventional operative procedures. This innovative regenerative therapy is an easy, safe, cost-effective and minimum-invasive treatment.

Define Professional Practice Gap: There is no other option treatments but to invasive treatment such as tympanoplasty for middle ear cholesteatoma and tumor. It is not necessary for this regenerative treatment to make skin incision and to harvest auto-tissue for reconstruction of TM.

Learning Objective: To understand the concept of in situ tissue engineering and its applications.

Desired Result: Attendees will understand the regenerative medicine for regeneration of TM and its applications.

IRB Status: Approved

ABSTRACTS OF SELECTED POSTERS

NO. F001

Cochlear Implant Binding in Patients Undergoing 1.5T Magnetic Resonance Imaging

Jeffrey D. Sharon, MD; Heather M. Weinreich, MD, MPH
Matthew W. Miller, MD, MS
Barbara Gottschalk, MSN, CRNP
Jaishri O. Blakeley, MD; John P. Carey, MD
Howard W. Francis MD, MBA

Objective: To determine the safety and tolerability of cochlear implant binding and MR imaging with the 1.5 Tesla magnet in patients

Study Design: Prospective cohort study

Setting: Tertiary care academic medical center

Patients: Patients aged 18 and older who had previously undergone cochlear implantation and then required MRI of any anatomic location

Invention: A formal wrapping of the cochlear implant device prior to imaging with a custom made silicone rubber mold held in place with circumferential gauze wrap and CobanTM bandage.

Main outcome measure: Tolerability of MRI as measured by patient pain scale rating and ability to complete the MRI scan

Results: 24 MRIs were performed in 16 patients. All MRIs were able to be completed. No device or wound complications were noted. On a scale of 1-10, average pain score increased from 1.4 prior to MRI to a 3 after MRI. All patients said that they would undergo MRI in the future if needed.

Conclusions: With tight binding of the cochlear implant, 1.5 Tesla MRI scanning is tolerated by most patients with minimal pain, thereby avoiding the need for surgical removal of the implanted magnet.

Define Professional Practice Gap: There is increasing evidence that surgical removal of cochlear implant magnets may not be necessary prior to MRI, but this is not widely practiced.

Learning Objectives: To understand the safety and tolerability of MRI in patients with cochlear implants.

Desired results: Demonstrate that with proper immobilization of the cochlear implant, MRI is safe and well tolerated.

IRB Status: Approved

NO. F002

Cochlear Implantation in Patients with Superficial Siderosis: A Review of 7 Cases

Mara C. Modest, MD; Matthew L. Carlson, MD
George B. Wanna, MD; Colin L. W. Driscoll, MD

Objective: To date there have been less than 20 cases of cochlear implantation (CI) in patients with superficial siderosis (SS) reported in the literature. The primary objective of the current study is to evaluate CI outcomes in 6 additional patients (7 ears) with SS and sensorineural hearing loss (SNHL).

Study Design: Retrospective case series

Setting: Two tertiary academic hospitals

Patients: Six patients (7 ears) with SS and SNHL underwent CI

Intervention: Cochlear implantation

Main outcome measures: Clinical presentation, clinical course, and serial post-implantation speech perception scores.

Results: A total of 6 patients (4 males; median age 52yrs) with SS and SNHL were evaluated at two independent tertiary academic centers. All patients developed progressive bilateral SNHL that was no longer amenable to conventional hearing aids. Additional presenting symptoms included vestibulopathy (n=4), cerebellar ataxia (n=3), mild dementia (n=1), and myelopathy (n=1). All patients underwent uncomplicated CI, and intraoperative device telemetry revealed normal responses in all electrodes. The median postoperative auditory threshold average was 27dB HL (range 16-33dB) and the median postoperative CNC word score was 51% (range 46-64%). The median duration of follow-up was 13.5 months. All patients demonstrated initial improvement in speech perception testing. A single patient had performance decline and worsening dementia due to progressive SS.

Conclusions: Cochlear implantation is a viable strategy for auditory rehabilitation in patients with SS and associated SNHL. Most individuals enjoy benefit from CI; however, patients should be counseled regarding the risks of performance decline with progressive SS.

Define Professional Practice Gap: Patients with superficial siderosis often have sensorineural hearing loss, which can be no longer amenable to hearing aids. Cochlear implantation in patients with superficial siderosis is very rare, but can be considered as a treatment option. There are less than 20 documented cases in the literature. At large academic institutions there is the opportunity to optimize treatment for these patients.

Learning Objective: Evaluate CI outcomes in 6 additional patients (7 ears) with superficial siderosis and sensorineural hearing loss.

Desired Result: Make attendees aware that cochlear implantation is a viable treatment option in patients with sensorineural hearing loss secondary to superficial siderosis if they are otherwise a proper candidate.

IRB Status: Approved

NO. F003

Gastroesophageal Reflux Symptoms, Regular Use of Proton Pump Inhibitors and H2-Receptor Blockers, and Risk of Hearing Loss

Brian M. Lin, MD; Sharon G. Curhan, MD
Konstantina M. Stankovic, MD, PhD; Gary C. Curhan, MD

Objective: Gastroesophageal reflux disease (GERD) is common and often treated with proton pump inhibitors (PPIs) or H2-receptor blockers. GERD has been associated with exposure of the middle ear to gastric enzymes, which can cause Eustachian tube dysfunction and impaired clearance of middle ear contents. We sought to investigate the relation between GERD, regular use of PPIs and H2-receptor blockers, and hearing loss in a prospective cohort of 116,430 women in Nurses Health Study II (NHSII).

Setting: Prospective cohort with biennial follow-up.

Patients: Eligible participants included 53,477 women aged 35-52 in 2005 who provided information on medication use and GERD in 2005 and answered the question on hearing loss in 2009.

Intervention(s): None

Main outcome measure(s): The primary outcome was self-reported hearing loss as ascertained by questionnaire. Cox proportional hazards regression was used to adjust for potential confounders.

Results: During 205,854 person/years of follow-up in which 5457 new cases of hearing loss were reported, GERD was associated with hearing loss (multivariate adjusted relative risk 1.13 [1.07, 1.20], $p<0.0001$). Increased frequency of GERD symptoms was associated with increased incidence of hearing loss (multivariate adjusted relative risks: <1 time/month 0.99 [0.89,1.10], several times/week 1.16 [1.05, 1.27], daily 1.31 [1.12, 1.52]). PPI use was independently associated with increased risk of hearing loss (multivariate adjusted relative risk 1.09 [1.02, 1.14], $p=0.008$) but H2-receptor blocker use was not. When stratified by frequency of GERD symptoms, there was no association between PPI use and hearing loss.

Conclusions: Self-reported GERD was associated with increased risk of hearing loss

Define Professional Practice Gap: There are no published prospective studies investigating the relation between gastroesophageal reflux, regular use of proton pump inhibitors and H2-receptor blockers, and risk of hearing loss.

Learning Objective: To examine if increasing frequency of gastroesophageal reflux disease symptoms, proton pump inhibitor use, and H2-receptor blocker use are independently associated with increased risk of hearing loss.

Desired Result: To Increase awareness regarding the relation between GERD, proton pump inhibitor use, H2-receptor blocker use, and risk of hearing loss.

IRB Status: Approved

NO. F004

Transcanal Round Window Occlusion for Superior Semicircular Canal Dehiscence

Colleen F. Perez, MD; Michael E. Hoffer, MD

Objective: Review the preoperative characteristics and postoperative outcomes of patients that underwent transcanal round window occlusion for superior semicircular canal dehiscence (SCD).

Study design: Retrospective chart review

Setting: Military tertiary referral center otolaryngology department

Patients: Patients included were those seen between January 2012 and January 2014 with symptomatic SCD or non-classical presentation of the syndrome that failed a trial of vestibular therapy and subsequently underwent transcanal round window occlusion.

Intervention: Transcanal round window occlusion.

Main outcome measures: Preoperative symptoms, presence of Tullio and/or Hennebert's signs, audiometric testing, vestibular-myogenic evoked potentials (VEMP) responses, and CT temporal bone findings were reviewed. Resolution of symptoms postoperatively was assessed at patient follow up.

Results: Seven patients underwent transcanal round window occlusion during the two-year timeframe. The surgical procedure will be discussed. Four patients reported improvement or resolution of symptoms, and three patients had no change in symptoms postoperatively. An extensive review of the results will be discussed.

Conclusion: Patients with non-classical presentations of SCD may benefit from the less-invasive and lower risk procedure of transcanal round window occlusion rather than the more invasive middle fossa or transmastoid approaches. We present the initial characteristics and outcomes in this group of patients and describe the preoperative findings that resulted in better outcomes after the procedure. This has implications in our military population where such a procedure may allow patients to avoid the morbidity of higher risk surgeries and to return to full duty sooner.

Define Professional Practice Gap: Since a non-classical presentation of superior canal dehiscence is not uncommon, understanding which patients may benefit from a transcanal round window occlusion technique rather than the more invasive methods would be beneficial for our speciality and for our unique military population.

Learning Objective: Describe the technique for transcanal round window occlusion, and identify patients that may benefit from this procedure. Review the results in a series of patients who underwent this procedure.

Desired Result: Attendees will consider a new technique for treating superior canal dehiscence and consider the advantages of this procedure versus more invasive methods.

IRB Status: Approved

NO. F005

Utility of Vertebrobasilar Insufficiency Testing (VBIT) as a Component of Videonystagmography

Norman J. Chan, MD; Taha A. Mur, MS
Kaitlin E. Palmer, MS; Bruce Zhang, MS
Paige M. Pastalove, AuD; Elizabeth Meenan, AuD
Pamela Roehm, MD, PhD

Objective: To determine the utility of the addition of vertebrobasilar insufficiency testing (VBIT) as a component of videonystagmography (VNG) in the evaluation of patients with vertigo or imbalance.

Study design: Retrospective chart review

Setting: Tertiary referral center

Patients: All patients aged 18 years and older who had a VBIT performed as a part of their VNG between January 1, 2011 to February 1, 2014.

Intervention: None

Main outcome measure: Sensitivity and specificity of VBIT in prediction of vertebrobasilar insufficiency compared with results on imaging.

Results: One hundred and twenty-eight patients had a VBIT performed as a component of their VNG. Twenty-four patients had magnetic resonance angiography (MRA) of the posterior circulation within 1 year of the VBIT. Seventy-three had magnetic resonance imaging (MRI) of the brain within 1 year of the VBIT. When using MRA as the definitive test for vertebrobasilar insufficiency, the sensitivity of VBIT was 50%, specificity was 54.55%, positive predictive value was 9.09%, and negative predictive value was 92.31%. When MRI was used as the comparative test, VBIT's sensitivity was 33.33%, specificity was 64.29%, positivity predictive value was 3.85% and negative predictive value was 95.74%.

Conclusion: When applied to all patients undergoing VNG, VBIT testing does not add additional data to contribute to diagnosis, and should not be used as a criterion for further radiologic testing for vertebrobasilar insufficiency.

Define Professional Practice Gap: Vertebrobasilar insufficiency testing is sometimes included as a component of videonystagmography and has unknown diagnostic utility.

Learning Objective: Vertebrobasilar insufficiency testing does not add additional data to contribute to diagnosis.

Desired Result: Vertebrobasilar insufficiency testing should not be used as a criterion for further radiologic testing for vertebrobasilar insufficiency.

IRB Status: Approved

NO. F006

High Resolution MRI Shows Presence of Endolymphatic Hydrops in Patients Still Symptomatic after Endolymphatic Shunt Surgery

Isabelle Y. Liu, MD; Ali R. Sepahdari, MD
Gail Ishiyama, MD; Akira Ishiyama, MD

Objective: Endolymphatic hydrops has been well described in patients with Meniere's disease; however, causation has not been established. Decompression of the endolymphatic sac has been proposed as a means to relieve hydrops and improve vertigo, but the efficacy of the surgery is debated. Until recently, there have been few objective measures of effectiveness. Recent archival human temporal bone studies have shown that patients continue to have hydrops after shunt surgery. We propose using high resolution MRI to determine the efficacy of endolymphatic shunt surgery in patients who continue to experience vertigo.

Setting: Academic tertiary care referral center

Patients: Four patients presented with continued vertigo after unilateral endolymphatic shunt surgery. Mean age was 56 years old. Surgery was performed at two different institutions.

Interventions: Magnetic resonance sequences included "cisternographic" three-dimensional T2, and delayed intravenous-enhanced three-dimensional fluid-attenuation inversion recovery (DIVE-3D-FLAIR) sequences, performed with 2350 ms (perilymph) and 2050 ms (endolymph) inversion times. The endolymph images were subtracted from perilymph images to create a composite image with bright perilymph, dark endolymph, and intermediate bone signals.

Main outcome measures: MRI finding of hydrops

Results: In all four patients who continued to experience severe vertigo, hydrops was found on high resolution MRI on the operated ear. The appearance on MRI was no different than in patients with EH who have not had surgery.

Conclusions: The present study demonstrates the persistence of endolymphatic hydrops in patients who have failed endolymphatic shunt surgery. Future studies evaluating for the presence or absence of endolymphaic hydrops in patients who claim to obtain relief from endolymphatic shunt surgery.

Define Professional Practice Gap: Endolymphatic shunt surgery is routinely done despite inconsistencies and lack of concurrence on its efficacy. It is difficult to measure its success rate since patient symptoms are subjective and often improve without intervention.

Learning Objective: We propose high resolution MRI as a tool to diagnose endolymphatic hydrops in patients with continued vertigo after endolymphatic sac surgery.

