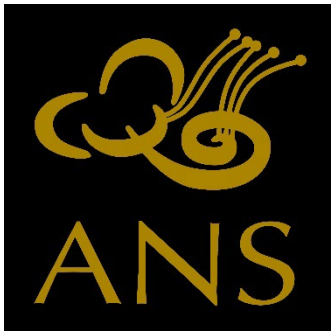

PROGRAM, ABSTRACTS
and MORE

from the

AMERICAN NEUROTOLOGY SOCIETY

60th Annual Spring Meeting

May 16 - 17, 2025
Hyatt Regency
New Orleans, LA

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AMERICAN NEUROTOLOGY SOCIETY
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American Neurotology Society Mission Statement

Purpose

The American Neurotology Society (ANS) is committed to improving public health care related to disorders of the ear, hearing and balance primarily through the provision of high-quality continuing medical education (CME) to our members. The overall goals of the ANS educational programs are to organize CME activities addressing the knowledge gaps and enhancing the clinical competence of the participants. The ANS is dedicated to improving public health care through the development, dialogue and dissemination of advances in evidence-based diagnosis and management of neurotologic and related skull base disorders.

Furthermore, the ANS is committed to fulfilling its purpose by encouraging and funding research that promotes the health and wellness of our patients, members, and their communities. Novel information, such as that presented at the annual conferences, as well as solicited and unsolicited manuscripts, are considered for publication in the ANS supported, peer reviewed and evidence-based content of the *Otology & Neurotology* (original and open access) Journals. The focus on the scientific advances in the field of neurotology is translated into approaches to quality care that are consistent with ACGME/ABMS general competency areas and the Institute of Medicine recommendations.

The ANS fully supports a culture of both unbiased, civil dialogue among its members and diversity in all aspects of the field, including education, research and clinical practice. Equally important to our mission is equity of access to the highest quality neurotological healthcare for all patients requiring our services. Our society considers the needs of trainees at all levels interested in learning neurotology in order to develop the next generation of practitioners from among the best and brightest among their peers with the broadest representation of all backgrounds and personal characteristics.

Target Audience

The primary target audience includes members of both the American Neurotology Society and our sister Society, the American Otological Society as well as healthcare professionals in the fields of otology, otolaryngology neurotology and skull base research and healthcare. The members served include physicians, otologists, neurotologists, residents, fellows, researchers, audiologists, and other healthcare professionals who are involved in the care of patients with otologic and neurotologic conditions.

Types of Activities Provided

In order to accomplish the goals of the ANS CME program, the Education committee will offer a range of activities with specific educational outcomes in mind. Current offerings include:

- Scientific symposia, delivered twice per year at national venues, showcasing the latest research in the field and featuring national and international experts on related clinical topics.

- Study groups & mini-seminars offered at the annual meeting of the American Academy of Otolaryngology-Head and Neck Surgery.
- Facilitation of manuscript submission on presented materials for publication in a peer reviewed journal (Otology & Neurotology and Otology/Neurotology Open)
- The Otology & Neurotology Journal, and the Otology/Neurotology Open Access publications, provide additional vehicles for further collaboration and dissemination of new information, science and standards of care.

Content

The content of the ANS CME program centers on clinical issues related to Neurotology and disorders of the skull base. The ANS also strives to respond to our members' educational needs that are not being met by other organizations, and therefore also offers activities in the areas of risk management, patient safety, physician-patient communications, coding, HIPAA compliance, and other regulatory issues as they relate to Neurotology. The educational efforts will also highlight the ACGME/ABMS general competencies within the context of this field and relate the significance of communication, professionalism, patient safety and systems-based practice within these workplace environments.

Expected Results

The CME program of the ANS strives to enhance the participants' knowledge and clinical competence in subject areas relevant to the field of Neurotology. The other expected outcome from this CME program is continued development of new evidence-based science, dissemination of ongoing research in the clinical area of Neurotology.

Resolution on Diversity of Meeting Presenters and Participation for the American Neurotology Society and the American Otological Society

- Whereas, the councils of the American Neurotology Society and American Otological Society desire to promote inclusivity within the membership of both organizations.
- Whereas it is recognized that diverse leadership and diversity of presenters allows for cross pollination of knowledge, perspective and experiences enabling a stronger and more robust educational experience for our members.
- Whereas the Councils of the organizations recognize the importance of acknowledging diversity among our patients, our trainees and our colleagues.
- Whereas, the purpose of the education programs of both organizations is to disseminate information designed to improve physician knowledge, patient care and outcomes, and advance the respective specialties.
- Whereas, valuable scientific contributions to Otology and Neurotology by colleagues (regardless of gender, race, or other attributes) should be presented at the society's respective meetings.
- Be it resolved that the Scientific Program Committees of the American Neurotology Society and American Otological Society will select speakers and panel members endeavoring to balance educational goals while promoting the diversity of our respective Societies' memberships and educational offerings.
- Be it resolved the Executive Councils of the ANS and AOS will select participation at all levels of the organizations endeavoring to reflect diversity of our respective Societies' memberships.

American Neurotology Society

AMERICAN OTOLOGICAL SOCIETY

CONTINUING MEDICAL EDUCATION CREDIT

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of American College of Surgeons and the American Neurotology Society (ANS). The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™
The American College of Surgeons designates this live activity for a maximum of **9.25** *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

ACS AMERICAN COLLEGE OF SURGEONS

ACCME ACCREDITED WITH COMMENDATION

ADDITIONAL CME INFORMATION

Award of CME credits by ACS is based on compliance of the program with the ACCME accreditation requirements and does not imply endorsement by ACS of the content, the faculty, or the sponsor of the program.

Successful completion of this CME activity, which includes participation in the evaluation component, enables the learner to earn credit toward the CME of the American Board of Surgery's Continuous Certification program and MOC points from the American Board of Otolaryngology – Head and Neck Surgery.

By attending this activity, you give us permission to share your CME data with the American College of Surgeons, the CME Accredited joint provider, and the Accreditation Council for Continuing Medical Education, (ACCME).

PROGRAM OBJECTIVES / EDUCATIONAL ACTIVITY DETAILS

What are the practice or patient care problems being addressed by this activity?

Overall this activity addresses gaps in knowledge and practice that reflect evolving understanding and perspectives in the diagnosis and management of health conditions of the ear and skull base. These sessions highlight the core principles of standard practice while challenging commonly held assumptions that create opportunities for further clarification or research.

The scope of the gaps addressed by the following activities is indicated:

LECTURE: From Apps to Apex: Three Paths to Better Frequency Mapping in CI Users- This lecture will assess gaps in knowledge about optimizing the function of cochlear implants and new research in drivers of the patient listening experience.

CUTTING EDGE IN COCHLEAR IMPLANTS Scientific Sessions – With broadening candidacy criteria, cochlear implants have become a viable option for the management of hearing loss with greater degrees of residual hearing. Early and preliminary experience and performance outcomes for the expanded indications for implantation and unique implant candidates will be addressed.

NEW INSIGHTS INTO HEARING LOSS Scientific Session – This session will address evolving paradigms related to the treatment of hearing loss including novel genetic therapies used for a growing indication of genetic hearing loss.

CHALLENGES IN MANAGING INTRACRANIAL CSF AND VASCULAR DISORDERS Scientific Session – This session will showcase evolving practices related to the evaluation and multidisciplinary management of spontaneous cerebrospinal fluid leaks and pulsatile tinnitus.

ADVANCES IN SKULL BASE TUMOR MANAGEMENT Scientific Session – This session will address evolving studies related to novel biomarkers predicting the biology of vestibular schwannomas and novel therapeutic options for these tumors.

LECTURE: The Truth About Neurosurgery or Every Dogma Has Its Day This lecture will address a history of lateral skull base surgery from a neurosurgeon's perspective and the evolving surgical techniques used in the last decades leading to contemporary practice.

NEW WINDOWS INTO THE VESTIBULAR SYSTEM Scientific Session – This session will address knowledge gaps in the management of vestibular disorders including superior canal dehiscence syndrome and vestibular loss in children.

PANEL- MANAGEMENT OF FACIAL PARALYSIS FOLLOWING TEMPORAL BONE TRAUMA – This panel will showcase ongoing controversies in the management of facial paralysis in the setting of acute temporal bone trauma.

PANEL- COMPLICATIONS IN NEUROTOLOGIC SURGERY: MANAGEMENT CONSIDERATIONS – This panel will address surgical complications faced by a panel of experienced otologic and neurotologic surgeons and how they handled the complications both intra-operatively and post-operatively in communicating with patients and families.

PANEL- MANAGEMENT OF COMPLEX VERTIGO – This panel will address strategies for managing patients with vertigo and vestibular disorders who do not improve with primary treatment and require additional consideration and therapeutic tools.

Why do these issues exist? Is there a deficit in provider's knowledge or skill? Is there a deficit in health care system process or outcomes?

In most cases, evolving knowledge, changing criteria and emerging technologies continue to expand options for patient management and improved outcomes, yet pose a continuous need for education. Furthermore, some entities are not common and require the coalescence of experience to emphasize core practice principles.

How will this activity improve the learners' competence (knowledge in action), performance (skill set) and/or patient outcomes (impact of care)?

- **Competence**:
  The educational program is designed to address the topics identified as practice gaps through individual presentations and in-depth panel discussions. The panels will emphasize case-based learning and opportunity to demonstrate the application of core principles and new information to clinical decision-making.

- **Performance**:
  All activities will review established knowledge, present areas of controversy and define skills that require additional development within our field or in consultation with other disciplines. Means by which these skills can be acquired or improved will also be presented.

- **Patient Outcomes**:
  The impact of clinical decision-making, professionalism, and health system structures on clinical outcomes will be presented and discussed with the assistance of the moderators. Improvement in recognizing, diagnosing, and managing disorders of the ear and skull base.

How do you anticipate this activity improving health care systems?

Increased understanding of interdisciplinary collaborations to advance care, and increased understanding of how to handle complications intra-operatively and post-operatively with the patients and their families will improve health care delivery for systems and patients.

If applicable, **how do you anticipate this activity impacting the health of patients and their communities?**

Sessions and lectures provide updates for diagnostic and therapeutic options for otologic/neurotologic conditions and increase understanding of factors impacting treatment outcomes. The lecture on management of acute facial paralysis will increase understanding for diagnosis and management of this condition resulting from temporal bone trauma.

State the learning objectives for this activity

1. To describe the impacts of vestibular conditions on quality of life in adults and children.

2. To demonstrate and discuss the implementation of expanded CI candidacy in the clinical management of sensorineural hearing loss and apply hearing preservation strategies cochlear implant surgery.

3. To draw from the latest clinical experience and cutting-edge research when managing patients with vestibular schwannoma.

4. To assess and manage spontaneous cerebrospinal fluid leaks in multidisciplinary teams.

5. To examine the latest approaches for the management of acute facial paralysis following temporal bone trauma.

6. To assess current research related to optimizing cochlear implant function.

7. To evaluate and discuss strategies for managing complications in contemporary neurotologic surgical practice.

8. To identify opportunities for management of patients with complex vestibular conditions that do not respond to first line treatment.

9. To discuss the evolving landscape of approaches to the lateral skull base from the perspective of a neurosurgeon.

In accordance with ACCME regulations (ACCME Standard 3), the American College of Surgeons must ensure that anyone who is able to control the content of the activity has disclosed **all financial relationships with any ineligible companies in the 24 months prior to their involvement in the educational activity.** There is no minimum financial threshold; we ask that you disclose all financial relationships, regardless of the amount, with ineligible companies.

Ineligible Company: Companies that are ineligible to be accredited in the ACCME system (ineligible companies) are those whose primary business is producing, marketing, selling, reselling, or distributing healthcare products used by or on patients.
Financial Relationships: Financial relationships are relevant if the following three conditions are met for the individual who will control content of the education: 1) a financial relationship, in any amount, exists between the person in control of content and an ineligible company; 2) the financial relationship existed in the last 24 months; 3) the content of the education is related to the products of an ineligible company with whom the person has a financial relationship.

Al Council Members, Scientific Program Committee, Education Committee members, and Speakers /Moderators/Discussants/Authors/ involved in the development and/or presentation of CME content were required to electronically complete this form. As relevant, all disclosure information for speakers will be revealed by a slide at the beginning of the presentation.

AS IT RELATES TO THE PRESENTATION:

☐ I am an owner or employee of an ineligible company. I am to be excluded from controlling content or participating as faculty in accredited education unless the planning chair determines that I meet an ACCME exception on page 2 of the Mitigation Section. For more information: ***ACCME Standard 3***

☐ I am a stockholder of a privately held ineligible company (not through a mutual fund or pension plan). I am to be excluded from controlling content or participating as faculty in accredited education unless the planning chair determines that I meet an ACCME exception on page 2 of the Mitigation Section. For more information: ***ACCME Standard 3***

☐ I do not have personal financial relationships with any ineligible companies as defined above.

☐ I **do** have financial relationship(s) with ineligible companies as defined above.

☐ I agree that I will not accept honoraria, travel expenses, in-kind contributions, or any other support from commercial companies/ineligible companies in connection with this activity.

The ACCME also requires that ACS manage any reported conflict and eliminate the potential for bias during the educational activity. Any conflicts reported have been managed to our satisfaction. The disclosure information is intended to identify any commercial relationships and allow learners to form their own judgments. However, if you perceive a bias during the educational activity, please report it on the CME evaluation.

A complete list of disclosures is available on the ANS website conference page.

OTOLOGY & NEUROTOLOGY JOURNAL REQUIREMENTS

Publication Statement: The material in this abstract must not have been published or presented previously at another national or international meeting and may not be under consideration for presentation at another national or international meeting including another COSM society. The study detailed in this abstract *may be submitted* for consideration for publication to *Otology & Neurotology* at any time after this call for papers begins. However, should the abstract be selected as a poster or an oral presentation, publication of the manuscript will be delayed until after the 2025 COSM meeting takes place. If this policy is violated, the ANS will prohibit presentation at the COSM meeting and the manuscript will be withdrawn from publication in print or online. The penalty for any duplicate presentation/ publication is prohibition of the author from presenting at a COSM society meeting for up to three years. **Duplicate submission to AOS or another participating COSM Society will disqualify your abstract immediately.**

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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 Journals of *OTOLOGY & NEUROTOLOGY* or *ONO (O&N OPEN)* do not accept paper manuscripts.

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

FUTURE MEETING DATES

ANS 60th Annual Fall Meeting
"FAB FRIDAY"
October 10, 2025
Indianapolis, IN
JW Marriott Indianapolis
Attendees: the Marriott and the JW Marriott will be co-branded as the AAO/HNSF HQ hotels.

61st Annual ANS Spring Meeting in conjunction with COSM
April 24-26, 2026
Phoenix Convention Center/ Sheraton Phoenix Hotel
Phoenix, Arizona

MARK YOUR CALENDAR! Due to the late date of the annual AAO meeting and ANS Fall meeting, the deadline for abstract submissions for the 61st Annual ANS Spring meeting has been extended to Wednesday, October 22, 2025. Abstract Instructions and the submission form will be available on the ANS website after September 1st.

CONTACT US!

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THE AMERICAN NEUROTOLOGY SOCIETY WOULD LIKE TO THANK THE FOLLOWING MEMBERS FOR THEIR CONTRIBUTION TO THE 2025 ANS SCIENTIFIC PROGRAM

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Christine T. Dinh, MD, ANS Education Director - Elect

(in alphabetical order)
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Daniel Q. Sun, MD
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AMERICAN NEUROTOLOGY SOCIETY
60th Annual Spring Meeting
SCIENTIFIC PROGRAM
May 16-17, 2025
New Orleans, LA

(ANS Posters will be displayed on Friday & Saturday)

FRIDAY MAY 16, 2025

1:00 **BUSINESS MEETING** *(Treasurers report/New Member Induction*)
Members Only

1:30 **SCIENTIFIC SESSION**
OPENING REMARKS BY THE PRESIDENT - *J. Thomas Roland, Jr., MD*
(Open to registered Members and Non-members – Badge required for admittance)

1:32 **PRESIDENTIAL CITATIONS**
Ronen Perez, MD
Christopher Ndoleriire, MBCHB, MMED ENT
William H. Shapiro, AuD
Jay T. Rubinstein, MD, PhD

1:42 **6th ANNUAL NOEL L. COHEN AWARD FOR SIGNIFICANT CONTRIBUTIONS TO OTOLOGY AND NEUROTOLOGY**
Presented by J. Thomas Roland, Jr., MD, President

1:47 **INTRODUCTION OF WILLIAM F. HOUSE MEMORIAL LECTURE**
J. Thomas Roland, Jr., MD

1:48 **WILLIAM F. HOUSE MEMORIAL LECTURE**
From Apps to Apex: Three Paths to Better Frequency Mapping in CI Users
Mario Svirsky, PhD
Noel L. Cohen Professor of Hearing Science
Department of Otolaryngology-Head and Neck Surgery
Professor, Department of Neuroscience and Physiology
NYU Langone Medical Center and NYU Grossman School of Medicine
New York, NY