Desired Result: Attendees are encouraged to use high resolution MRI as a way to objectively identify endolymphatic hydrops in patients with Meniere's disease, and as an objective measure of the effectiveness of shunt surgery.

IRB Status: Exempt

NO. F007

Long-term Surgical and Audiometric Outcomes for Repair of Congenital Aural Atresia and Hypoplasia

Harrison W. Lin, MD; Roberto A. Cueva, MD

Objectives: To review the surgical outcomes for congenital aural atresia and hypoplasia (CAA) and analyze the hearing results.

Study Design/Setting/Patients: Retrospective chart review of 98 patients (104 ears) who underwent surgery for CAA during an 11-year period at a tertiary care institution.

Interventions/Outcome Measure/Methods: Preoperative and postoperative pure-tone averages (PTA), speech reception thresholds (SRT), air-bone gaps (ABG), and interaural PTA and SRT differences were compared. Factors impacting hearing outcomes were analyzed. The complication rates were reviewed and compared with results from similar studies.

Results: The average age was 16.6 years (39.8% female); mean follow-up time was 3.9 years. The mean improvement in ABG and SRT was 24.5 dB and 25.9dB, respectively, resulting in a postoperative ABG of 30 dB or less in four of five cases. The average postoperative PTA and SRT were 36.9dB and 34.3dB, respectively. Cases with an intact ossicular chain (34.6%; 36/104) had significantly superior audiometric outcomes when compared to cases in which a reconstruction prosthesis was required during primary or revision surgeries. Audiometric results from hypoplasia surgery were not significant different from those of atresia surgery. We again report a low incidence of meatal stenosis and tympanic membrane lateralization.

Conclusion: The mean hearing outcomes for this group compared favorably with other series. The need for ossicular chain reconstruction was associated with poorer audiometric outcomes. The safety profile and the demonstrated hearing improvement of CAA surgery suggest that it remains a favorable option for patients.

Define Professional Practice Gap: (1) Incomplete understanding of the surgical and audiometric outcomes of patients undergoing repair of aural atresia; (2) Lack of evidence -based management of aural atresia

Learning Objective: (1) Report surgical and audiometric outcomes of aural atresia surgery; (2) Recognize difficulties and common complications with repair of aural atresia

Desired Result: (1) Recognize the surgical and audiometric results following aural atresia repair; (2) Understand the management and potential complications of aural atresia surgery

IRB Status: Approved

NO. F008

A Comparison of Outcomes between Functional Canal Wall Up vs Conventional Canal Wall Down Mastoidectomy for Cholesteatoma

Wei-Chieh Chao, MD; Tali Rasooly, BA
Ilkka Kivekas, MD, PhD; Peter Forbes, PhD
Yi-Hsuan Wu, MD; Dennis Poe, MD, PhD

Objective: We reviewed our experience with two surgical treatments and compared the rates of recurrence/residual and hearing results.

Setting: Tertiary academic center

Patients: Retrospective chart review of 231 patients (241 ears) operated for primary cholesteatomas extending beyond the mesotympanum between 1996 and 2012.

Intervention(s): A minimally invasive functional approach for cholesteatoma excision has been previously reported and the larger cholesteatomas required a canal wall-up (CWU) approach. Even more extensive cholesteatoma was managed with a conventional canal wall-down (CWD) mastoidectomy and these results were compared with the previously reported CWU results.

Main outcome measure(s): Pure tone audiometry (PTA) results were analyzed pre-operatively, and at one-, three-, and five-years postoperatively. Residual and recurrent rates of cholesteatoma were also reported.

Results: The CWD group included 58 ears of 55 patients, mean age 37.7 y (range: 3-78y). Mean follow-up was 4.8 years (range 2-12 y). The CWD mean preoperative PTA was 53.3±17.7dB and the CWU mean PTA for 165 ears was 39.8±15.8dB. CWD cohort had significantly poorer hearing results than the CWU cohort, during the 5 year follow-up period ($p<.0001$). In the CWU group, the overall recurrence rate was 13% (vs 1.7% in CWD) and 3% of cases had unexpected residual disease (vs no cases in CWD).

Conclusions: The functional approach to CWU cholesteatoma surgery provided better long-term hearing results, equivalent residual rates, but higher recurrence rates compared to CWD mastoidectomy. The treatment of cholesteatomas should be individualized with CWD mastoidectomy chosen for patients with recurrent or more extensive disease.

Define Professional Practice Gap: There continues to be controversy over the use of canal wall up (CWU) versus canal wall down (CWD) mastoidectomies to minimize cholesteatoma recidivism. The functional CWU procedure, endoscopic-assisted when indicated, can be applied to improve residual rates compared to conventional CWU techniques. The long-term hearing outcomes are favorable compared to. CWD procedures, which are, therefore, selectively used for recurrences or extensive disease. The CWD approach uses the same functional approach for cholesteatoma removal to minimize the size of the resultant cavity and optimize the risk of residual or recurrent disease.

Learning Objective: Describe the hearing results, residual and recurrence rates between functional CWU and CWD procedures for the treatment of cholesteatoma. Discuss the indications for the two procedures. Surgeons should become familiar with the principles of the functional approach.

Desired Result: To familiarize practitioners with the comparative techniques, benefits and pitfalls of the two procedures to aid in choosing between the two procedures. Surgeons should be comfortable in employing the functional approach in their own patients using either CWU or CWD technique.

IRB Status: Approved

NO. F009

A Modified Eustachian Tube Reconstruction with Transnasal Approach to Treat Patulous Eustachian Tube

Yong Cui, PhD; Xiangdong Tu, BS
Jiandong Zhan, BS; Hongming Huang, MS
Qianhui Chen, PhD; Shaohua Chen, BS

Objective: To evaluation the effect of a modified Eustachian tube reconstruction in the treatment of the patulous Eustachian tube (PET).

Study design: retrospective case review

Setting: tertiary referral center

Patients: 12 patients with PETs complained of 1 or more years of confirmed continuous patulous ET symptoms refractory to medical care.

Interventions: The procedures were performed using a endoscopic transnasal approach instead of combined transnasal and transoral approach designed by Dennis Poe. 5 cases were performed with endoluminal cartilage implantation initially, then 7 cases were performed with ectoluminal implantation. In the later 7 cases, the junction of the lateral and medial lamella were split and trimmed septal or auricular cartilage were implanted in the pocket made laterally to the lateral lamella.

Main outcome measure: Autophony symptoms were scored as 1) complete relief; 2) significant improvement, satisfied; 3) significant improvement, dissatisfied; 4) unchanged; or worse.

Results: In the endoluminal group, 2 cases had complete relief; 1 case had significant improvement and satisfied; 2 cases had improvement but dissatisfied. In the ectoluminal group, 5 cases had complete relief, 2 cases had significant improvement and satisfied.

Conclusions: The patulous ET reconstruction can be performed through the transnasal approach in which special designed instruments are not needed. Our modified technique of patulous ET reconstruction, including splitting the junction of Eustachian tube cartilage and implanting the cartilage laterally to the lateral wall improve the surgical outcomes significantly.

Define Professional Practice Gap: Lack of simple and effective procedure to cure the patulous Eustachian tube.

Learning Objective: A modified Eustachian tube reconstruction devised by us can effectively treat patulous Eustachian tube.

Desired Result: The patulous ET reconstruction can be performed through the transnasal approach in which special designed instruments are not needed. Our modified technique of patulous ET reconstruction, including splitting the junction of Eustachian tube cartilage and implanting the cartilage laterally to the lateral wall improve the surgical outcomes significantly.

IRB Status: Approved

NO. F010

Surgical Anatomy of the Human Round Window Region: Implication for Cochlear Endoscopy through the External Auditory Canal

Jung Eun Shin, MD, PhD; MaryBeth Cunnane, MD
Demetri Psaltis, MD; Konstantina M. Stankovic, MD, PhD

Objectives: We have demonstrated, in mice, that optical imaging through the round window provides unprecedented resolution of unstained cochlear cells and intracellular organelles. Based on these results, we are developing an endoscope for optical imaging of the human cochlea to establish, for the first time, cellular-level diagnosis of sensorineural hearing loss.

Methods: Fifty human temporal bones were studied. Otomicroscopic examination was performed using a transcanal tympanotomy approach. A straight wire was inserted transcanal and bent at the tip to reach the round window membrane perpendicularly. The angle of the bent wire was measured, and correlated with the angle calculated from temporal bone CT scans obtained before and after measurements in situ.

Results: The opening of the round window niche was located inferiorly in 18 bones (39%), posteriorly in 6 bone (13%) and posteroinferiorly in 22 bones (48%). The angle measured in cadaveric temporal bones correlated well with that obtained from CT scans. The angles ranged from 116-126o, 109-119o and 102-120o in posteriorly, inferiorly and postero-inferiorly opened round window niches, respectively. We found that other parameters that would influence the design of a cochlear endoscope are aeration around the round window niche, the distance between the niche and the posterior wall of the EAC, and the prominence of the tympanomastoid suture line in the EAC.

Conclusions: By correlating measurement from cadaveric human temporal bones and their CT scans, we defined key parameters necessary for design of an endoscope for intracochlear imaging. Our design would enable cell-specific, minimally-invasive, real-time diagnosis in clinics.

Define Professional Practice Gap: Lack of contemporary methods for diagnosing sensorineural hearing loss in cell-specific, minimally-invasive, real time for the patients in clinical setting.

Learning Objective: To understand key parameters in determining the design of an endoscope for intracellular imaging

Desired Result: Once the endoscope becomes available, the attendees will have a greater understanding of the design of the endoscope and how to actually apply to the patients in real clinical setting.

IRB Status: Exempt

NO. F011

Consistency and Modality in the Radiologic Diagnosis of Thin and Dehiscent Superior Semicircular Canals

Samuel A. Spear, MD; Neal M. Jackson, MD
Christian E. Morel, MD; Moises A. Arriaga MD, MBA

Objective: To assess the consistency of the radiologic diagnosis given to patients with abnormally thin (TSC) or dehiscent superior semicircular canals (DSC) on computed tomography (CT) and magnetic resonance imaging (MRI).

Study Design: Clinical Study

Setting: Tertiary referral center

Patients: Patients with a prior diagnosis of TSC, DSC or vestibulocochlear symptoms who underwent both MRI and CT of the temporal bones over the past 3 years that included images of sufficient detail through the labyrinth.

Interventions: CT and MR images of superior semicircular canals (SSC) were separately reviewed, in a blinded fashion, by 3 neuroradiologists at our institution.

Main Outcome Measures: DSC, TSC or Normal SSC.

Results: 53 patients were included this study resulting in 106 superior semicircular canals for review. Each of the three neuroradiologists selected the same diagnosis independently in 64.2% (68 of 106) of the CT SSC images reviewed and 49% (52 of 106) of MRI SSC images reviewed. TSC was the diagnosis with the highest rate of disagreement by one of the three radiologists among both CT (58%) and MRI (65%) followed by DSC on CT (53%) and MRI (63%). There was no agreement in 5.7% (6 of 106) SSC cases reviewed in MRI.

Conclusion: A systematic review of the literature reveals wide disparity in published criteria for DSC and TSC. Even among neuroradiologists that are familiar with these diagnoses, there is inconsistency in the diagnosis of abnormally TSC and DSC on CT and MRI, suggesting the importance of establishing standard radiologic criteria for diagnosis of these conditions.

Define Professional Practice Gap: A systematic review of the literature reveals wide disparity in published criteria, specifically radiologic diagnostic criteria, for dehiscent and abnormally thin superior semicircular canal. This can lead to inconsistent radiologic diagnoses of these findings after CT and MRI scans.

Learning Objective: To assess the consistency of the radiologic diagnosis given to patients with abnormally thin or dehiscent superior semicircular canals on computed tomography and magnetic resonance imaging and to review published radiologic guidelines and criteria of these findings.

Desired Result: Attendees will learn of established or lack of established radiologic criteria of thin and dehiscent superior semicircular canals and of potential inconsistencies in their diagnosis after CT and MRI.

IRB Status: Approved

NO. F012

Ex Vivo MR Histology of Nerve Fibers in a Human Temporal Bone by High-Resolution Diffusion Tensor Imaging Using 9.4 T MRI

Masato Fujioka, MD, PhD; Keigo Hikishima, PhD
Naoki Oishi, MD, PhD; Yoshinori Kawai, MD
Hirotaka J. Okano, MD, PhD; Kaoru Ogawa, MD, PhD

Hypothesis: High resolution visualize of nerve fibers in the temporal bone can be obtained by 9.4T MRI.

Background: MR histology is a novel entity finely visualizing tissue/organs at any plane in 3D imaging, of which quality is guaranteed by high magnetic field MRI. Internal auditory canal (IAC) in the temporal bone contains four nerves, cochlear nerve, superior vestibular nerve, inferior vestibular nerve and facial nerve, all of which are derived from different nucleus, gather at the CP-angle, run through the canal and project to their target organs.

Methods: Formaldehyde fixed cadaver was used (N=2). Temporal bone and surrounded structures were dissected and were scanned using a 9.4 T MRI (Bruker Biospec®). Diffusion tensor imaging (DTI) was analyzed by an algorism for tracking fibers (TrackVis®).

Results: Using a 9.4 T MRI with or without cryogenic probe, we were able to visualize fine structures of human temporal bone including Reissner membrane, scala tympani, media and vestibule, and nerve fibers in the IAC. In the DTI, we successfully distinguished four nerves separately and track individual fibers to the end organ (cochlea, vestibules and main trunk of facial nerve at the mastoid tip). We were able to separate auditory nerve fibers from apical and basal turn of the cochlea and, interestingly, nerve fiber from the mid-turn contacted to the inferior vestibular nerve was observed.