2:18 **SESSION A - ADVANCES IN SKULL BASE TUMOR MANAGEMENT**
Alicia Quesnel, MD, Moderator

2:19 **Evaluating Functional Hearing Outcomes and Associated Predictors after Resection of Cerebellopontine Angle Meningioma**
Khalil Baddour, MD
Vanessa Helou, MD
Parthasarathy D. Thirumala, MD
Philip L. Perez, MD

2:25 **Proteomic Analysis Identifies Novel Plasma Biomarkers in Patients with Vestibular Schwannoma**
Yin Ren, MD, PhD
Han TN Nguyen, PhD
Hsuan-Chih Kuo, MS
Giorgia Giordano, BS
Sasa Vasilijic, PhD
Towia Libermann, PhD
Konstantina Stankovic, MD, PhD

2:31 **HERBERT SILVERSTEIN AWARD FOR RESEARCH EXCELLENCE IN OTOLOGY/NEUROTOLOGY**
Whole Genome Sequencing of Sporadic Vestibular Schwannoma Identifies Novel Molecular Pathways
Benjamin T. Ostrander, MD, MSE
Olivia La Monte, MD
Vivienne Li, BA
Vivian Vo, BS
Marc S. Schwartz, MD
Rick A. Friedman, MD, PhD

2:37 **ANS TRAINEE AWARD**
Automated Segmentation of Bilateral Vestibular Schwannoma
Krish Suresh, MD
Ryan Weiss, MS
Daniel J. Lee, MD
D. Bradley Welling, MD, PhD
Yin Wu, PhD
Matthew G. Crowson, MD, MPA, MASc

2:43 **Comparing Cochlear Implantation With vs. Without Resection in Intralabyrinthine Schwannoma: A Systematic Review and Meta-Analysis**
Brendon K. Warner, MD
Lawrence Lee, MD
Nauman F. Manzoor, MD

2:49 **NEUROTOLOGY FELLOW AWARD**
Radiosurgery for Sporadic Facial Nerve Schwannomas: An International Multi-Institutional Study
John P. Marinelli, MD
Justin Cottrell, MD
Eric E. Babajanian, MD
Simon K.W. Lloyd, BSc (Hons), MPhil
Jason P. Sheehan, MD

J. Walter Kutz, Jr., MD
Matthew L. Carlson, MD

2:55 **DISCUSSION/Q&A with MODERATOR**

3:02 **BREAK WITH EXHIBITORS**

3:32 **ANNOUNCEMENT OF POSTER WINNERS (ANS & AOS)**
Yuri Agrawal, MD, MPH – ANS Education Director
Nancy M. Young, MD – AOS Education Director & President-Elect

3:34 **ANS GUIDELINE DEVELOPMENT UPDATE**
Richard K. Gurgel, MD, MSCI
Seth R. Schwartz, MD, MPH

3:43 **SESSION B - NEW WINDOWS INTO THE VESTIBULAR SYSTEM**
Mallory J. Raymond, MD, Moderator

3:44 **Evaluating for Endolymphatic Hydrops in Meniere's Disease Using In-Vivo 7 Tesla Magnetic Resonance Imaging and Advanced Post-Processing Techniques**
Syed Ameen Ahmad, BS
Joon Soo Kim, BS
Diane Jung, MD
Adrian Paez, BS
John P. Carey, MD
Jun Hua, PhD
Bryan K. Ward, MD

3:50 **Risk Factors Associated with Superior Semicircular Canal Dehiscence: A National Database Study**
Prithwijit Roychowdhury, MD
Miriam R. Smetak, MD, MSc
Matthew Shew, MD
Jacques A. Herzog, MD
Craig A. Buchman, MD
Nedim Durakovic, MD

3:56 **Changes in the Neurovascular Unit in Meniere's Disease**
Steven D. Curry, MD
Ivan A. Lopez, PhD
Gail Ishiyama, MD
Akira Ishiyama, MD

4:02 **NICHOLAS TOROK VESTIBULAR AWARD**
Clinical Vestibular Function in Children with and without Sensorineural Hearing Loss
Graham D. Cochrane, MD, PhD
Emily Buss, PhD
Carlton Zdanski, MD

4:08 **DISCUSSION/Q&A WITH MODERATOR**

4:13 **INTRODUCTION of PANEL** - *J. Thomas Roland, Jr., MD*

4:14 **PANEL**
MANAGEMENT OF FACIAL PARALYSIS FOLLOWING TEMPORAL BONE TRAUMA
Oliver F. Adunka, MD, Moderator
Bruce J. Gantz, MD
Daniel H. Coelho, MD
Erika A. Woodson, MD
Christine T. Dinh, MD

5:04 **CLOSING REMARKS** – *J. Thomas Roland, Jr., MD*

5:06 **ADJOURN**

SATURDAY MAY 17, 2025

7:00 **BUSINESS MEETING/COMMITTEE REPORTS**
(All welcome)

7:30 **SCIENTIFIC SESSION**
OPENING REMARKS BY THE PRESIDENT – *J. Thomas Roland, Jr., MD*
(Open to registered Members and Non-members – Badge required for admittance)

MICHAEL E. GLASSCOCK SCIENTIFIC MERIT AWARD
Introduction by David S. Haynes, MD, MMHC
Awarded to Hannah N. W. Weinstein, BA

7:33 **SESSION C - NEW INSIGHTS INTO HEARING LOSS**
Marc Bassim, MD, Moderator

7:34 **Otic Capsule Demineralization and Hearing Outcomes of Stapes Surgery for Otosclerosis**
Akira Kimura, MD
Chihiro Yagi, MD, PhD
Yuka Morita, MD, PhD
Tatsuya Yamagishi, MD, PhD
Shinsuke Ohshima, MD, PhD
Shuji Izumi, MD, PhD
Arata Horii, MD, PhD

7:40 **Pseudomembranes and Tissue Plugs in the Round Window Niche: Implications for Inner Ear Drug Delivery**
Nicole Kim, BA
Liliya Benchetrit, MD
Anbuselvan Dharmarajan, MD, MPH
Alicia M. Quesnel, MD

7:46 **Are Jak Inhibitors Contributing to Ototoxicity? Investigating Their Role in Aminoglycoside-Induced Damage**

Jonathan Fleegel
Marisa Zallocchi, PhD

7:52 **Computer Vision-Based Extraction of Structured Data from Scanned Audiograms in the Electronic Health Record**
Peter R. Dixon, MD, MSc
Ruoyu Yang, PhD
Dana Mae Salvador, BSc
Carl Ehrett, PhD

7:58 **MICHAEL E. GLASSCOCK SCIENTIFIC MERIT AWARD**
Conductive Hearing Loss is Associated with Dementia in the All of Us Research Program
Hannah N. W. Weinstein, BA
Lauren H. Tucker, BA
Michael W. Denham, MD, MS, MPhil
Richard K. Gurgel, MD, MSCI
Justin S. Golub, MD, MS

8:04 **DISCUSSION/Q&A WITH MODERATOR**

8:10 **INTRODUCTION OF WILLIAM E. HITSELBERGER MEMORIAL LECTURE**
J. Thomas Roland, Jr., MD

8:11 **WILLIAM E. HITSELBERGER MEMORIAL LECTURE**
The Truth About Neurosurgery or Every Dogma Has Its Day
John G. Golfinos, MD
Joseph P. Ransohoff Professor and Gray Family Chairman
Department of Neurosurgery
Neurosurgeon-in-Chief
NYU Langone Medical Center and NYU Grossman School of Medicine
New York, NY

8:36 **SESSION D - CHALLENGES IN MANAGING INTRACRANIAL CSF AND VASCULAR DISORDERS**
Nicholas Deep, MD, Moderator

8:37 **Safety of Middle Cranial Fossa Repair of Spontaneous Cerebrospinal Fluid Leaks in Superobese Patients**
Hunter L. Elms, MD
Douglas J. Totten, MD
Evan C. Cumpston, MD
Charles W. Yates, MD
Rick F. Nelson, MD, PhD

8:43 **A Systematic Review and Meta-Analysis of Meningitis Risk Reduction after Repair of Spontaneous Lateral Skull Base Cerebrospinal Fluid Leaks**
Khadija Khan, BA
Prishae Wilson, BS
Mayuri S. Patel, BSc
Estephania Candelo Gomez, MD, MSc

Zhen Wang, PhD
Tara Brigham, MLIS, AHIP-D
Mallory J. Raymond, MD

8:49 **Intracranial Dural Arteriovenous Fistula Can Mimic Sigmoid Sinus Wall Anomalies Induced Pulsatile Tinnitus: Caution before Considering It's Venous**
Yue-Lin Hsieh, MD, PhD
Xu Liu, MD
Wuqing Wang, MD, PhD

8:55 **Risk Factors and Developmental Patterns of Spontaneous New Encephaloceles following Initial Repair**
Keshav V. Shah, BS
Kevin Wong, MD
Timothy Shim, MD
Tiffany P. Hwa, MD
Douglas C. Bigelow, MD
Michael J. Ruckenstein, MD

9:01 **DISCUSSION/Q&A WITH MODERATOR**

9:06 **INTRODUCTION of PANEL** – *J. Thomas Roland, Jr., MD*

9:07 **PANEL**
COMPLICATIONS IN NEUROTOLOGIC SURGERY: MANAGEMENT CONSIDERATIONS
Jacques A. Herzog, MD, Moderator
John G. Golfinos, MD
Tina C. Huang, MD
Jay T. Rubinstein, MD, PhD
Alejandro Rivas, MD
Nedim Durakovic, MD

9:52 **BREAK WITH EXHIBITORS**

10:22 **SESSION E - CUTTING EDGE IN COCHLEAR IMPLANTS**
Daniel Jethanamest, MD, Moderator

10:23 **Factors Associated with Cochlear Implant Utilization in Adults with Single-Sided Deafness**
Matthew J. Wu, MD
Amit Walia, MD, MSCI
Shubhanjali Minhas, BA
Jill Firszt, PhD
Jacques A. Herzog, MD
Craig A. Buchman, MD
Matthew A. Shew, MD

10:29 **NEUROTOLOGY FELLOW AWARD**

Factors Associated with Delayed Loss of Residual Acoustic Hearing following Cochlear Implantation

Michael W. Canfarotta, MD
Ankita Patro, MD, MS
Natalie Schauwecker, MD
Connie Ma, MD
Aaron C. Moberly, MD
Jourdan T. Holder, AuD, PhD
Elizabeth L. Perkins, MD

10:35 **Perimodiolar Electrode Locations Outperform Lateral Wall Arrays When Controlling for Cochlear Health and Speech Processing Strategy**

Amit Walia, MD, MSCI
Matthew A. Shew, MD
Amanda Ortmann, PhD
Matthew Wu, MD
Shannon Lefler, AuD
Jacques A. Herzog, MD
Craig A. Buchman, MD

10:41 **One or Two Cochlear Implants? A Comparison of Bimodal Hearing Versus Bilateral Cochlear Implantation in a Large Cohort of Traditional Candidates**

Ankita Patro, MD, MS
Michael W. Canfarotta, MD
Natalie Schauwecker, MD
Elizabeth L. Perkins, MD
David S. Haynes, MD, MMHC
René H. Gifford, PhD
Aaron C. Moberly, MD

10:47 **Evaluating the Impact of Cochlear Implantation on Cognitive Outcomes in Older Adults: a 5-year Follow-up**

Samira Takkoush, MD
Kevin Duff, PhD
Norman L. Foster, MD
Neil S. Patel, MD
Richard K. Gurgel, MD, MSCI

10:53 **Tone Adaptation Among Cochlear Implant Candidates to Inform Hearing Preservation during Awake Cochlear Implantation**

Karl R. Khandalavala, MD
Jill M. Gruenwald, AuD
Sarah E. Ostlie, AuD
Ashlee P. Kirtz
Christine M. Lohse, MS
Matthew L. Carlson, MD

10:59 **DISCUSSION/Q&A WITH MODERATOR**

11:05 **INTRODUCTION of PANEL** – *J. Thomas Roland, Jr., MD*

11:06 **PANEL**
MANAGEMENT OF COMPLEX VERTIGO
Meredith E. Adams, MD, Moderator
Michael E. Hoffer, MD
Akira Ishiyama, MD
John P. Carey, MD
Edward I. Cho MD

11:51 **INTRODUCTION OF INCOMING PRESIDENT**
Colin L.W. Driscoll, MD

11:54 **CLOSING REMARKS** – *J. Thomas Roland, Jr., MD*

11:56 **ADJOURN**

SELECTED ABSTRACTS

ORAL PRESENTATIONS

IN ORDER OF PRESENTATION

Evaluating Functional Hearing Outcomes and Associated Predictors after Resection of Cerebellopontine Angle Meningioma

Khalil Baddour, MD; Vanessa Helou, MD; Parthasarathy D. Thirumala, MD
Philip L. Perez, MD

Objective: To characterize functional hearing outcomes after resection of cerebellopontine angle (CPA) meningioma, and determine factors associated with preserved or improved postoperative hearing

Study Design: Retrospective cohort

Setting: Tertiary referral center

Patients: Adults with CPA meningioma

Interventions: Surgical resection

Main Outcome Measures: Preservation or improvement of hearing via subjective reporting, pure tone averages (PTA), word recognition scores (WRS), and/or American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS) hearing classification grade

Results: Twenty-five patients (72% female) with a median (range) age at surgery of 55 (47) years were included. Most tumors (40%) originated from the posterior petrous ridge. The internal auditory canal (IAC) was involved in 72% of cases. The median (range) tumor volume was 5.98 (46.78) cm^3. Meningiomas were most commonly resected via a combined approach involving a retrosigmoid craniotomy (53%) with 64% of procedures resulting in gross total resection. The preoperative median (range) PTA and WRS were 33.75 (92.5) dB and 88% (100%), and were preserved postoperatively at PTA 33.13 (108.75) dB and WRS 94% (100%). Eighty percent of patients had reported or measured improvement/preservation in their postoperative hearing. Of those, 11 had improvement/maintenance of functional hearing based on audiometric data. Univariable analysis evaluated the association between functional hearing outcomes and age, tumor laterality, volume, location, IAC involvement, surgical approach, extent of resection, preoperative hearing loss, audiometric data and AAO-HNS class. The final proposed model to predict postoperative hearing outcomes included age (OR 1.19, 95% CI 1.01-1.41, *p-value 0.04*) and preoperative WRS (OR 0.97, 95% CI 0.94-1.00, p-value 0.08), although neither remained statistically significant in multivariable analysis.

Conclusions: Postoperative preservation or improvement of hearing can be expected after hearing-preserving resection of CPA meningiomas. Older age and lower preoperative WRS may portend poorer functional hearing outcomes.

Professional Practice Gap & Educational Need: There is scarce literature evaluating functional hearing outcomes after CPA meningioma resection and potential predictive factors that may be associated with worse postoperative hearing.

Learning Objective: To quantify postoperative functional hearing outcomes after CPA meningioma resection and associated factors

Desired Result: To improve preoperative patient counseling regarding expected functional hearing outcomes and any potential patient-specific associated risk factors

Level of Evidence – Level IV

Indicate IRB or IACUC: University of Pittsburgh STUDY18120055

Proteomic Analysis Identifies Novel Plasma Biomarkers in Patients with Vestibular Schwannoma

Han TN Nguyen, PhD; Hsuan-Chih Kuo, MS; Giorgia Giordano, BS; Sasa Vasilijic, PhD
Towia Libermann, PhD; Konstantina Stankovic, MD, PhD; Yin Ren, MD, PhD

Hypothesis: Patients with sporadic vestibular schwannoma (VS) have unique plasma protein biomarkers that can accurately distinguish and classify them from healthy, non-tumor controls.

Background: Conventional radiographic modalities, such as MRI, are resource intensive and offer limited insight into tumor biology. Histological markers such as ki-67, while informative, require invasive craniotomy and are not applicable in non-surgical patients. Identification of plasma-derived biomarkers for VS could enhance disease prognostication and guide treatment decisions.

Methods: High-throughput, multiplexed, DNA aptamer-based proteomic analysis was performed in plasma samples from 12 patients, six with sporadic non-irradiated VS and six age-/gender-matched healthy controls. Dysregulated proteins were identified using a cut-off value of $|\log_2 \text{foldchange}|>1$ and $p_{adj}<0.05$. Enriched pathways were determined using Metascape and STRING bioinformatic analysis. Candidate biomarker expression was validated in tumor tissue, a schwannoma cell line, and primary VS culture.