Conclusions: The result suggests the feasibility of autopsy imaging in the temporal bone histopathology without dissection by using high field MRI scan.

Define Professional Practice Gap: The number of human temporal bone study in Japan was limited due to the national characters and religious issue. Autopsy imaging would be a feasible option if the resolution is high enough.

Learning Objective: To show that high resolution MRI is sufficient to visualize structures in the temporal bone including nerve fibers.

Desired Result: Postmortem imaging of temporal bone and its nerve fibers by using MRI.

IRB Status: Approved

NO. F013

Review of a Single Surgeon's Stapes Cases Performed with a Nickel Titanium Prosthesis (2002-2014)

Natalie Justicz, BA; Kevin K. Motamedi, MD
Douglas E. Mattox, MD

Objective: To identify the efficacy and safety of stapes surgeries performed with a nickel titanium prosthesis for patients with otosclerosis.

Study Design: Retrospective chart review of outcomes by a single surgeon at the same institution over a period of 12 years using the same nickel titanium stapes prosthesis.

Setting: Academic tertiary care referral center.

Patients: The records of 372 unique initial stapes surgeries were reviewed to yield 279 records with both preoperative and postoperative audiograms.

Intervention(s): Left or right stapedotomy with nickel titanium prosthesis.

Main outcome measure(s): Pure-tone averages (PTA) at baseline and six weeks after surgery were calculated over four frequencies; 0.5, 1, 2 and 4 kHz. Average air-bone gaps (ABG) were also calculated based on preoperative and postoperative audiograms.

Results: Average preoperative baseline PTA was 57 dB in the affected ear. Postoperative PTA (for most patients measured at approximately six weeks after surgery) was 31 dB, a 26 dB improvement. Initial average ABG was 31 dB, while postoperative ABG averaged 6.6 dB, a 24.4 dB improvement. Complications were noted and recorded, including recurrent conductive hearing loss (6), post-operative BPPV (3), progressive SNHL (2), and prosthesis dislocation (1). Overall complication rate was 4.3%.

Conclusions: Stapes surgery with a nickel titanium prosthesis is a safe and well-tolerated procedure that led to a significant improvement in hearing outcomes.

Define Professional Practice Gap: This is the largest retrospective series of stapes surgeries performed by a single surgeon using the same nickel titanium prosthesis. While multiple implantable options exist for stapes surgery, this review will hope to provide a comprehensive measure of safety and efficacy for one specific implant to help surgeons choosing amongst various implantable prostheses.

Learning Objective: To identify the efficacy and safety of stapes surgeries performed with a nickel titanium prosthesis for patients with otosclerosis.

Desired Result: To provide other otologic surgeons with a safety/ efficacy profile for a specific nickel titanium implant in hopes of helping to define expected outcome measures as well as assisting with adequate patient counseling prior to surgery.

IRB Status: Approved

NO. F014

Early Blind Sac Closure for the Treatment of Chronic Otitis Media

Joseph P. Roche, MD; Oliver F. Adunka, MD
Craig A. Buchman, MD

Objective: Evaluate the efficacy and safety of early blind sac closure as a treatment option of for chronic otitis media and cholesteatoma.

Study design: Retrospective case review.

Setting: University-based tertiary referral medical system.

Patients: Adults and pediatric patient with cholesteatoma or chronic otitis media.

Intervention(s): Patients were offered early blind sac ear closure if they had extensive disease or intractable symptoms.

Main outcome measure(s): Demographic, audiological, and surgical information was collected and tabulated.

Results: 20 patients underwent blind sac ear closure. Chronic otitis media and residual cholesteatoma were the most common indications. Preoperative hearing thresholds were high and airbone gaps, when measured were large. Hearing reconstruction and device selection was individualized and included cochlear implantation, osteointegreated implants, and active middle ear devices. Complications were uncommon and included a surgical site infection and need for reinforcement of the ear closure. Three recurrent cholesteatomas occurred, all were detected on imaging and all were treated with surgical reexcision. All patients to date have been satisfied with their surgical intervention and hearing reconstruction outcome.

Conclusions: Early blind sac closure appears to be a safe and efficacious treatment option for patients with multi-recidivistic disease and / or intractable symptoms.

Define Professional Practice Gap: The current standard of care for cholesteatoma is the canal wall down mastoidectomy. Early ear closure may offer patients a more expeditious definitive treatment than current practice.

Learning Objective: Conference attendees will learn about the surgical rationale, expected outcomes, and follow up options for patients undergoing early ear closure for the treatment of cholesteatoma.

Desired Result: Conference attendees will be able to better able to counsel patients regarding the outcomes that can be expected if early ear closure is selected as a treatment option.

IRB Status: Approved

Feasibility of Transcanal Endoscopic Ear Surgery to Access Cholesteatoma in the Tympanic Sinus by Depth Classification

Seiji Kakehata, MD, PhD; Tomoo Watanabe, MD, PhD
Tsukasa Ito, MD, PhD; Toshinori Kubota, MD, PhD
Kazunori Futai, MD, PhD; Takatoshi Furukawa, MD, PhD

Objective: To determine the feasibility of transcanal endoscopic ear surgery (TEES) to access cholesteatomas in the tympanic sinus (TS) based on a classification of the depth of the TS in comparison to the facial nerve.

Background: The TS is an anatomical dead corner which is not directly visible microscopically and is a frequent site of residual cholesteatomas. TS depth is classified as A, B and C going from shallow to deep.

Study design: A retrospective case series

Setting: Tertiary referral center

Patients: 110 patients with primary acquired cholesteatoma who underwent surgery between September 2011 and August 2014, including 87 with pars flaccida (PF) and 23 with pars tensa (PT) cholesteatoma.

Intervention: Operation records were reviewed to determine the presence of cholesteatoma in the TS. The TS was classified based on a high resolution CT scan.

Results: Cholesteatomas extended into the TS in 20 cases (18%), including 9 cases of PF and 11 cases of PT. The TS classification was A (8), B (11) and C (1) with the 12 B and C cases representing deep retractions which are inaccessible microscopically. The cholesteatoma was completely removed from the TS under endoscopic visualization in all cases by either TEES or canal wall down. TEES was performed on 12 out of 20 cases (60%), including 3 PF (33%) and 9 PT (82%), with 3 TS classification of A and 9 of B.

Conclusions: TEES is a less invasive approach providing visibility and access to the TS, a hitherto anatomical dead corner.

Define Professional Practice Gap: Lack of awareness of how often primary acquired cholesteatomas extend into the tympanic sinus and that 60% of these tympanic sinuses are too deep to be accessed microscopically.

Learning Objective: To demonstrate the feasibility of TEES to access cholesteatomas in the tympanic sinus based on a classification of the tympanic sinus depth in comparison to the facial nerve.

Desired Result: More surgeons will employ TEES which is a less invasive approach that provides visibility and access to the tympanic sinus, a hitherto anatomical dead corner.

IRB Status: Approved

NO. F016

Is There a Right Ear Advantage in Congenital Aural Atresia?

Matthew A. Hubbard, MD; Robert E. Reed, MD
Lincoln C. Gray, PhD; Bradley W. Kesser, MD

Hypothesis: This study examines a cohort of patients with congenital aural atresia to determine if left sided hearing loss confers less disability relative to patients with impaired hearing in the right ear.

Study Design: Case control survey and review of audiometric data

Methods: A survey assessing academic progress and demographic factors was distributed to families of children with unilateral congenital aural atresia (CAA) and unilateral sensorineural hearing loss (USNHL) to identify rates of grade retention, use of any hearing or learning resource, and behavioral problems. Audiometric and demographic data of the cohort were tabulated. Results of the survey were compared between children with right CAA and those with left CAA to determine a possible right ear advantage.

Results: Left CAA patients were more likely to be non-Caucasian relative to the right CAA group. There was no significant difference in grade retention or utilization of amplification, speech language therapy, IEP, or FM system between children with right vs. left CAA. Children with left CAA were significantly more likely to be enrolled in special education programs. Differences in reported communication problems approached significance with more difficulties noted in the right ear CAA group ($p = 0.059$).

Conclusions: In the studied population of children with unilateral CAA, the only statistically significant difference discovered was in special education enrollment, which was more prevalent in left sided CAA. Further investigation of both the clinical implications and underlying psychoacoustics of unilateral hearing loss is warranted.

Define Professional Practice Gap: 1. Lack of awareness of the clinical implications of congenital aural atresia 2. Lack of evidence supporting clinical significance of the hypothesized "right ear advantage"

Learning Objective: 1. Describe educational / social interventions with utility in the congenital aural atresia population. 2. Understand the neuroauditory phenomenon known as right ear advantage and its potential clinical implications

Desired Result: The attendee will facilitate supportive measures of utility for patients with congenital aural atresia and provide appropriate counseling and anticipatory guidance for patients and families regarding treatment and prognosis.

IRB Status: Approved

NO. F017

Connecting the Heart and Ear: A Novel LVAD Powered through a Post-Auricular Pedestal

Richard K. Gurgel, MD; Stephen H. McKellar, MD
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Objective: To evaluate the safety and efficacy of a novel method to power a Left Ventricular Assist Device (LVAD) in patients with advanced heart failure via a subcutaneous connection to a post-auricular, percutaneous, osseointegrated pedestal. This system was designed to improved patient mobility and function compared to traditional LVADs and expands on techniques commonly utilized for osseointegrated hearing prosthetics.

Study design: Case series from a prospective, randomized clinical trial

Setting: Tertiary-care, university hospital

Patients: Patients with heart failure refractory to medical management requiring LVAD

Intervention(s): Therapeutic and rehabilitative

Main outcome measure(s): LVAD use, rate of osseointegration, and post-auricular wound healing

Results: Three patients with NYHA class IV heart failure (average ejection fraction 18%, range 10-25%) were treated with the study device. Successful use of the external power supply, improved cardiac output, and temporal bone osseointegration occurred for all patients. No infections adjacent to the pedestal were encountered (average follow-up 7 months). One patient had a 4mm wound dehiscence adjacent to a rejected suture, and another patient had a pyogenic granuloma develop in the incision line. Both issues resolved with local wound care and did not impair use of the device.

Conclusions: This study has shown that a post-auricular, percutaneous pedestal housing subcutaneous connectors is a safe and effective way to deliver power to an LVAD. Minor post-auricular wound complications were encountered, but resolved with local wound care. This study also illustrates how otologic surgical techniques can be applied in a cross-disciplinary collaborative manner to foster prosthetic innovation.

Define Professional Practice Gap: Lack of awareness and contemporary knowledge of how a commonly utilized otologic surgical technique of post-auricular osseointegrative prosthetics can be applied to other disciplines, such as cardiothoracic surgery, with a novel Left Ventricular Assist Device (LVAD).

Learning Objective: Present data on the safety and efficacy of a novel method to power a Left Ventricular Assist Device (LVAD) in patients with advanced heart failure via a subcutaneous connection to a post-auricular, percutaneous, osseointegrated pedestal.

Desired Result: Attendees will be able to understand how otologic surgical techniques can be applied in a multi-disciplinary manner with cardiothoracic surgery to enable prosthetic innovation.

IRB Status: Approved

NO. F018

Transcanal Endoscopic Ear Surgery for Pediatric Population with Narrow External Auditory Canal

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Tomoo Watanabe, MD, PhD; Kazunori Futai, MD, PhD
Takatoshi Furukawa, MD, PhD; Seiji Kakehata, MD, PhD

Objective: To demonstrate the feasibility of transcanal endoscopic ear surgery (TEES) for middle ear disease in the pediatric population with a narrow external auditory canal.

Study design: Retrospective case review

Setting: Academic tertiary referral center

Patients: Thirty-one patients ranging in age from 2 to 13 years old (median: 7.6 years) with middle ear disease who underwent TEES between November 2011 and August 2014. Sixteen of these patients had surgery for cholesteatomas; eleven for chronic otitis media; and four for malformation of the middle ear.

Intervention: A preoperative CT scan was performed to evaluate the middle ear disease. Transcanal endoscopic tympanoplasty was performed by rigid endoscopes with an outer diameter of 2.7 mm. Transcanal endoscopic retrograde mastoidectomy was also performed, as necessary, on some patients to access pathologies in the antrum.

Main outcome measure: The minimum values of anterior-posterior diameters and superior-inferior diameters of the bony parts of external auditory canal were measured based on the preoperative cone beam CT scan data.

Results: The smallest anterior-posterior diameters of the external ear canal ranged from 3.2 to 7.1 mm (5.0 ± 1.0 mm) and the smallest superior-inferior diameters ranged from 3.4 to 10.3 mm (5.9 ± 1.3 mm). TEES was successfully performed on each patient without an extra retroauricular incision.

Conclusion: TEES is feasible using rigid endoscopes with an outer diameter of 2.7 mm and is less invasive for pediatric patients with a narrow external auditory canal.

Define Professional Practice Gap: Lack of awareness that transcanal endoscopic ear surgery is feasible for pediatric patients who have a narrower external auditory canal compared to adult patients.

Learning Objective: To confirm that transcanal endoscopic ear surgery with optional retrograde mastoidectomy on demand is feasible and less invasive for children.

Desired Result: Transcanal endoscopic ear surgery, a minimally invasive procedure, will be widely employed in the treatment of pediatric middle ear disease.