Results: A total of 7310 proteins were profiled. Of 1499 differentially expressed proteins, 152 (10%) were upregulated and 273 (18%) were downregulated in VS. There was an enrichment in cancer proliferation, protein catabolism and immune cell activation processes. A panel of 40 proteins distinguished VS from HC, accounting for 84% of the variance on principal component analysis. These included NFKBIA, WNT10A and WNT16, proteins integral to NF-κB and Wnt signaling. Four were further validated *in vitro*. *IGFBP-1, IGFBP-2* and *FCGR3A* mRNA expression were elevated >20-fold in schwannoma cells. Hepcidin (HAMP), a regulator of iron homeostasis and metabolism that influences tumor growth, was enriched in VS tissue and in primary VS culture-derived secretions compared to wild-type Schwann cells (308 vs. 6 pg/mL).

Conclusions: Our study identified several plasma biomarkers that classify VS patients. Identification of hepcidin warrants further investigation into its role in tumor progression.

Professional Practice Gap & Educational Need: Vestibular schwannomas are associated with significant morbidity. No consensus plasma biomarkers for VS exist. There is a critical gap to identify prognostic biomarkers to molecularly stratify VS patients and guide clinical decision making.

Learning Objective: To better understand the role of plasma proteins as a predictive tool to distinguish VS patients from healthy controls and identify potential novel therapeutic targets.

Desired Result: Identification of novel circulating plasma proteins in VS that may promote tumor growth.

Level of Evidence – Level V

Indicate IRB or IACUC: The Ohio State University IRB Protocol #IRB1994H0241

HERBERT SILVERSTEIN AWARD FOR RESEARCH EXCELLENCE IN OTOLOGY/NEUROTOLOGY

Whole Genome Sequencing of Sporadic Vestibular Schwannoma Identifies Novel Molecular Pathways

Benjamin T. Ostrander, MD, MSE; Olivia La Monte, MD; Vivienne Li, BA
Vivian Vo, BS; Marc S. Schwartz, MD; Rick A. Friedman, MD, PhD

Hypothesis: Whole genome sequencing of sporadic vestibular schwannoma (VS) specimens will reveal novel genetic mutations and molecular pathways involved in the pathogenesis of the disease.

Background: The optimal treatment for VS remains uncertain due to inability to predict tumor behavior, growth, and symptom progression. While molecular changes and mutational burden may govern tumor behavior, genotype-phenotype correlations are not well established. The objective of this study was to describe the genomic landscape of sporadic VS utilizing whole genome sequencing (WGS), with the aim to uncover novel genes and pathways involved in tumor behavior.

Methods: Tumor and matched peripheral blood specimens were collected from 28 patients with sporadic VS who underwent surgical resection. Demographic and clinical characteristics including pre-operative hearing status, cystic change, tumor size, and tumor growth were obtained. Specimens were processed and DNA extraction was completed. WGS was performed and mutational burden and functional enrichment analysis were completed.

Results: WGS was performed on 23 tumor specimens. 46 genes were mutated in 4 or more samples. Commonly mutated genes included TTN, KMT2C, AHNAK2, CCDC168. STRING network analysis demonstrated several network associations. ADGRV1, OTOGL, CCFC168, and TRIOBP, genes which have previously been shown to play an essential role in the development of hearing and inherited deafness, were affected. Mucin genes, important in middle ear and endolymphatic sac inflammation, were also altered. Functional enrichment analysis revealed several enrichments, with affected genes involved in histone methylation and extracellular matrix structure. 16 of 23 samples had 32 identified mutations in the NF2 gene. Of these, 24 were intron variants.

Conclusions: WGS of sporadic VS tumors identified several novel genes and molecular pathways which may be important drivers of tumor behavior.

Professional Practice Gap & Educational Need: The optimal treatment for vestibular schwannoma has been debated for decades. Much of this debate derives from an inability to predict tumor behavior, which generates significant uncertainty. An improved understanding of the genetic and molecular drivers of tumor behavior may advance management of the disease and lead to novel therapeutic targets.

Learning Objective: To describe novel genetic mutations and molecular pathways involved in the pathogenesis and behavior of sporadic vestibular schwannoma tumors.

Desired Result: To utilize genomics data to better understand vestibular schwannoma behavior and to inform future research.

Level of Evidence - Level V

Indicate IRB or IACUC: University of California San Diego Institutional Review Board #180556 and #181755

TRAINEE AWARD

Automated Segmentation of Bilateral Vestibular Schwannoma

Krish Suresh, MD; Ryan Weiss, MS; Daniel J. Lee, MD
D. Bradley Welling, MD, PhD; Yin Wu, PhD; Matthew G. Crowson, MD

Objective: Automated segmentation models for volumetric measurement of vestibular schwannoma (VS) have been developed for sporadic VS but not for bilateral VS. Automated segmentation would be especially valuable in this setting: Patients with neurofibromatosis 2 (NF2) undergo numerous MRI scans, and automated analyses would aid in timely therapeutic decision-making. We aim to develop a computer vision model for the volumetric measurement of bilateral VS.

Study Design: Retrospective study

Setting: Tertiary referral centers

Patients: 90 individuals with VS (30 sporadic, 60 NF2) from our institution; 242 patients with sporadic VS on The Cancer Imaging Archive (TCIA).

Interventions: A nnU-Net was trained on our institutional data augmented with the TCIA data to develop an automated segmentation model for bilateral VS on T1-post contrast MRI. The model was tested on a holdout set of bilateral VS scans.

Main Outcome Measures: Dice score to compare pixel-wise agreement, qualitative review

Results: The best model achieved a mean Dice score of 96%. On qualitative review, model performance was significantly degraded in cases with synchronous tumors, such as posterior fossa meningiomas and other schwannomas of the trigeminal nerve and jugular foramen. Often, these lesions abutted the VS and the model erroneously included them in the VS segmentation. When analyzing the subset of cases with synchronous lesions, the mean Dice score was 59%. One other issue with the model was that, in some instances, it segmented only one VS and failed to include the contralateral VS. We expect this to improve with inclusion of more bilateral VS in the training data.

Conclusions: Automated segmentation of bilateral VS represents a unique challenge compared to sporadic VS. Further work is necessary to improve model performance in complex NF2 cases.

Professional Practice Gap & Educational Need: Despite the well-established benefits of volumetric measurements for VS, adoption is limited.

Learning Objective: To identify challenges with automated segmentation for bilateral VS and understand ongoing efforts to overcome these.

Desired Result: Attendees will consider applying automated segmentation for volumetric measurement of VS in sporadic and simpler NF2 cases.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Comparing Cochlear Implantation With vs. Without Resection in Intralabyrinthine Schwannoma: A Systematic Review and Meta-Analysis

Brendon K. Warner, MD; Lawrence Lee, MD; Nauman F. Manzoor, MD

Objective: To analyze the differences in outcomes between cochlear implantation (CI) with and without primary resection of intralabyrinthine schwannomas (ILS).

Data Sources: PubMed, Embase, and CINAHL.

Study Selection: Two-person title/abstract screening followed by full text screening. Of 759 studies screened, 13 met inclusion criteria.

Data Extraction: JBI risk of bias tool for case series was used to assess validity of included studies.

Data Synthesis: Statistical testing included meta-analysis of mean differences and two-sample t-tests.

Results: A total of 97 patients were analyzed, 80 in CI with resection, and 17 in CI without resection. CI with resection showed favorable audiometric outcomes, with a mean difference in PTA of -76.5 ($p<0.00001$, [-84.0, -69.1]) and in WRS of 47.5 ($p=0.0002$, [22.8, 72.1]). CI without resection also showed favorable audiometric outcomes, with PTA mean difference: -82.8 ($p<0.00001$, [-96.0, -69.5]), and in WRS: 41.1 ($p<0.00001$, [25.7, 56.4]). Comparison of PTA mean difference between CI with and without resection showed no statistically significant difference, $t = -0.3$ ($p = 0.77$, [-17.2, 12.9]. WRS comparison also showed no statistical significance, $t= 0.64$ ($p = 0.53$, [-25.3, 49.0].

Conclusion: CI placement, both with and without resection of ILS, showed improvement in audiometric outcomes. There does not appear to be a statistically significant difference in audiometric outcomes if the tumor is resected or not when CI is placed. More research should be done regarding CI without resection to give a better understanding of outcomes and when resection may or may not be warranted.

Professional Practice Gaps: Current minimal application of cochlear implantation of ILS patients without tumor resection, with even less research done on outcomes.

Learning Objectives: To understand audiometric outcome differences between cochlear implantation with and without ILS tumor resection, and to weigh the risks and benefits of each approach.

Desired Results: To improve audiometric outcomes for patients with ILS, to improve surgeon ability to decide between best approaches to ILS treatment for optimum patient care, and to increase awareness for the need for further research regarding cochlear implantation in ILS with and without concurrent resection.