IRB Status: Approved

NO. F019

The Presentation and Management of Tympanic Membrane Perforation with versus without Secondary Acquired Cholesteatoma

James H. Clark, MB, BCh; Allen L. Feng, BS
Aisha Harun, MD; Howard W. Francis, MD, MBA

Objective: Comparing clinical features and tympanoplasty outcomes in patients with both tympanic membrane perforation (TMP) and secondary acquired cholesteatoma (SAC) versus non-complicated TMP (NTMP)

Setting: Tertiary-care, academic center

Patients: Forty-one patients with a diagnosis of TMP with SAC confirmed at surgery between 1999 and 2013, and an age-matched cohort of 41 patients with NTMP.

Intervention(s): Medial (MGTT) or Lateral (LGTT) graft technique tympanoplasty.

Main outcome measure(s): Resolution of perforation, SAC and symptoms.

Results: Comparison between the cohorts did not reveal significant differences in symptomology or presentation. Within the SAC cohort, 25 (61%) underwent MGTT and 16(39%) LGTT. No significant difference (p=0.7) between the two techniques was observed for resolution of SAC. In the NTMP cohort 33(80%) underwent MGTT and 8(20%) LGTT. Comparison of the two cohorts for initial tympanoplasty revealed a statistically significant (p=0.008) increase in resolution of the perforation for MGTT in the NTMP cohort compared to the SAC cohort. No difference (p=0.7) however was observed in resolution when a second tympanoplasty was required. When comparing disease resolution between the SAC versus NTMP cohorts, there was no significant difference in resolution for an initial procedure (p=0.4) or a second procedure (p=0.5) for LGTT.

Conclusion: There are no clear clinical predictors for the development of SAC in some patients with TMP. Tympanoplasty technique may have limited impact on treatment outcomes for TMP with SAC. A larger sample size is needed to further elucidate best practices. The ability to distinguish the two entities however, is important to mitigate the destructive potential of SAC and correctly counsel on tympanoplasty success rates.

Define Professional Practice Gap: Secondary acquired cholesteatoma (SAC) occur when the tympanic membrane epidermis invades the medial surface of the tympanic membrane from the margin of its perforation.
Few studies have report on SAC and little is known about the clinical features or outcomes after tympanoplasty for this clinical entity. The purpose of this manuscript is to correct this deficiency in knowledge by describe both the clinical features and the outcomes that we have witness in our practice for the management of SAC.

Learning Objective: - There are no clear clinical predictors for the development of secondary acquired cholesteatoma in some patients with tympanic membrane perforation. - Tympanoplasty technique may have limited impact on treatment outcomes for tympanic membrane perforation with secondary acquired cholesteatoma. - A larger sample size with stratification by perforation size and location is needed to further elucidate best practices.

Desired Result: - A clinician's ability to distinguish the two entities, is important to mitigate the destructive potential of SAC and correctly counsel patients on tympanoplasty success rates.

IRB Status: Approved

NO. F020

Development of a Temporal Bone Simulator for Transcanal Endoscopic Ear Surgery

Matthew M. Dedmon, MD, PhD; Elliott D. Kozin, MD
Daniel J. Lee, MD

Objective: Minimally-invasive transcanal endoscopic ear surgery (TEES) is being used more frequently in chronic ear disease for cholesteatoma removal and middle ear reconstruction, reducing the need for a post-auricular incision and mastoidectomy. However, TEES is a challenging technique even for the most experienced otologist, requiring one-handed dissection using angled endoscopes and instruments. At our institution, we have developed a high-fidelity temporal bone model incorporating key aspects of TEES and cholesteatoma removal to facilitate the acquisition of these skills in a safe environment.

Study Design: Simulator development

Methods: Mastoidectomy and facial recess drilling were performed on fixed human cadaveric temporal bone to access the middle ear. Cholesteatoma was simulated using chicken skin and fixed in the epitympanum, oval window niche, sinus tympani, and mastoid antrum using cyanoacrylate ("Super Glue"). Water-based paint was utilized to generate artificial blood. Small-bore tubing delivered artificial blood to the external auditory canal to simulate bleeding during the procedure.

Results: The simulator was used to endoscopically elevate a tympanomeatal flap under bleeding conditions. Cholesteatoma was removed with 0 and 30 degree endoscopes using a bone curette and angled instrumentation.

Conclusions: Our human temporal bone model provides a high-fidelity environment to develop the advanced techniques of minimally-invasive TEES and cholesteatoma removal. A pilot study is currently underway to quantify performance measurements using global assessment scales and procedure-specific checklists in surgeons who are learning TEES.

Define Professional Practice Gap: Lack of availability of high-fidelity temporal bone models to simulate endoscopic dissection and removal of cholesteatoma

Learning Objective: Understand the development and components of a temporal bone model that simulates endoscopic dissection and cholesteatoma removal

Desired Result: Attendees will be able to create a temporal bone model to simulate endoscopic dissection and removal of cholesteatoma

IRB Status: Exempt

NO. F021

Skin Necrosis in a Magnet-based Bone Anchored Hearing Implant

Daniel Jethanamest, MD; Judy W. Lee, MD

Objective: To describe a delayed complication of a new magnet-based, transcutaneous, bone anchored hearing implant (BAHA Attract™). This case highlights various potential patient factors related to the breakdown of previously well-healed skin over the magnet site that may contribute to candidate selection, and reviews the method of surgical repair.

Study Design: Retrospective case review.

Setting: Tertiary referral center

Patient: One bone anchored hearing implant user with multiple prior otologic surgeries

Interventions: Therapeutic and rehabilitative.

Main outcome measures: Wound healing and viability of bone anchored implant.

Results: One patient with Treacher Collins Syndrome, bilateral conductive hearing loss and multiple otologic surgeries was identified. She underwent revision bone anchored hearing implant surgery to place a new magnet-based transcutaneous system after having prior repeated abutment skin overgrowth. After initial normal wound healing, she was loaded with the magnet-based processor and subsequently developed skin necrosis over the magnet site after continuous usage. A local scalp rotation-advancement flap was used to successfully repair the site with magnet removal. Patient factors including device use beyond initial manufacturer recommendations and a history of multiple prior surgeries were examined.

Conclusions: The vascularity and health of the skin that bears the pressure over a magnetic implant may be affected by prior surgeries and should be considered in candidates for this device. Patient education and compliance with initial loading is critical to avoid potential skin complications. A local scalp rotation-advancement flap is an effective technique to address skin complications.

Define Professional Practice Gap: 1. A new magnet-based, transcutaneous bone anchoring hearing implant is widely available, but there is a lack of contemporary descriptions of potential complications and the techniques to repair them;
2. Lack of review of patient factors such as prior surgical history at the same location as a potential risk factor for skin complications with this type of device.

Learning Objectives: 1. To review a skin necrosis complication in a magnet-based bone anchored implant system and describe the local flap repair use to address this; 2. To describe the patient factors contributing to skin necrosis over this new implantable hearing device that may be used to assess all future candidates.

Desired Result: Change practicing physician knowledge and practice in selection of candidates. Provide awareness of this possible delayed skin complication, the use of magnet strengths and importance of processor loading compliance. These factors can be generalized to optimize care prevent future patient complications with this new technology.

IRB Status: Exempt

NO. F022

The Onset and Treatment of Otitis Media Associated with Eosinophilic Granulomatous Polyangiitis (EGPA)

Naohiro Yoshida, MD, PhD; Akihiro Shinnabe, MD
Yukiko Iino, MD, PhD

Objective: To present six cases of hearing loss associated with eosinophilic granulomatosis with polyangiitis (EGPA) and to discuss the onset, treatment and mechanisms of hearing impairment after steroid instillation and immunosuppressive therapy.

Study design: Retrospective case review.

Setting: Tertiary referral center.

Patients: Six patients were referred to our University Hospital from 2004 to 2014 with intractable otitis media with eosinophil infiltration to the middle ear and progressive mixed (conductive and sensorineural) hearing loss.
Interventions: Diagnosis and treatment.

Main outcome measures: Otologic symptoms, resistance for steroid instillation and analysis of cochlear function before and after treatment.

Results: Six cases (three male, three female; aged 35–70; one MPO-ANCA positive, one PR3-ANCA positive) were included in this study all presenting middle ear effusion with eosinophil infiltration. In one case, hemi/bilateral facial palsy (16.7%) was also reported prior to diagnosis (10 months). All cases were treated as eosinophilic otitis media one to 10 years after bronchial asthma and chronic sinusitis presented. Four cases were diagnosed as EGPA one to six years after otologic symptoms appeared. The administration of triamcinolone acetonide was effective at controlling these symptoms; however, immunosuppression therapy was necessary for advanced cases.

Conclusions: This study highlights the difficulties in diagnosing localized EGPA and the effectiveness of steroid instillation if an early diagnosis can be obtained. Our findings also indicate that the otologic symptoms and resistance for steroid instillation may be an indicator and importance of differentiating EGPA-associated otitis media from eosinophilic otitis media diagnostically.

Define Professional Practice Gap: Eosinophilic granulomatosis with polyangiitis (EGPA) is categorized as one of the ANCA-associated vasculitis. The onset, clinical features and treatment of EGPA-associated otitis media has not been well studied yet. Four of six cases were diagnoses as EGPA one to six months after otologic symptoms. This presentation gives the clinical features of six EGPA-associated otitis media and information for diagnosing this disease and difficulty of differentiating from other intractable otitis media with eosinophil infiltration to the middle ear such as an eosinophilic otitis media.

Learning Objective: 1. EGPA is rare but important life threatening disease. In 66% of our cases, EGPA associated otitis media is occurred prior to the systemic condition of EGPA. 2. EGPA associated otitis media is one of the important different diagnosis for intractable otitis media with eosinophil infiltration related to the bronchial asthma and sinusitis with nasal polyps if not with skin and neuritis. 3. Early diagnosis and steroid instillation to the middle ear has the possibility for control and treatment of EGPA associated otitis media but immunosuppression is necessary for advanced cases.

Desired Result: This presentation gives the clinical features of six EGPA-associated otitis media and information for diagnosing this disease. Our findings indicate that the otologic symptoms and resistance for steroid instillation may be an indicator and importance of differentiating EGPA-associated otitis media from eosinophilic otitis media diagnostically.

IRB Status: Approved

NO. F023

Clinical Impact of Ultra-high Resolution Inner Ear Magnetic Resonance Imaging

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Akira Ishiyama, MD

Objective: To Describe The Role Of Ultra-High Resolution Inner Ear Magnetic Resonance Imaging (MRI).

Study Design: Retrospective case series.

Setting: Tertiary referral center.

Patients: This study was exempt from institutional review board approval. Three subjects were imaged: 1) a 42-year-old male with unilateral hearing loss, tinnitus, and vertigo; 2) a 48-year-old female with dizziness; 3) a 41-year-old female with a history of vestibular schwannoma, status post resection at an outside facility, presenting for cochlear implantation for hearing loss.

Interventions: MRI was performed on a 3 Tesla unit using a multi -channel surface coil paired with a head coil. Ultra-high resolution heavily T2-weighted images were acquired using a variable flip angle 3D turbo spin echo pulse sequence, with 0.27 x 0.2 x 0.2mm voxel size.

Main Outcome Measure: Characterization of pathology in the internal auditory canal and influence on clinical decision-making.

Results: Ultra-high resolution MRI revealed the following: 1) a 4mm mass at the fundus of the IAC that arose from the cochlear nerve, leading to a recommendation of early surgical intervention; 2) a 7mm mass in the IAC separate from the nerves, consistent with meningioma rather than schwannoma. Small lesion size and absence of nerve origin indicated that this incidental, and helped confirm a diagnosis of benign paroxysmal positional vertigo; 3) a focal defect in the cochlear nerve, suggestive of iatrogenic injury, leading to a recommendation against cochlear implantation.

Conclusion: Ultra-high resolution inner ear MRI allows for confident delineation of inner ear anatomy, and changes clinical management in some cases.

Define Professional Practice Gap: 1. Lack of awareness of the role of magnetic resonance imaging (MRI) in visualization of inner ear and retrocochlear pathologies.

Learning Objective: Understand the role of ultra-high resolution (MRI) of the inner ear and recognize its usefulness in delineating cochlear, vestibular, and retrocochlear pathologies.

Desired Result: Attendees will recognize that inner ear MRI is a powerful and easily-implemented diagnostic tool that may be employed by the practicing otologist and neurotologist.

IRB Status: Exempt

NO. F024

Radiologic Variation of Round Window Anatomy: Implications for Cochlear Implantation and Inner Ear Drug Delivery

Peter L. Nguy, BS; Sheela Saidha, BA
Ann Jay, MD; H. Jeffrey Kim, MD
Michael Hoa, MD

Objective: To determine the anatomic relationships and variation of the round window membrane to externally visible and surgically relevant bony landmarks on the basis of high-resolution computed tomography.

Study design: Retrospective chart and CT review

Setting: Tertiary academic center.

Patients: 21 consecutive patients (age = 47.1 ± 20.5 years) with normal temporal bone CTs. Each ear was treated as an independent variable.

Intervention(s): All patients underwent standard-of-care temporal bone imaging for various otologic symptoms. Clinical information was gathered using electronic medical records.

Main outcome measure(s): Temporal bone studies were evaluated to define a series of measurements, which included 1) the angle of the round window membrane (RWM) in relation to the basal turn of the cochlea, 2) the extent of RWM visibility from the perspective of the facial recess measured in degrees of freedom (DOF) and 3) the RWM distance and angulation in relation to the bony tympanic annulus at the level of the umbo.