Level of Evidence - Level I

IRB: Exempt

NEUROTOLOGY FELLOW AWARD

Radiosurgery for Sporadic Facial Nerve Schwannomas: An International Multi-Institutional Study

John P. Marinelli, MD; Justin Cottrell, MD; Eric E. Babajanian, MD; Simon K.W. Lloyd, BSc (Hons), MPhil
Jason P. Sheehan, MD; J. Walter Kutz, Jr., MD; Matthew L. Carlson, MD

Objective: To characterize patient outcomes following primary stereotactic radiosurgery (SRS) for management of sporadic facial nerve schwannomas.

Study Design: Retrospective cohort study.

Setting: Six tertiary referral centers across the United States and United Kingdom.

Patients: Adults undergoing SRS from 2000 to 2023 for sporadic facial nerve schwannomas along any segment of the facial nerve were included. Patients with NF2-related schwannomatosis were excluded.

Interventions: SRS.

Main Outcome Measure: Long-term tumor control, defined as salvage treatment-free survival at 10 years.

Results: Among 59 patients meeting inclusion, the median age at SRS was 52 years (IQR 42-65) with a median tumor size of 19.5 mm (IQR 15.4-22.8). Tumors commonly involved the internal auditory canal (72%), cerebellopontine angle (50%), geniculum/labyrinthine (48%), and tympanic segments (22%). Cochlear fistula was present in 3 (5%). Two patients underwent salvage treatment; salvage-free survival rates (95% CI; number still at risk) at 1-, 3-, 5-, and 10-years following SRS were 100% (100-100; 53), 100% (100-100; 36), 100% (100-100; 18), and 87% (72-100; 9), respectively. Among 31 (53%) patients with House-Brackmann (HB) grade I facial function at presentation, only 5 demonstrated worse facial function at a median of 3.2 years (IQR 1.7-7.1) following SRS. Of 18 patients with serviceable hearing (AAO class A/B) at SRS, 12 maintained serviceable at a median of 1.1 years (IQR 0.5-5.2) of post-SRS audiometric follow-up.

Conclusions: Durable tumor control following primary SRS for sporadic facial nerve schwannomas is achieved in most patients. Among those with HB grade I facial function at presentation, the majority demonstrated preservation of facial nerve function at last follow up.

Professional Practice Gap & Educational Need: Secondary to disease rarity, limited evidence currently exists surrounding the efficacy and expected outcomes of stereotactic radiosurgery when used in the primary management of sporadic facial nerve schwannomas which limits patient counseling and understanding of treatment response.

Learning Objectives:

(1) Understand the common clinical presentations of sporadic facial schwannomas that undergo radiosurgery.
(2) Describe long-term tumor control following primary radiosurgery for sporadic facial nerve schwannomas.
(3) Describe evolution in facial function, hearing, and other common related symptoms following treatment.

Desired Result: Providers would be able to describe the long-term efficacy of stereotactic radiosurgery when used as primary management of sporadic facial nerve schwannomas, as well as the expected evolution in patient symptoms, including but not limited to facial function, hearing, facial spasm, xerophthalmia, dysgeusia, trigeminal hypesthesia and pain, and vestibular function.

Level of Evidence: IV

Indicate IRB or IACUC: 24-000217; S22-01574; STU112016-040

Evaluating for Endolymphatic Hydrops in Meniere's Disease Using In-Vivo 7 Tesla Magnetic Resonance Imaging and Advanced Post-Processing Techniques

Syed Ameen Ahmad, BS; Joon Soo Kim, BS; Diane Jung, MD; Adrian Paez, BS
John P. Carey, MD; Jun Hua, PhD; Bryan K. Ward, MD

Objective: To conduct a volumetric analysis of the inner ear's membranous labyrinth in patients with Meniere's Disease (MD) vs. healthy controls using high-resolution 7 tesla (T) MRI.

Study Design: Prospective cohort study.

Setting: Tertiary Medical Center.

Patients: Adult participants with MD (n=12) and healthy controls (n=5).

Interventions: Axial T2-weighted and 3D-Fluid Attenuated Inversion Recovery (FLAIR) sequences were obtained at 7T MRI before and four hours after intravenous gadolinium-based contrast agent administration. Following image co-registration and subtraction with Statistical Parametric Mapping (SPM12) and MATLAB, images were uploaded into 3D Slicer for 3D reconstruction and volumetric analysis.

Main Outcome Measures: Voxels measuring 0.3 x 0.3 x 0.5 mm corresponding to areas of endolymph were manually identified and highlighted to create 3D reconstruction, delineation, and volume quantification of the a) utricle and semicircular canals (SCC), b) saccule, c) cochlea, and d) total endolymph (all three compartments).

Results: The median [interquartile range (IQR)] volume in ears affected by MD (n=15) was larger than healthy control ears (n=10) for all measured structures—utricle+SCC: 86.79 mm^3 (IQR 83.35-97.94 mm^3) vs. 58.32 mm^3 (IQR 53.99-71.04 mm^3) ($p<0.001$), saccule: 5.76 mm^3 (IQR 4.70-7.64 mm^3) vs. 2.80 mm^3 (IQR 2.70-4.29 mm^3) ($p=0.002$), cochlea: 62.01 mm^3 (IQR 51.75-75.85 mm^3) vs. 27.50 mm^3 (IQR 26.83-37.39 mm^3) ($p<0.001$), and total endolymph: 149.36 mm^3 (IQR 135.99-179.73 mm^3) vs. 86.62 mm^3 (IQR 80.84-111.05 mm^3) ($p<0.001$).

Conclusions: Ears affected by MD exhibited increased volume in all compartments of the membranous labyrinth compared to healthy controls, with the largest changes observed in the saccule and cochlea. 7T MRI enables in-vivo volumetric measurement of the membranous labyrinth.

Professional Practice Gap & Educational Need: While endolymphatic hydrops (EH) is known to be associated with MD, the underlying cause of MD remains poorly understood. Additionally, in-vivo analysis has traditionally been limited by poor spatial resolution. Therefore, there is a need for advanced imaging techniques to evaluate EH in live human subjects, which could help bridge the gap in understanding the cause, diagnosis, and treatment of MD.

Learning Objective: To demonstrate that EH can be visualized in live human subjects with MD, compared to healthy controls, using advanced imaging techniques.

Desired Result: To enhance understanding of the cause and treatment of MD, ultimately improving patient outcomes.

Level of Evidence - III

Indicate IRB or IACUC: Johns Hopkins IRB00259196

Risk Factors Associated with Superior Semicircular Canal Dehiscence: A National Database Study

Prithwijit Roychowdhury, MD; Miriam Smetak, MD; Matthew Shew, MD; Jacques Herzog, MD
Craig Buchman, MD; Nedim Durakovic, MD

Objective: To characterize the demographics of patients with superior semicircular canal dehiscence (SSCD) in the US and understand the association with elevated BMI, concurrent CSF leak, obstructive sleep apnea (OSA) or osteoporosis (OP).

Study Design: Retrospective cohort study

Setting: National database (TriNetX) sourced from 67 HCOs in the USA

Patients: Adults diagnosed with SSCD (ICD-10H81.8X9).

Interventions: Evaluation of age, gender, race, BMI > 25, CSF leak, OSA or OP diagnosis.

Main Outcome Measures: 1) Mean age, gender, race 2) BMI > 25 (overweight) 3) CSF leak diagnosis 4) OSA diagnosis 5)OP diagnosis

Results: 11,589 subjects with SSCD were identified. Mean age at diagnosis of SSCD was 53.0 ± 19.5 (mean ± SD). The majority were female (63.6%, n = 7,375) and white (73.3%, n = 8,490). Subjects with SSCD had a greater risk of being overweight (40.6% vs 28.4%, $p < 0.0001$), having a diagnosis of CSF leak (0.67% vs 0.065%, $p < 0.0001$), having a diagnosis of OSA (11.5% vs 3.65%, $p < 0.0001$) and OP (7.55% vs 2.21%, $p < 0.0001$) compared to age-matched controls (n = 89,720,908).

Conclusions: Patients with SSCD demonstrated significant associations with BMI > 25, a concurrent diagnosis of CSF leak, OSA, and osteoporosis. Findings have implications for the understanding of the etiopathogenesis of SSCD.

Professional Practice Gap & Educational Need: Prior studies have implicated gender, BMI, OSA and underlying predisposition to bony thinning (development of additional CSF leaks and/or concurrent osteoporosis) to the development of SSCD. Herein we leverage a large national database of healthcare outcomes to better characterize these associations.