Results: The mean RWM angle in relation to the basal turn of the cochlea was 45.44 ± 8.44°. The DOF from the facial recess to the RWM was 11.63 ± 2.16°. The length of the vector from the TA to the RWN was 4.57 ± 0.91 mm, and its angle was 45.86 ± 10.07°.

Conclusions: Anatomic variation of RWM orientation and distance to relevant surgical landmarks is defined and provides a baseline for future studies to assess feasibility of round window insertion for cochlear implantation and anatomic factors affecting transtympanic inner ear drug delivery.

Professional Practice Gap: Current practice standards indicate the need for imaging prior to otologic surgery, especially in regards to cochlear implantation. However, there are no established methods of examining anatomical variation of the inner ear that clearly dictate whether patients are favorable candidates for surgery.

Learning Objective: The study's objective is to help learners identify a series of radiologic measurements on temporal bone imaging that will be useful to the otologic surgeon.

Desired Result: The goal is for attendees to be able to use the radiologic measurements defined by this study in their pre-procedural planning and patient counseling.

IRB Status: Approved

NO. F025

Comparison of Postoperative Pain between Transcanal Endoscopic Ear Surgery and Microscopic Ear Surgery

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Tsukasa Ito, MD; Yasuhiro Abe, MD
Toshinori Kubota, MD; Kazunori Futai, MD
Seiji Kakehata, MD

Objective: Transcanal endoscopic ear surgery (TEES) is much less invasive than microscopic ear surgery (MES) because TEES requires a smaller skin incision and mastoidectomy. We compared TEES with MES in terms of postoperative pain.

Study Design: A prospective case series

Setting: Tertiary referral center

Patients: Seventy-five patients aged 20 years or older who had undergone middle ear surgery between February 2013 and May 2014 with 47 in the TEES group and 28 in the MES group.

Methods: We compared and assessed postoperative pain between the TEES and MES groups. We used a pain numeric rating scale (NRS) and the number of times a non-steroidal anti -inflammatory drug (NSAID) was administered between postoperative days 1 and 7 as indexes to assess postoperative pain. We also examined the relationship between the extent of skin incision or mastoidectomy and postoperative pain.

Results: The average NRS score in the 7 days after surgery was significantly lower with TEES (0.81) than with MES (2.31) ($p < 0.001$). The number of times a NSAID was administered in the 7 days after surgery was lower with TEES (1.33) than with MES (3.64) ($p < 0.05$). NRS scores increased in proportion to the extent of skin incision. However NRS scores did not increase in proportion to the extent of mastoidectomy.

Conclusion: We proved that TEES was not only less invasive but was also superior in terms of postoperative pain. The low-level invasiveness of TEES should be considered when choosing a surgical procedure.

Define Professional Practice Gap: Lack of awareness that TEES is not only less invasive but was also superior in terms of postoperative pain.

Learning Objective: We compared TEES with MES in terms of postoperative pain.

Desired Result: To understand that TEES is superior in terms of postoperative pain.

IRB Status: Approved

NO. F026

Benign Temporomandibular Joint Lesions Presenting as Masses in the External Auditory Canal

Ryan A. Williams, MD; C. Eduardo Corrales, MD
Robert K. Jackler, MD

Objective: Describe benign lesions arising from the temporomandibular joint (TMJ) that presented as masses in the external auditory canal (EAC).

Study Design: Retrospective case series.

Setting and patients: Tertiary academic medical center. Four patients were identified with lesions emanating from the TMJ that presented as EAC masses. Three were occlusive and two developed entrapment cholesteatoma between the mass and tympanic membrane.

Intervention: Surgical resection.

Main Outcome Measures: TMJ function, hearing, tumor control.

Results: All patients presented with subjective hearing loss and TMJ pain associated with otalgia. TMJ dysfunction improved in all cases. Hearing improved in 2 patients, remained stable in 1 patient, and worsened in 1 patient. The lesions included: pigmented villonodular synovitis (PVNS), nodular fasciitis, foramen of Huschke herniation with salivary fistula, and fibroepithelial polyp. The patient with PVNS has a stable remnant. The other patients are free of disease.

Conclusions: Selection of the treatment modality begins with properly diagnosing lesions of the EAC. Critical review of CT and MR imaging showed that all masses originated or were associated with the TMJ. Imaging should be obtained and critically analyzed prior to performing a biopsy of a mass in the EAC. Surgical management can prove to be challenging. Complete tumor resection is the main stay of treatment, however partial resection also achieves excellent results. Tumor occlusion of the EAC represents a relative contraindication to stereotactic radiation. Goals for therapy are to restore patency of the EAC, preserve function of TMJ and mandibular motility, and avoid facial nerve injury.

Define Professional Practice Gap: Inconsistencies within work up and treatment of occluding external auditory canal lesions.

Learning Objective: Increase awareness of possible occluding external auditory canal masses including preoperative considerations, indications for treatment, and post operative goals.

Desired Result: 1. Strongly consider imaging prior to biopsy of external auditory canal masses; 2. benign lesions originating from temporomandibular joint are amenable to partial resection if the function of the joint can be restored or maintained.

IRB Status: Approved

NO. F027

Efficacy and Safety of Nanoparticle-mediated Steroid Delivery to the Inner Ear Following Acoustic Trauma

Didier A. Depireux, PhD; Mika Shimoji, PhD
Bharath Ramaswamy, BSc; Benjamin Shapiro, PhD

Abstract: We have developed a technology to precisely and effectively deliver drugs to the inner ear via magnetically guided nanoparticles. In a rat model of noise-induced trauma, we have shown that delivery of prednisolone to the cochlea post-trauma can prevent tinnitus and reduce severe hearing loss even when administered several weeks post-trauma. We have also demonstrated our ability to use the magnetic nanoparticles as a platform to deliver other drugs.

The use of magnetically pushed nanoparticles results in micromolar levels of prednisolone in the perilymph within an hour of treatment. The drug distribution is more uniform than that obtained by passive diffusion. The binding of the drug to the particles allows for a controlled elution rate resulting in a clinically relevant concentration lasting several days. Preliminary studies, including the use of auditory brainstem response, pre-pulse inhibition of the startle reflex and immunochemistry have shown a transient but no permanent shift in hearing thresholds, and no signs of long-term toxicity from either the method or the particles.

We will present a summary of the effectiveness of the method in preventing tinnitus and hearing loss, and the results of a preclinical safety assessment of the treatment on healthy rats, including drug levels, nanoparticle concentration and cytokine levels, measured days and weeks following treatment, in the cochlea, blood, brain, and other major organs.
The use of magnetic nanoparticle-mediated delivery of steroids and other drugs is a non-toxic, safe and controlled method to achieve a sustained, clinically significant drug concentration in the cochlea.

Define Professional Practice Gap: The cochlea is an organ sitting in the hardest bone of the human body, protected from systemic circulation by a blood-labyrinth barrier. Systemic delivery is therefore an ineffective method to deliver drug to the cochlea. New methods, using drug eluting nanoparticles for instance, are being developed. The nanoparticles contain a magnetic core which allows for their manipulation with external magnet, and the choice of their coating allows for their functionalization by attaching to them a variety of drugs such as steroids and antibiotics. In the near future, new methods will allow the practitioner to deliver drugs to the cochlea only, resulting in a rapid, relatively uniform drug concentration with no ototoxic effect.

Learning Objective: New drug delivery methods have the potential to deliver drugs and other agents to the inner ear only.

Desired Result: *No response*

IRB/ IACUC Status: Approved

NO. F028

Development of Objective Measurement Method for the External Auditory Canal for Use in Transcanal Endoscopic Ear Surgery

Toshinori Kubota, MD, PhD; Tsukasa Ito, MD, PhD
Tomoo Watanabe, MD, PhD; Kazunori Futai, MD, PhD
Takatoshi Furukawa, MD, PhD; Seiji Kakehata, MD, PhD

Objective: To develop an objective method for measuring the external auditory canal (EAC) for use in procedures such as transcanal endoscopic ear surgery (TEES). The EAC has been evaluated, up until now, based on a subjective examination of a CT scan. We have developed an objective evaluation system using an image processing program and used it to retrospectively determine the minimum width of the EAC in past TEES patients.

Study design: A retrospective case series

Setting: Tertiary referral center

Patients: We examined the EAC of 14 patients whom had undergone TEES using a 2.7 mm diameter endoscope (cross-section area: 5.73 mm2). The age of patients ranged from 3 to 77 years (mean 30.9).

Intervention: We evaluated the bony portion of the EAC using sagittal cone-beam CT images. The EAC bony portion was defined as that bone which surrounds the canal. ImageJ was used as the image processing program. The minimum values of the cross-section area, minor axis and major axis of each patient were evaluated. The minimum and maximum Feret diameters were used as the EAC minor and major axis respectively.

Results: The cross-section area of the EAC ranged from 20.4 to 42.0 mm2 (mean 30.5). The minor axis ranged from 3.4 to 5.9 mm (mean 4.8). While the major axis ranged from 7.0 up to 9.5 mm (mean 8.2).

Define Professional Practice Gap: To create an objective method for measuring the external auditory canal (EAC), and to provide data on EAC width in past transcanal endoscopic ear surgery (TEES) patients.

Learning Objective: To develop an objective method for measuring the EAC and to present the EAC width of patients who had undergone TEES as a reference.

Desired Result: Surgeons will have an additional tool which provides objective data on EAC width.

IRB Status: Approved

NO. F029

Unilateral Sudden Sensorineural Hearing Loss in the Setting of West Nile Viral Meningitis: A Case Report and Literature Review

Andrew M. Vahabzadeh-Hagh, MD; Akira Ishiyama, MD

Objective: The etiology of sudden sensorineural hearing loss more often remains undiscovered. Among those identifiable causes, an infectious etiology is most common. Here we wish to expand that list of infectious etiologies by presenting a case of unilateral sudden sensorineural hearing loss in an otherwise healthy, immunocompetent 44 year-old man with West Nile viral meningitis. Through literature review we also highlight prognostic features and treatment pathways.

Study Design: A case report and literature review.

Setting: Tertiary referral center; University hospital.

Interventions: Intratympanic dexamethasone administration.

Main outcome measure: Pure tone and speech audiometry.

Results: The patient presented with sudden left sided hearing loss, tinnitus, and occipital headaches in the absence of vertigo/ dizziness. Analysis of cerebrospinal fluid was consistent with viral meningitis and West Nile Virus IgG and IgM antibodies were detected. Initial diagnostic audiogram demonstrated mild to moderately severe downsloping sensorineural hearing loss from 1000 to 8000 Hz in the left ear. MRI of the internal auditory canals and brain were normal. The patient was given two intratympanic dexamethasone injections with an improvement of 15 dB in bone conduction at 1000 Hz and a 10 dB improvement in speech reception threshold.

Conclusions: Unilateral sudden sensorineural hearing loss may result from neuroinvasive West Nile Virus infections. Although the incidence of such is low, West Nile Virus should be included in the differential diagnosis of sudden sensorineural hearing loss. A systematic diagnostic and therapeutic approach remains of utmost importance in the treatment of and prognostication in these cases.

Define Professional Practice Gap: The differential diagnosis for sudden sensorineural hearing loss is broad, yet many practicing physicians only order a very limited few tests in the work-up of sudden sensorineural hearing loss. As such, perhaps many idiopathic cases might otherwise have an identifiable cause which may not affect treatment per se but might provide further prognostic insight.

Learning Objective: Viral causes of sudden sensorineural hearing loss (SSNHL) compose a respectful fraction of non-idiopathic SSNHL. Here we wish to improve the awareness of such causes and highlight the rare viral etiology of West Nile Viral meningitis.

Desired Result: Keep an open mind and broad differential when they encounter forthcoming cases of sudden sensorineural hearing loss.

IRB Status: Exempt

NO. F030

Spontaneous Cerebral Spinal Fluid Leak during Tympanostomy Tube Placement: Intraoperative Findings of a Hyrtl's Fissure Repair

Del R. Sloneker, MD; Brian S. Chen, MD
Patricia S. McAdams, MD; James C. Crawford, MD

Objective: To better characterize the presentation, anatomy, and repair of a patent Hyrtle's fissure in an effort to assist otolaryngologist in the recognition and treatment of this rare cause of CSF otorrhea and to add to our understanding of the anatomy and embryology of the middle ear.

Study design: Case report and literature review

Methods: We present a case report of an otherwise healthy female who presented with a rush of clear fluid from the left ear upon myringotomy which prompted abortion of the procedure and referral to a tertiary center for further workup and treatment.

Results: We report a case spontaneous CSF leak caused by a patent Hyrtl's fissure encountered during routine tympanostomy tube placement. Hyrtl's fissures are exceedingly rare, but obvious on computed tomography scans and can be closed definitely through an endoscopic assisted retroauricular approach with temporalis fascia and bone pate. Intraoperatively, a membranous sac filling the middle ear cleft is encountered emanating from a fossa just inferior to the round window niche and should be removed entirely.

Conclusion: A patent Hyrtle's fissure is an exceedingly rare cause of CSF otorrhea which can present spontaneously or during otologic procedures that enter the middle ear. The CT scan and intraoperative endoscopic image presented give a the most comprehensive view of a patent Hyrtle's fissure available in the current literature and will aid in the recognition and treatment of this condition as well as add to our overall anatomical and embryological understanding of the middle ear.

Define Professional Practice Gap: A patent Hyrtle's fissure is an exceedingly rare anatomical finding, and in this case was symptomatic for CSF otorrhea upon myringotomy. Presentation of our CT findings will benefit attendees in that they will be better able to recognize and diagnose this condition preoperatively. In addition, the endoscopic images from our endoscopic assisted repair are unparalleled in the literature and will aid in the recognition and treatment of this condition.

Learning Objective: To better characterize the presentation, anatomy, and repair of a patent Hyrtle's fissure in an effort to assist general otolaryngologists and otologists in the recognition and treatment of this rare cause of CSF otorrhea.

Desired Result: That the attendee will leave with a better understanding of the radiologic and surgical anatomy of a patent Hyrtle's fissure, and leave with a basic understanding of the workup and surgical repair of this anomaly.

IRB Status: Exempt

NOTES

AOS CLINICIAN-SCIENTIST AWARD

Project Title: Multi-Sensory Modulation of Tinnitus Correlates in Primary Auditory Cortex
Primary Investigator: Gregory J. Basura, MD, PhD
Mentor: Susan Shore, PhD

The central hypothesis for this project is that spike-timing-dependent plasticity (STDP) induced by paired (auditory-auditory) and/or bimodal (auditory-somatosensory; Sp5) stimulation underlies changes in primary auditory cortex (A1) neural correlates of tinnitus following noise damage; an effect that is cholinergic-dependent. To test this hypothesis, two aims were formulated for the planned 3-year AOS award.

Specific Aim 1 will test the hypothesis that STDP following paired (auditory-auditory) and bimodal (auditory-Sp5) stimulation modulates tinnitus neural correlates (spontaneous firing rates; SFRs and neural synchrony; NS) in A1. Using a gap-detection model of tinnitus in noise-exposed guinea pigs, multi-channel recording electrodes will be used to measure extracellular SFRs and NS across A1 layers. To assess stimulus timing-dependent plasticity, SFRs and NS will be measured before and after paired, bimodal or unimodal (control) stimulation at varied pairing intervals and orders. We predict that stimulus timing-dependent changes analogous to STDP in SFRs and NS in A1 will be influenced by paired and bimodal stimulation.

Progress: Our progress to date on this aim has been substantial. Within the first 6 months of funding we have successfully recorded A1 neural activity from noise-damaged and sham animals using both bimodal (auditory-Sp5) and paired (auditory-auditory) protocols. We have developed the gap detection system for tinnitus detection following noise exposure that will be utilized in the latter half of year one and for the remainder of the 3-year award once we have characterized the effects of noise damage in A1. We are currently analyzing a large amount of electrophysiology data from both recording paradigms as they compare to unimodal (control) stimulation. We have successfully identified optimal bimodal pairing intervals (time between auditory and Sp5 stimulation) and will utilize that information going forward to isolate long-term changes in A1 tinnitus neural correlates following bimodal stimulation. In terms of paired stimulation (auditory-auditory) we have successfully replicated the stimulation paradigm and preliminary effects as previously published in sham controls (Dahmen et al., 2008).

A sub-aim of Aim 1 is to utilize current source density (CSD) measures to ascertain layer specificity across A1 where most neurophysiologic change is occurring. We have successfully implemented coding algorithms into our data analysis and are correlating CSD physiologic responses to A1 layers in the data we have generated to date.

For the remaining 6-months of this first year of funding, we are on schedule to complete aim 1 as written comparing the effects of paired (auditory-auditory) and bimodal (auditory-Sp5) stimulation on tinnitus neural correlates across A1 layers following noise damage.

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Specific Aim 2 will test the hypothesis that STDP induced following paired and bimodal stimulation in A1 is cholinergic dependent. The same gap-detection methods and pairing protocols from *aim 1* will be used to generate timing rules before and after ACh, atropine (mAChR antagonist) or mecamylamine (nAChR antagonist) infusion via drug-delivery electrodes to activate or block ACh receptors. Since ACh regulates thalamocortical (pre-synaptic) and intra-cortical (post-synaptic) inputs to A1 via mAChR and nAChRs, it is likely to modulate neural response timing rules following paired and bimodal stimulation depending upon the order and timing of pre-and post-synaptic activity.

Progress: While specific aim 2 is scheduled for completion in years 2 and 3 of AOS funding, we have made excellent progress within the first 6 months. The neuropharmacology studies as outlined will not begin until year 2, but we have preliminary immunohistochemical (IHC) data for both the muscarinic and nicotinic receptors within A1. We are currently running further experiments to characterize the expression of both receptors as well as to optimize antibody dilution concentrations to be eventually used when sham and noise-exposed brains are compared from animals in aim 1.

For the remaining 6-months of this first year of funding we will complete preliminary IHC experiments and further characterize the expression of both receptors in sham and noise-exposed A1 to be applied to the remaining experiments in the next 2 years.

AOS RESEARCH GRANT

Title: Development of Round Window Membrane (RWM) Microneedle Array for Intracochlear Drug Delivery
Co-PIs: Jeffrey W. Kysar, PhD and Anil K. Lalwani, MD

Protected by one of the hardest bones in body, the cochlea is nearly an impenetrable structure frustrating both bacteria and clinician trying to gain access to it. As a result, a means for reliable delivery of agents into the inner ear for therapeutic purposes remains a formidable challenge. Were it not for its oval and round "windows", delivery of therapeutic agents to the inner ear would always necessitate traumatic disruption of its bony walls with fearful consequences to hearing. Of the two windows, the round window membrane (RWM) is an attractive target for intracochlear delivery of drugs or biologic agents. Diffusion of therapeutic agents, such as gentamicin and steroids, across the RWM has already been harnessed as a mode for intracochlear delivery of medications for the treatment of a variety of auditory and vestibular disorders including Ménière's Disease, sudden sensorineural hearing loss and tinnitus. However, simple diffusion of medications across RWM is limited by what material can be delivered, size of material to be delivered, difficulty with precise dosing, timing, and precision of delivery over time. Our goal is to design, fabricate and manufacture microneedles that will allow reliable and predictable intracochlear delivery of pharmaceutical, molecular or cellular therapeutic agents across the RWM without anatomic or functional damage. To determine the optimal needle design, a better understanding of the mechanical property of the RWM is needed. We propose to investigate the mechanical properties of the RWM, design and fabricate microneedles based on these properties, and then test the efficacy, both *in vitro* and *in vivo,* of the microneedles in enhancing RWM permeability and drug delivery.

Our first aim is to study the mechanical properties of the RWM and its impact on microneedle design. The human RWM is known to be of variable thickness and its thickness varies with inflammation and infection. With acute otitis media caused by bacterial or viral infection, the RWMs can thicken 2 to 3-fold (from 80 to 240 μM); the Young's modulus decreases almost 5-fold with only a slight change in the displacement amplitude and resonance frequency of the RWM. However, membrane thickening due to fluid or inflammatory cells does not affect the collagen fibers that carry the stress of and the load applied on the RWM. This suggests that tissue inflammation does not alter significantly the macroscopic mechanical properties of the RWM.

We have assessed the safety factor of the microneedles. The safety factor is defined as the ratio of the load that causes needle failure divided by the load sufficient to perforate the membrane. Experimentally, using an Instron tensile tester, we evaluated the needle safety factor of a 20 μm stainless steel tip needle, 200 μm shaft diameter tapering to 20 μm tip diameter, with greater than 2 mm length being pushed against a metal plate. The needle maintained tip sharpness without failure with the load of 200 mN and did not fail with any cracks with the load of 5 N. When used on the RWM, the needle pushes the RWM about 0.5 mm leading to rupture with maximum load of 35 mN. Thus, our experimental data shows that the safety factor of the 20 μM needle is greater than 6 with more than enough length to penetrate **any** human RWMs. Therefore, when the microneedle array is applied to a RWM with inflammation, the force necessary to penetrate the RWM will not cause failure of the needle.

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Furthermore, the load that causes buckling failure of the needle is proportional to the fourth power of the diameter of the needle shaft and inversely proportional to the second power of the length of the needle so that the safety factor can be further optimized.

We have also made progress on the third aim of our study – to assess the ability of microperforations to enhance delivery of material across the RWM. First, a novel model for measuring diffusion across guinea pig RWM, with and without microperforation, was developed and tested: cochleae, sparing the RWM, were embedded in 3D-printed acrylic holders using hybrid dental composite and light cured to adapt the round window niche to 3ml Franz diffusion cells. The diffusion cell apparatus provided reliable and replicable measurements of diffusion across RWM. Perforations were created manually with 12.5μm diameter needles and examined with light microscopy; the resultant perforations removed only 0.22±0.07% of the membrane. Diffusion of 1mM Rhodamine B across RWM in static diffusion cells was measured via fluorescence microscopy. The creation of microperforation was associated with a 35x enhancement in diffusion ($p<0.05$). Thus, creation of microperforation with a 12.5μm microneedle in RWM is an effective means of increasing diffusion across the RWM. The findings of our study open the door to novel manipulation of the RWM for the treatment of inner ear diseases.

The proposed research is novel and significant. Successful completion of the planned studies will bring our understanding of the biomechanical properties of the RWM to a new level and establish a reliable means of delivering therapeutic materials into the cochlea. Establishing a safe and effective means of intracochlear delivery will have significant implication for the treatment of auditory/vestibular disease. Additionally, the mechanical property characterization of the RWM will also aid in the design of effective RWM driver for auditory amplification.

RESEARCH FELLOWSHIP

Title: Neutrophil Contribution to Endotoxemia-Enhanced Cochlear Aminoglycoside Uptake
PI: Zachary D. Urdang, MS

Aminoglycosides remain essential to treat life-threatening infections despite their risk of permanent ototoxicity. Recently, a mouse model for sepsis (endotoxemia, lipopolysaccharide (LPS) was shown to have an increased risk of ototoxicity compared to healthy mice. Furthermore, cochleae of endotoxemic mice take up more aminoglycosides compared to healthy control mice, which may contribute to the increased risk of ototoxicity in the septic state. This is clinically important, as it is patients with serious infections who are subject to aminoglycoside exposure. Understanding how endotoxemia potentiates aminoglycoside ototoxicity will provide insight into strategies to decrease the risk of ototoxicity in critically-ill patients. Furthermore, this understanding will add insight into blood- labyrinth barrier physiology and how inflammation disrupts normal cochlear homeostasis.

Neutrophils are the first responders to LPS-mediated inflammatory stimuli mediated by the TLR4 receptor, and are essential in clearing infection. Neutrophils neutralize infections and clear debris from affected tissues; however, neutrophils also cause significant collateral host-tissue damage. The exit of activated neutrophils into tissue compartments is inherently damaging, causing neutrophil-mediated vascular injury (NMVI). In addition, the cytotoxic molecules released damage the host's own cells and tissues. We have hypothesized that during endotoxemia, neutrophils can compromise blood-labyrinth barrier integrity and enhance cochlear uptake of aminoglycosides and subsequent ototoxicity. We are conducting experiments to 1) profile cochlear inflammatory cytokines and chemokines during endotoxemia, 2) count total cochlear neutrophil populations and characterize their micro-anatomical distribution during endotoxemia, and 3) characterize the paracellular permeability of the blood- labyrinth barrier during endotoxemia.

Using multi-plex ELISA and qRT-PCR, we collected inflammatory molecular profiles of endotoxemic (1mg/kg, 24hrs post-treatment) wildtype and mutant (C3H/HeJ) mice with hypo-functional TLR4. Wildtype mice up-regulated pro-inflammatory molecules, while this response was significantly attenuated in hyporesponsive TLR4 mice. Furthermore, cochlear uptake of fluorescently-tagged aminoglycosides was also attenuated in hyporesponsive TLR4 mice.

We developed a protocol to generate single-cell suspensions of whole cochleae to count cochlear neutrophil populations by flow cytometry. Currently, we have measured baseline numbers of neutrophils present in wildtype cochlear tissues of healthy mice as a proof of concept. We are analyzing data from a larger experiment to determine total cochlear neutrophil numbers in endotoxemic mice compared to healthy controls. Using the neutrophil marker Ly6G, we have immunolocalized neutrophils in the spiral ligament and stria vascularis of endotoxemic wildtype mice across various doses of LPS and time points. This protocol is now ready for application to larger cohorts of mice which will provide statistically conclusive data.

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Ionic lanthanum (La3+) is impermeable to cation channels and is minimally trafficked by active transport processes such as carrier-mediated and transcytotic mechanisms. We adapted an established protocol to characterize the paracellular permeability of characterize blood-labyrinth barrier capillaries in the spiral ligament and stria vascularis. In pilot studies, lanthanum crystals were observed outside of cochlear blood vessels using transmission electron microscopy in endotoxemic mice (1mg/kg, 24hrs

AMERICAN OTOLOGICAL SOCIETY RESEARCH FUND
RESEARCH GRANT AWARDS
& TRAINING FELLOWSHIPS

The American Otological Society, Inc., through its Research Fund, is offering Research Grant Awards, an Award for a Clinical Trial, full-time Research Training Fellowships, and a Clinician-Scientist Award. Research supported by all of the grant mechanisms can relate to any aspects of the ear, hearing and balance disorders. This represents a change from past restrictions that required the Research Grant Awards and Awards for Clinical Trials to focus on otosclerosis or Ménière's disease.