Learning Objective: 1) Demonstrate the basic demographics (age, gender, race) of subjects with SSCD in the US 2) Identify key associations including elevated BMI, concurrent CSF leak, OSA or OP with the development of SSCD.

Desired Result: Attendees will appreciate the demographics and common risk factors associated with SSCD.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Changes in the Neurovascular Unit in Meniere's Disease

Steven D. Curry, MD; Ivan A. Lopez, PhD; Gail Ishiyama, MD; Akira Ishiyama, MD

Hypothesis: Degenerative changes in the neurovascular unit (NVU) in the human spiral ganglia (SG) in patients with Meniere's disease (MD) compared to normal patients underly the clinical manifestations of MD.

Background: Endolymphatic hydrops (EH) is the most consistent pathological correlate of MD, yet the etiology of MD is poorly understood. EH does not explain the changes in permeability of the cochlear blood-labyrinthine barrier seen with delayed contrast MRI or the fluctuations in hearing and impedances of patients with MD with cochlear implants.

Methods: Hematoxylin and eosin sections of the cochlea were obtained from temporal bones of normal patients (n=8, age 50-90 years, 5 male/3 female) and patients diagnosed with MD (n=8, age 44-92, 4 male/4 female). The number of spiral ganglia neurons (SGNs) in each cochlea was estimated. SGNs and blood vessels in the cochlea from normal and MD patients (archival celloidin sections from the same patients) were reliably identified with antibodies against acetylated-3-tubulin and glucose transporter-1 (GLUT-1) respectively and visualized by immunofluorescence and laser confocal microscopy.

Results: There was a significant decrease (50% loss) of SGNs among patients diagnosed with MD compared with age-matched controls ($p<.05$). Immunofluorescence-stained sections showed a marked decrease of blood vessels parallel to the loss of SGNs in MD specimens as compared to the controls.

Conclusions: The decrease of neurons and blood vessels as well as the clinical outcomes showed a correlation between regional damage of the cochlea and patient presentation. These results suggest that the NVU interaction maybe critical to preserve the SGNs in MD and establishes a framework for understanding the etiology and treatment of MD beyond EH.

Professional Practice Gap & Educational Need: Meniere's disease is poorly understood, with limited treatment options available. A better understanding of Meniere's disease at a cellular level may identify targets for therapeutic interventions.

Learning Objective: Understand the changes in the neurovascular unit seen in the cochlea in patients with Meniere's disease based on evidence from human temporal bone research.

Desired Result: Participants will understand how changes in the neurovascular unit contribute to our understanding of the pathophysiology of Meniere's disease beyond its association with EH.

Level of Evidence: Not applicable

Indicate IRB or IACUC: Approved, IRB #22-001587, UCLA Medical Center

NICHOLAS TOROK VESTIBULAR AWARD

Clinical Vestibular Function in Children with and without Sensorineural Hearing Loss

Graham D. Cochrane, MD, PhD; Emily Buss, PhD; Carlton Zdanski, MD

Objective: The objective of the study was to compare vestibular function between children with and without sensorineural hearing loss (SNHL)

Study Design: Cross-sectional, single visit

Setting: Tertiary hospital outpatient specialty clinic

Patients: Forty children ages 6-12 with (n=20) and without (n=20) SNHL of any severity, aided or unaided, without significant physical limitations that would impair their ability to complete balance and gait tasks.

Interventions: All participants completed a one-hour clinical vestibular protocol consisting of measures of static and dynamic balance, vestibular-ocular reflex function, and subjective visual vertical. Parents completed a self-report survey related to their child's birth, motor development, and current activity levels.

Main Outcome Measures: Participants completed the Modified Clinical Test of Sensory Integration on Balance (mCTSIB), a Dynamic Visual Acuity (DVA) task, a Subjective Visual Vertical (SVV) bucket task, the Functional Gait Assessment (FGA), and the Emory Modified Clinical Vestibular Chair Test (EMCVCT).

Results: Children with SNHL demonstrated significantly worse performance on FGA, DVA, SVV, and EMCVCT compared to children without SNHL. Parents of children with SNHL more commonly reported their child was sensitive to motion, clumsy, and less physically able than their peers. Children with bilateral SNHL and children with greater severities of hearing loss were more likely to demonstrate vestibular deficits across multiple tasks.

Conclusions: Deficiencies in vestibular function can be identified with low-cost tasks in children with SNHL and are associated with severity of hearing loss. Parents of children with SNHL report their children have greater physical limitations and trouble keeping up with peers. Future research should investigate whether these identifiable deficits can be improved with vestibular therapy and whether improvement in these functions may help alleviate those perceived physical limitations.

Professional Practice Gap & Educational Need: Vestibular deficits are identifiable in children with SNHL with simple tools clinics could use to screen and these deficits are associated with perceived physical limitations of the children. More children with SNHL should be screened for vestibular deficits as there are low-cost screening tools available and proper identification may aid in their motor development and physical activity levels with peers. More accessible vestibular screening protocols may help children with SNHL address balance difficulties and engage more actively with peers.

Learning Objective: Children with SNHL have easily identifiable deficits in vestibular function and are more likely to have perceived sensitivity to motion compared to children without SNHL.

Desired Result: These results should encourage providers to screen for vestibular deficits in children with SNHL and refer them appropriately to services such as vestibular therapy. Vestibular screening may not need to be done in a specialized, high-cost clinic to identify children who may benefit from therapy.

Level of Evidence – Level 3

Indicate IRB or IACUC: University of North Carolina at Chapel Hill IRB #23-2458

Otic Capsule Demineralization and Hearing Outcomes of Stapes Surgery for Otosclerosis

Akira Kimura, MD; Chihiro Yagi, MD, PhD; Yuka Morita, MD, PhD; Tatsuya Yamagishi, MD, PhD
Shinsuke Ohshima, MD, PhD; Shuji Izumi MD, PhD; Arata Horii, MD, PhD

Objective: To correlate the otic capsule demineralization with pre-/post-operative hearing parameters in otosclerosis.

Study Design: Retrospective study

Setting: University hospital

Patients: 181 consecutive ears with otosclerosis that underwent stapes surgeries from January 2003 to December 2020.

Interventions: Demineralization of the otic capsule was examined by CT.

Main Outcome Measures: Demineralization loci were examined using high resolution computed tomography seen as hypodense area in the otic capsule. Hearing parameters before and 12 months after surgeries were compared between demineralization (+) and (-) ears and were also correlated with number of loci in demineralization (+) group.

Results: There were eighty-five ears in the demineralization (-) group, while one or more hypodense areas were found in 96 ears (53%) (demineralization (+) group). Preoperative air-conduction (AC) threshold was significantly worse due to larger air-bone gap (ABG) in demineralization (+) group than that in demineralization (-) group, while there was no difference in bone-conduction (BC) thresholds between groups. Postoperative AC was significantly worse due to larger ABG in demineralization (+) group, whereas there were no significant differences in postoperative BC and closure of ABG between groups. No significant relationship was found between the number of demineralization loci (single to triple) and pre-/post-operative hearing parameters in demineralization (+) group.

Conclusions: While both pre- and post-operative AC were worse in demineralization (+) group than those of (-) group, significant and similar closure of ABG was obtained in demineralization (+) group as in (-) group. Otic capsule demineralization may attribute to possible third window syndrome and ABG that cannot be fixed by stapes surgeries.

Professional Practice Gap & Educational Need: The role of demineralization for otosclerosis has no consensus.

Learning Objective: The extent of demineralization observed on CT does not correlate with hearing outcomes after stapes surgery.

Desired Result: Learning the significance of the demineralization

Level of Evidence - Level IV

Indicate IRB or IACUC: Niigata University Hospital (No. 2020-0446)

Pseudomembranes and Tissue Plugs in the Round Window Niche: Implications for Inner Ear Drug Delivery

Nicole Kim, BA; Liliya Benchetrit, MD
Anbuselvan Dharmarajan, MD, MPH; Alicia M. Quesnel, MD

Hypothesis: We hypothesize that a significant proportion of human temporal bone specimens has anatomical obstructions in the round window niche, including pseudomembranes and tissue plugs, and certain patient factors predict these obstructions.

Background: Therapies for sensorineural hearing loss (SNHL) may utilize intratympanic drug delivery through the round window membrane (RWM) of the cochlea. However, anatomical barriers like pseudomembranes and tissue plugs may impede access if drug delivery relies on diffusion across the RWM or intracochlear access without surgical dissection of the RWM. This study, the largest survey of RWM obstructions to date, aims to assess their prevalence and identify factors predictive of obstructions relevant to inner ear drug delivery.