SAVE THE DATE

A letter of intent should be submitted by December 31st, one month prior to the January 31st deadline for the applications. The letter must state the grant mechanism for the proposal, the Principle Investigator and Institution(s) for the work, provide a working title, and contain an abstract of no more than 500 words to summarize the proposal. These grant awards and fellowships are for work conducted in *United States or Canadian institutions only*, July 2016 – June 2017. Additional details may be found on the AOS website at www.americanotologicalsociety.org

Letter of Intent Deadline: December 31, 2015
Deadline: Grant and fellowships applications must be received by January 31, 2016

Information may be obtained from:

Kristen Bordignon, Assistant to
John P. Carey, MD
Executive Secretary, Research Fund of the
American Otological Society, Inc.
Johns Hopkins University, School of Medicine
Department of Otolaryngology-Head & Neck Surgery
601 N. Caroline Street, JHOC 6255
Baltimore, MD 21287-0910
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Applications available on AOS website
http://www.americanotologicalsociety.org/forms.html

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1941	George M. Coates, MD
1942	L. M. Seydell, MD
1943 - 44	W.C. Bowers, MD
1945 - 46	Gordon Berry, MD
1947	William E. Grove, MD
1948	B. J. McMahon, MD
1949	Marvin F. Jones, MD
1950	Philip E. Meltzer, MD
1951	Kenneth M. Day, MD
1952	Gordon D. Hoople, MD
1953	A.C. Furstenberg, MD
1954	Frederick T. Hill, MD
1955	D.E.S. Wishart, MD
1956	William. J McNally, MD
1957	John R. Lindsay, MD
1958	Dean M. Lierle, MD
1959	Moses H. Lurie, MD
1960	Robert C. Martin, MD
1961	Henry L. Williams, MD
1962	Lawrence R. Boies, MD
1963	Joseph A. Sullivan, MD
1964	Theodore E. Walsh, MD
1965	Harry Rosenwasser, MD
1966	Howard P. House, MD
1967	James A. Moore, MD
1968	G. Shambaugh, Jr., MD
1969	Frank D. Lathrop, MD
1970	Francis L. Lederer, MD
1971	John E. Bordley, MD
1972	Walter P. Work, MD
1973	Ben H. Senturia, MD
1974	Wesley H. Bradley, MD
1975	Lester A. Brown, MD
1976	Victor Goodhill, MD
1977	Harold Schuknecht, MD
1978	Clair M. Kos, MD
1979	G. Dekle Taylor, MD
1980	Eugene Derlacki, MD
1981	Richard J. Bellucci, MD
1982	J. Brown Farrior, MD
1983	Jack V. Hough, MD
1984	Cary N. Moon, Jr., MD
1985	Francis A. Sooy, MD
1986	Brian F. McCabe, MD
1987	Harold G. Tabb, MD
1988	Richard R. Gacek, MD
1989	D. Thane Cody, MD
1990	H.A. Ted Bailey, Jr., MD
1991	William F. House, MD
1992	Michael Glasscock, III, MD
1993	Mansfield F.W. Smith, MD
1994	Robert I. Kohut, MD
1995	Robert A. Jahrsdoerfer, MD
1996	Derald E. Brackmann, MD
1997	Joseph C. Farmer, Jr., MD
1998	Charles M. Luetje, MD
1999	Gregory J. Matz, MD
2000	C. Gary Jackson, MD
2001	A. Julianna Gulya, MD
2002	Richard A. Chole, MD PhD
2003	Horst R. Konrad, MD
2004	Jeffrey P. Harris, MD, PhD
2005	Sam E. Kinney, MD
2006	John K. Niparko, MD
2007	Antonio De La Cruz, MD
2008	Clough Shelton, MD
2009	Joseph B. Nadol, Jr., MD
2010	Bruce J. Gantz, MD
2011	C. Phillip Daspit, MD
2012	Herman A. Jenkins, MD
2013	Paul R. Lambert, MD
2014	John W. House, MD

AMERICAN OTOLOGICAL SOCIETY
2014 - 2015 Membership Roster
Includes the 2015 Candidates inducted at the AOS 2015 Spring Meeting

ACTIVE MEMBERS

Ronald G. Amedee, MD (Active 1995)
New Orleans, LA

Simon I. Angeli, MD (Active 2009)
Miami, FL

Patrick J. Antonelli, MD (Active 2001)
Gainesville, FL

Mosies A. Arriaga, MD (Active 2002)
Metairie, LA

H. Alexander Arts, MD (Active 2001)
Ann Arbor, MI

Douglas D. Backous, MD (Active 2006)
Seattle, WA

Manohar Bance, MD (Active 2013)
Halifax, Nova Scotia Canada

David M. Barrs, MD (Active 1997)
Phoenix, AZ

Loren J. Bartels, MD (Active 1992)
Tampa, FL

Carol A. Bauer, MD (Active 2006)
Springfield, IL

Charles W. Beatty, MD (Active 1995)
Rochester, MN

James E. Benecke Jr., MD (Active 2006)
St. Louis, MO

Brian Blakley, MD (Active 1996)
Winnipeg, Manitoba, Canada

Nikolas H. Blevins, MD (Active 2009)
Stanford, CA

Hilary A. Brodie, MD, PhD (Active 2001)
Sacramento, CA

Craig A. Buchman, MD (Active 2005)
Chapel Hill, NC

John P. Carey, MD (Active 2006)
Baltimore, MD

Stephen P. Cass, MD (Active 2000)
Aurora, CO

Sujana S. Chandrasekhar, MD (Active 2004)
New York, NY

Kay W. Chang, MD (Active 2014)
Stanford, CA

Douglas A. Chen, MD (Active 2008)
Pittsburgh, PA

Steven Wan Cheung, MD (Active 2006)
San Francisco, CA

Richard A. Chole, MD, PhD (Active 1984)
St. Louis, MO

Daniel Choo, MD (Active 2008)
Cincinnati, OH

Roberto A. Cueva, MD (Active 2005)
San Diego, CA

Charles C. Della Santina, MD (Active 2009)
Towson, MD

M. Jennifer Derebery, MD (Active 2002)
Los Angeles, CA

Hamid R. Djalilian, MD (Active 2015)
Orange, CA

Joni K. Doherty, MD, PhD (Active 2015)
Los Alamitos, CA

John L. Dornhoffer, MD (Active 2004)
Little Rock, AR

Karen Jo Doyle, MD, PhD (Active 2002)
Fenton, MI

Colin L. W. Driscoll, MD (Active 2012)
Rochester, MN

Larry G. Duckert, MD (Active 1988)
Seattle, WA

Thomas L. Eby, MD (Active 1995)
Jackson, MS

Hussam K. El-Kashlan, MD (Active 2006)
Ann Arbor, MI

Adrien A. Eshraghi, MD (Active 2013)
Weston, FL

Jay B. Farrior, III, MD (Active 1990)
Tampa, FL

Jose N. Fayad, MD (Active 2007)
Los Angeles, CA

Joseph G. Feghali, MD (Active 2002)
Bronx, NY

Howard W. Francis, MD (Active 2003)
Baltimore, MD

David R. Friedland, MD, PhD (Active 2011)
Milwaukee, WI

Rick Friedman, MD, PhD (Active 2001)
Los Angeles, CA

Michael H. Fritsch, MD (Active 2003)
Indianapolis, IN

Bruce J. Gantz, MD (Active 1987)
Iowa City, IA

Gerard J. Gianoli, MD (Active 2007)
Covington, LA

Paul W. Gidley, MD (Active 2015)
Houston, TX

Joel A. Goebel, MD (Active 1995)
St. Louis, MO

J. Douglas Green Jr., MD (Active 2008)
Jacksonville, FL

John H. Greinwald Jr., MD (Active 2013)
Cincinnati, OH

Thomas J. Haberkamp, MD (Active 1997)
Cleveland, OH

Paul E. Hammerschlag, MD (Active 2001)
New York, NY

Marlan R. Hansen, MD (Active 2009)
Iowa City, IA

Jeffrey P. Harris, MD, PhD (Active 1988)
San Diego, CA

George T. Hashisaki, MD (Active 2015)
Charlottesville, VA

David S. Haynes, MD (Active 2009)
Nashville, TN

Keiko Hirose, MD (Active 2010)
St. Louis, MO

Barry E. Hirsch, MD (Active 1996)
Pittsburgh, PA

Michael E. Hoffer, MD (Active 2003)
Miami, FL

Karl L. Horn, MD (Active 2001)
Santa Fe, NM

John W. House, MD (Active 1984)
Los Angeles, CA

Timothy E. Hullar, MD (Active 2013)
St. Louis, MO

Akira Ishiyama, MD (Active 2009)
Los Angeles, CA

Robert K. Jackler, MD (Active 1992)
Stanford, CA

Carol A. Jackson, MD (Active 1994)
Newport Beach, CA

Abraham Jacob, MD (Active 2014)
Tucson, AZ

Adrian James, MD (Active 2011)
Toronto, Canada

Herman A. Jenkins, MD (Active 1987)
Aurora, CO

Timothy K. Jung, MD (Active 1990)
Riverside, CA

David M. Kaylie, MD (Active 2014)
Durham, NC

Bradley W. Kesser, MD (Active 2008)
Charlottesville, VA

Hung Jeffrey Kim, MD (Active 2014)
Washington, DC

Harold H. Kim, MD (Active 2010)
Portland, OR

Richard D. Kopke, MD (Active 2005)
Oklahoma City, OK

Robert F. Labadie, MD, PhD (Active 2009)
Nashville, TN

Anil K. Lalwani, MD (Active 1999)
New York, NY

Paul R. Lambert, MD (Active 1995)
Charleston, SC

John P. Leonetti, MD (Active 1995)
Maywood, IL

Samuel C. Levine, MD (Active 1999)
Minneapolis, MN

Christopher J. Linstrom, MD (Active 2003)
New York, NY

Phillip D. Littlefield, MD (Active 2013)
Kaneohe, HI

Larry B. Lundy, MD (Active 2011)
Ponte Vedra Beach, FL

Lawrence R. Lustig, MD (Active 2006)
New York, NY

John D. Macias, MD (Active 2015)
Phoenix, AZ

Sam J. Marzo, MD (Active 2011)
Maywood, IL

Douglas E. Mattox, MD (Active 1992)
Atlanta, GA

John T. McElveen Jr., MD (Active 1997)
Raleigh, NC

Michael McGee, MD (Active 2002)
Oklahoma City, OK

Michael J. McKenna, MD (Active 1999)
Boston, MA

Brian J. McKinnon, MD (Active 2015)
Memphis, TN

Sean O. McMenomey, MD (Active 2009)
New York, NY

Cliff A. Megerian, MD (Active 2006)
Cleveland, OH

Alan G. Micco, MD (Active 2007)
Chicago, IL

Lloyd B. Minor, MD (Active 2001)
Stanford, CA

Edwin M. Monsell, MD, PhD (Active 1995)
Southfield, MI

Gary F. Moore, MD (Active 2003)
Omaha, NE

William H. Moretz Jr., MD (Active 1999)
Augusta, GA

Terrence P. Murphy, MD (Active 2002)
Atlanta, GA

Brian A. Neff, MD (Active 2014)
Rochester, MN

Erik G. Nelson, MD (Active 2011)
Lake Forest, IL

John K. Niparko, MD (Active 1995)
Los Angeles, CA

John S. Oghalai, MD (Active 2009)
Stanford, CA

Robert C. O'Reilly, MD (Active 2009)
Wilmington, DE

Dennis G. Pappas Jr., MD (Active 2004)
Birmingham, AL

Blake C. Papsin, MD (Active 2005)
Toronto, Ontario, Canada

Steven M. Parnes, MD (Active 2002)
Albany, NY

Lorne S. Parnes, MD (Active 2000)
London, Ontario, Canada

Myles L. Pensak, MD (Active 1992)
Cincinnati, OH

Brian P. Perry, MD (Active 2015)
San Antonio, TX

Harold C. Pillsbury, MD (Active 1988)
Chapel Hill, NC

Dennis S. Poe, MD (Active 1995)
Boston, MA

G. Mark Pyle, MD (Active 2003)
Madison, WI

Steven D. Rauch, MD (Active 2004)
Watertown, MA

Miriam I. Redleaf, MD (Active 2013)
Chicago, IL

J. Thomas Roland Jr., MD (Active 2005)
New York, NY

Seth Rosenberg, MD (Active 2001)
Sarasota, FL

Allan M. Rubin, MD, PhD (Active 1997)
Sylvania, OH

Jay T. Rubinstein, MD, PhD (Active 2002)
Seattle, WA

Michael J. Ruckenstein, MD (Active 2003)
Philadelphia, PA

Leonard P. Rybak, MD, PhD (Active 1989)
Springfield, IL

Robert T. Sataloff, MD (Active 1990)
Philadelphia, PA

James E. Saunders, MD (Active 2008)
Lebanon, NH

Mitchell K. Schwaber, MD (Active 1993)
Nashville, TN

Michael D. Seidman, MD (Active 2001)
West Bloomfield, MI

Samuel H. Selesnick, MD (Active 1999)
New York, NY

William H. Slattery III, MD (Active 2014)
Los Angeles, CA

Richard J. H. Smith, MD (Active 2012)
Iowa City, IA

Eric E. Smouha, MD (Active 2004)
New York, NY

Hinrich Staecker, MD, PhD (Active 2013)
Kansas City, KS

Konstantina M. Stankovic, MD, PhD (Active 2015)
Boston, MA

Steven A. Telian, MD (Active 1997)
Ann Arbor, MI

Fred F. Telischi, MD (Active 2002)
Miami, FL

Norman Wendell Todd Jr., MD (Active 1996)
Atlanta, GA

Debara L. Tucci, MD (Active 2000)
Durham, NC

Jeffrey T. Vrabec, MD (Active 2004)
Houston, TX

P. Ashley Wackym, MD (Active 1997)
Portland, OR

George J. Wanna, MD (Active 2015)
Nashville, TN

Jack J. Wazen, MD (Active 1993)
Sarasota, FL

Peter C. Weber, MD, MBA (Active 2002)
Boston, MA

D. Bradley Welling, MD, PhD (Active 1998)
Boston, MA

Stephen J. Wetmore, MD (Active 2001)
Morgantown, WV

Eric P. Wilkinson, MD (Active 2014)
Los Angeles, CA

David F. Wilson, MD (Active 1992)
Portland, OR

Nancy M. Young, MD (Active 2007)
Chicago, IL

SENIOR MEMBERS

Edward Applebaum, MD (Senior 1985)
Chicago, IL

Thomas J. Balkany, MD (Senior 1991)
Miami, FL

Derald E. Brackmann, MD (Senior 1979)
Los Angeles, CA

Margaretha L. Casselbrant, MD, PhD (Senior 2001)
Pittsburgh, PA

Jack D. Clemis, MD (Senior 1976)
Wilmette, IL

Joseph DiBartolomeo, MD (Senior 2015)
Santa Barbara, CA

John R.E. Dickins, MD (Senior 1991)
Little Rock, AR

Robert A. Dobie, MD (Senior 1985)
San Antonio, TX

John R. Emmett, MD (Senior 1990)
Memphis, TN

George W. Facer, MD (Senior 1994)
Bonita Springs, FL

L. Gale Gardner, Jr., MD (Senior 1983)
Shreveport, LA

Michael E. Glasscock III, MD (Senior 1973)
Austin, TX

Robert A. Goldenberg, MD (Senior 1989)
Dayton, OH

Ronald A. Hoffman, MD (Senior 1992)
New York, NY

Athanasios Katsarkas, MD (Senior 1991)
Montreal, Quebec, Canada

Sam E. Kinney, MD (Senior 1981)
Moreland Hills, OH

Horst R. Konrad, MD (Senior 1991)
Springfield, IL

William H. Lippy, MD (Senior 1988)
Warren, OH

Charles M. Luetje, MD (Senior 1991)
Olathe, KS

Charles A. Mangham Jr., MD (Senior 1987)
Hailey, ID

Gregory J. Matz, MD (Senior 1979)
Chicago, IL

Richard T. Miyamoto, MD (Senior 1987)
Indianapolis, IN

Joseph B. Nadol Jr., MD (Senior 1988)
Boston, MA

Julian M. Nedzelski, MD (Senior 1987)
Toronto, Ontario, Canada

J. Gail Neely, MD (Senior 1985)
St. Louis, MO

Michael M. Paparella, MD (Senior 1968)
Minneapolis, MN

Simon C. Parisier, MD (Senior 1982)
New York, NY

Peter S. Roland, MD (Senior1992)
Eden, UT

Max L. Ronis, MD (Senior 1972)
Philadelphia, PA

Richard M. Rosenfeld, MD, MPH (Senior 2004)
Brooklyn, NY

Robert J. Ruben, MD (Senior 1974)
Bronx, NY

Clarence T. Sasaki, MD (Senior 1992)
New Haven, CT

Clough Shelton, MD (Senior 1995)
Salt Lake City, UT

Herbert Silverstein, MD (Senior 1973)
Sarasota, FL

Aristides Sismanis, MD (Senior 1993)
Richmond, VA

Richard J. Wiet, MD (Senior 1987)
Hinsdale, IL

Robert J. Wolfson, MD (Senior 1971)
Philadelphia, PA

EMERITUS MEMBERS

Warren Y. Adkins, MD (Emeritus 1987)
Mt. Pleasant, SC

Kedar Adour, MD (Emeritus 1988)
San Francisco, CA

Professor P. W. Alberti, MD (Emeritus 1982)
Toronto, Ontario, Canada

Bobby R. Alford, MD (Emeritus 1970)
Houston, TX

Sean R. Althaus, MD (Emeritus 1987)
Georgetown, TX

Beverly Armstrong, MD (Emeritus 1960)
Charlotte, NC

H.A. Ted Bailey, Jr., MD (Emeritus 1969)
Little Rock, AR

Charles D. Bluestone, MD (Senior 1977)
Pittsburgh, PA

B. Hill Britton, MD (Emeritus 1978)
San Antonio, TX

Seymour J. Brockman, MD (Emeritus 1964)
Beverly Hills, CA

Richard A. Buckingham, MD (Emeritus 1969)
Wilmette, IL

Rinaldo F. Canalis, MD (Emeritus 1991)
Santa Monica, CA

Robert W. Cantrell, MD (Emeritus 1979)
Charlottesville, VA

Francis I. Catlin, MD (Emeritus 1975)
Houston, TX

Noel L. Cohen, MD (Emeritus 1985)
New York, NY

Newton J. Coker, MD (Emeritus 1991)
Santa Fe, NM

James M. Cole, MD (Emeritus 1966)
Danville, PA

C. Phillip Daspit, MD (Emeritus 1995)
Paradise Valley, AZ

James A. Donaldson, MD (Emeritus 1974)
Richmond, WA

Arndt J. Duvall III, MD (Emeritus 1971)
Minneapolis, MN

John M. Epley, MD (Emeritus 2001)
Portland, OR

Abraham Eviatar, MD (Emeritus 1981)
Scarsdale, NY

John M. Fredrickson, MD (Emeritus 1978)
Albuquerque, NM

Richard R. Gacek, MD (Emeritus 1969)
Worcester, MA

George A. Gates, MD (Emeritus 1987)
Boerne, TX

Richard L. Goode, MD (Emeritus 1990)
Stanford, CA

Malcolm D. Graham, MD (Emeritus 1979)
Atlanta, GA

A. Julianna Gulya, MD (Emeritus 1991)
Locust Grove, VA

Lee A. Harker, MD (Emeritus 1987)
Omaha, NE

Cecil W.J. Hart, MD (Emeritus 1992)
Palm Springs, CA

David A. Hilding, MD (Emeritus 1972)
Salt Lake City, UT

James J. Holt, MD, MS (Emeritus 2009)
Marshfield, WS

C. Gary Jackson, MD (Emeritus 1990)
Brentwood, TN

Donald B. Kamerer, MD (Emeritus 1988)
Pittsburgh, PA

Nelson Y.S. Kiang, PhD (Emeritus 1969)
Boston, MA

Arvind Kumar, MD (Emeritus 1993)
Hinsdale, IL

K. J. Lee, MD (Emeritus 1997)
New Haven, CT

S. George Lesinski, MD (Emeritus 1993)
Cincinnati, OH

Roger C. Lindeman, MD (Emeritus 1987)
Mercer Island, WA

Fred H. Linthicum Jr., MD (Emeritus 1967)
Los Angeles, CA

Ward B. Litton, MD (Emeritus 1969)
Bonita Springs, FL

Anthony J. Maniglia, MD (Emeritus 1989)
Cleveland, OH

William L. Meyerhoff, MD (Emeritus 1981)
Dallas, TX

Eugene N. Myers, MD (Emeritus 1974)
Pittsburgh, PA

Ralph A. Nelson, MD (Emeritus 1995)
Manchester, WA

Dennis Pappas, MD (Emeritus 1985)
Birmingham, AL

James L. Parkin, MD (Emeritus 1986)
Salt Lake City, UT

Leonard R. Proctor, MD (Emeritus 1989)
Bel Aire, MD

J. H. Thomas Rambo, MD (Emeritus 1958)
New York, NY

Wallace Rubin, MD (Emeritus 1967)
Metairie, LA

Richard L. Ruggles, MD (Emeritus 1967)

William H. Saunders, MD (Emeritus 1972)
Columbus, OH

Arnold G. Schuring, MD (Emeritus 1990)
Warren, OH

George T. Singleton, MD (Emeritus 1972)
Gainesville, FL

J. Brydon Smith, MD (Emeritus 1958)
Willowdale, Canada

James B. Snow Jr., MD (Emeritus 1973)
West Grove, PA

Gershon Jerry Spector, MD (Emeritus 1979)
St. Louis, MO

G. Dekle Taylor, MD (Emeritus 1965)
Jacksonville, FL

Paul H. Ward, MD (Emeritus 1972)
Los Angeles, CA

Roger E. Wehrs, MD (Emeritus 1975)
Tulsa, OK

Eiji Yanagisawa, MD (Emeritus 1996)
New Haven, CT

ASSOCIATE MEMBERS

James F. Battey, Jr., MD, PhD (Associate 2001)
Bethesda, MD

Ricardo F. Bento, MD, PhD (Associate 2001)
Sao Paulo, Brasil

Judy Dubno, PhD (Associate 2014)
Charleston, SC

Andrew J. Griffith, MD, PhD (Associate 2015)
Bethesda, MD

Maureen T. Hannley, PhD (Associate 1995)
Tucson, AZ

Paul R. Kileny, PhD (Associate 1979)
Ann Arbor, MI

Brenda Lonsbury-Martin, PhD (Associate 1997)
Loma Linda, CA

Carlos A. Oliveira, MD, PhD (Associate 1992)
Brasília-DF, Brasil

John J. Rosowski, PhD (Associate 1989)
Boston, MA

Alec N. Salt, PhD (Associate 1972)
St. Louis, MO

Neil T. Shepard, PhD (Associate 1973)
Rochester, MN

SENIOR ASSOCIATE MEMBERS

Barbara A. Bohne, PhD (Senior Associate 1979)
St. Louis, MO

Robert A. Butler, PhD (Senior Associate 1978)

Raul Hinojosa, MD (Senior Associate 1989)
Chicago, IL

Makoto Igarashi, MD (Senior Associate 1973)
Tokyo, Japan

Salvatore J. Iurato, MD (Senior Associate 1994)
Bari, Italy

Lars-Goran Johnsson, MD (Senior Associate 1979)
Finland

Steven K. Juhn, MD (Senior Associate 1980)
Minneapolis, MN

Robert S. Kimura, PhD (Senior Associate 1978)
Middleton, WI

David J. Lim, MD (Senior Associate 1973)
Los Angeles, CA

Michael Merzenich, PhD (Senior Associate 1986)
San Francisco, CA

Josef M. Miller, PhD (Senior Associate 1979)
Ann Arbor, MI

Tetsuo Morizono, MD DMS (Senior Associate 1985)
Nishi-Ku, Fukuoka City, Japan

Rodney Perkins, MD (Senior Associate 2013)
Woodside, CA

Edwin W. Rubel, PhD (Senior Associate 1986)
Seattle, WA

Jochen Schacht, PhD (Senior Associate 1992)
Ann Arbor, MI

Ruediger Thalmann, MD (Senior Associate 1971)
St. Louis, MO

Galdino Valvassori, MD (Senior Associate 1970)
Wilmette, IL

Sabina Regina Wullstein, MD (Senior Associate 1999)
Wurzburg, Germany

Joseph J. Zwislocki, ScD (Senior Associate 1984)
Syracuse, NY

CORRESPONDING MEMBERS

Marcus D. Atlas, MBBS, FRACS (Corresponding 2005)
Subiaco, Western Australia

Bagger-Sjoback, Daniel J., MD (Corresponding)
Stockholm, Sweden

Sandra G. Desa Souza, MBMS (Corresponding 2003)
Mumbai, India

Vicente G. Diamante, MD (Corresponding 2000)
Buenos Aires, Argentina

Bernard Gil Fraysse, MD (Corresponding 1999)
Toulouse, France

S. Armagan Incesulu, MD (Corresponding 2012)
Eskisehir, Turkey

Juichi Ito, MD (Corresponding 2007)
Kyoto, Japan

Thomas E. Linder, MD (Corresponding 2001)
Luzern, Switzerland

Wolf J. Mann, MD (Corresponding 1996)
Mainz, Germany

David A. Moffat, MA (Corresponding 1996)
Cambridge, England

Lars Odkvist, MD, PhD (Senior Corresponding 1999)
Linkoping, Sweden

Jose Antonio Rivas, MD (Corresponding 2009)
Bogota/D.C., Colombia

Alain Robier, MD (Corresponding 2008)
Tours, France

Masafumi Sakagami, MD, PhD (Corresponding 2006)
Hyogo, Japan

Henryk Skarzynski, MD, PhD (Corresponding 2012)
Nadarzyn, Poland

Olivier Sterkers, MD, PhD (Corresponding 2003)
Paris, France

Haruo Takahashi, MD (Corresponding 2005)
Nagasaki, Japan

Thomas P.U. Wustrow, MD (Corresponding 2000)
Munchen, Germany

HONORARY MEMBERS

Pedro Albernaz, (Honorary)
Sao Paulo, Brasil

IN MEMORIAM
(in alphabetical order)

The AOS Administrative office was notified of the following members death since the last Spring meeting.

Please take a moment of silence to remember these outstanding colleagues & friends.

Roger Boles, MD - member since - 1982

D. Thane Cody, MD - member since - 1969
1982 - 1987-AOS Secretary-Treasurer
1989 - AOS President
1992 - Guest of Honor
1995 - Award of Merit recipient

James A. Crabtree, MD - member since - 1972

Gordon B. Hughes, MD - member since - 1987

Robert H. Mathog, MD - member since - 1985

Isamu Sando, MD - member since - 1975

John J. Shea Jr., MD - member since - 1967
1986 - Award of Merit recipient

Malcolm H. Stroud, MD - member since - 1967

Mansfield F.W. Smith, MD - member since - 1973
1993 - AOS President
1997 - Guest of Honor
1999 - Award of Merit recipient

We need your help, do you know this member?

The AOS Administrative Office has lost contact with the following members:

Robert A. Butler, PhD
John M. Epley, MD
Richard L. Ruggles, MD

If you know of the whereabouts of any of the above members, please contact the AOS Administrative office at 217-638-0801 or by email: administrator@americanotologicalsociety.org