Methods: Temporal bone cases with SNHL and normal hearing controls were selected from Massachusetts Eye and Ear, University of Pittsburgh, and Hospital Nacional de Niños using the NIDCD National Temporal Bone Registry. Exclusion criteria included prior otologic surgery, middle ear disease, and congenital ear anomalies. Histopathologic analysis was performed.

Results: 279 temporal bones were analyzed, including 215 with SNHL and 64 controls. RWM obstruction prevalence was 37.3% for pseudomembranes and 28.3% for tissue plugs, with no significant differences between SNHL and controls. Multivariate analysis showed age over 18 was significantly associated with pseudomembranes (Odds Ratio [OR]: 8.45), while age 18 or younger was associated with tissue plugs (OR: 2.63). Hearing loss due to Meniere's disease (OR: 0.08) or ototoxicity (OR: 0.13) predicted a lower likelihood of pseudomembranes.

Conclusions: Pseudomembranes and tissue plugs are common in the RWN, with 2/3 of ears demonstrating either obstruction. Adults were more likely to have pseudomembranes, while pediatric patients were more likely to have tissue plugs. These findings may impact inner ear drug delivery strategies.

Professional Practice Gap & Educational Need: This research highlights the prevalence of RWM obstructions, including pseudomembranes and tissue plugs, and begins to elucidate associations of obstruction types with age and specific hearing loss etiologies. It aims to stimulate discussion on potential anatomical assessment protocols for more effective inner ear drug delivery.

Learning Objective: Recognize that the presence of RWM obstructions, including pseudomembranes and tissue plugs, is relatively common. Identify age and certain hearing loss etiologies as factors relevant to the prevalence of obstructions.

Desired Result: Improve awareness of types of RWM obstruction, which may have implications for intratympanic or intracochlear approaches to inner ear drug delivery.

Level of Evidence – III

Indicate IRB or IACUC: Protocol # 2021P001593 (Human Temporal Bone Pathology of Sensorineural Hearing Loss, Otosclerosis, and Post Cochlear Implantation), Mass Eye and Ear U24 grant

Are Jak Inhibitors Contributing to Ototoxicity?
Investigating Their Role in Aminoglycoside-Induced Damage

Jonathan Fleegel; Marisa Zallocchi, PhD

Hypothesis: Inhibition of the JAK-STAT signaling pathway, either pharmacologically with JAK or genetically through JAK2 knockout, potentiates the ototoxic effects of aminoglycosides. JAK2 knockout mice will show increased susceptibility to aminoglycoside-induced ototoxicity.

Background: Aminoglycosides are effective antibiotics but are linked to irreversible ototoxicity. Although the mechanisms underlying aminoglycoside-induced ototoxicity are being explored, the role of specific signaling pathways in modulating this ototoxicity remains unclear.

Methods: Auditory function was assessed using auditory brainstem response (ABR) and distortion product otoacoustic emissions (DPOAE) across multiple frequencies. Vestibular function was evaluated with vestibular short-latency evoked potentials (VsEP). C57BL/6J Cdh23-corrected mice were treated with JAK inhibitors (momelotinib 20 mg/kg, tofacitinib 20 mg/kg, upadacitinib 10 mg/kg) via oral gavage for 14 days, alone or combined with kanamycin (600 mg/kg, S.C.). In a separate experiment, Pax2-Cre; JAK2^fl/fl knockout mice were treated with kanamycin, or tobramycin (200 mg/kg, S.C.). Vestibular testing was conducted for all animals exposed to tobramycin.

Results: All JAK inhibitors significantly potentiated the ototoxic effects of kanamycin, as evidenced by elevated ABR and DPOAE thresholds across multiple frequencies. JAK2 knockout in mice treated with kanamycin or tobramycin exhibited significant hearing loss and vestibular dysfunction compared to controls. RM-ANOVA with Tukey's HSD was used for statistical testing.

Conclusions: Systemic administration of JAK inhibitors enhances the ototoxic effects of kanamycin, emphasizing the role of the JAK-STAT pathway in auditory protection. JAK2 knockout mice were particularly vulnerable to aminoglycoside-induced hearing loss and vestibular dysfunction. These findings highlight a critical role for JAK-STAT signaling in mitigating aminoglycoside ototoxicity, suggesting that patients treated with JAK inhibitors could be at higher risk for hearing loss when exposed to aminoglycosides. Monitoring for ototoxicity may be beneficial in these populations.

Professional Practice Gap & Educational Need: Jak inhibitors are a rapidly growing class of drugs that may increase the susceptibility of patients to ototoxic effects of various drugs. A formal clinical assessment through ototoxicity monitoring programs would be beneficial in identifying the risk associated with the use of these drugs and adverse hearing and vestibular consequences.

Learning Objective: The identification of unknown at-risk clinical cohorts for ototoxicity.

Desired Result: Clinical monitoring and risk assessment in patients exposed to Jak inhibitors.

Level of Evidence – I

IACUC Protocol number(s): Creighton University IACUC: 1148 and 1251.

Computer Vision-Based Extraction of Structured Data from Scanned Audiograms in the Electronic Health Record

Peter R. Dixon, MD, MSc; Ruoyu Yang, PhD; Dana Mae Salvador, BSc; Carl Ehrett, PhD

Objective: A barrier to leveraging real-world data from electronic health records (EHRs) for hearing research is the inability to confirm hearing loss diagnosis and quantify its severity. This study aims to develop a machine learning-based approach to interpret scanned audiogram test sheets from the HER at scale.

Study Design: A contour-based computer vision (CV) method to extract structured data from scanned audiograms with hand-drawn symbols stored in the EHR

Setting: Tertiary academic health network

Patients: Models were trained on 907 audiograms (Jan 1, 2014 – Dec 31, 2022) selected using stratified random sampling to ensure balanced representation of normal hearing, bilateral sensorineural, asymmetric sensorineural, conductive, and mixed hearing loss. Audiograms were download, de-identified, and pure tone thresholds manually extracted to serve as the ground truth.

Interventions: The CV pipeline accepted audiogram PDF files as inputs and returned frequency (Hz) and threshold (dB HL) estimates for all symbols.

Main Outcome Measures: Mean absolute error (MAE) on 30 test audiograms randomly sampled from the EHR comparing CV-generated and ground truth values

Results: The pipeline has three steps: (1) Image cropping to segment the pure tone threshold plot, (2) Pattern detection using grayscale conversion and contrast enhancement preprocessing, followed by contour identification to calculate symbol center points, and (3) Pattern coordinate calibration to identify axis labels and translate center points from pixel to audiogram coordinates. In the test set, the MAE was 136 Hz for frequency and 1.3 dB HL for threshold across all symbols.

Conclusions: The CV method accurately estimates symbol coordinates for pure tones. Future work will expand the pipeline for automated identification of audiograms within EHR media and integrate deep learning algorithms, such as convolutional neural networks, to enhance pattern classification and scalability for hearing health research.

Professional Practice Gap & Educational Need: Despite the growing availability of EHR data, clinicians and researchers face challenges in identifying hearing loss and quantifying its severity due to the unstructured nature of scanned audiograms stored as images. There is a need for education on how machine learning and computer vision techniques can automate the extraction of structured data from these audiograms, enabling more efficient research and clinical workflows. This session addresses the gap by introducing practical approaches for leveraging automated methods to enhance hearing health services research.

Learning Objective: Understand how computer vision can extract data from scanned audiograms and explore its applications in hearing health research using EHR data.

Desired Result: Attendees will be able to describe the potential of machine learning-based methods for audiogram interpretation, recognize how automated data extraction can improve research workflows, and identify future directions for integrating deep learning in hearing health studies.

Level of Evidence - Level IV

Indicate IRB or IACUC: Exempt

MICHAEL E. GLASSCOCK SCIENTIFIC MERIT AWARD

Conductive Hearing Loss is Associated with Dementia in the All of Us Research Program

Hannah N. W. Weinstein, BA; Lauren H. Tucker BA; Michael W. Denham, MD, MS, MPhil
Richard K. Gurgel, MD, MSCI; Justin S. Golub, MD, MS

Objective: Sensorineural hearing loss (SNHL) has been associated with cognitive impairment and dementia. However, because SNHL contains a neural component, it is difficult to exclude reverse causation whereby dementia causes worse SNHL. Conductive hearing loss (CHL), a purely peripheral phenomenon, would not have this limitation. We investigate the association between CHL and dementia in a large national cohort.

Study Design: Cross-sectional epidemiologic study

Setting: The NIH All of Us Research Program, which includes aggregated data from the electronic health records of voluntary participants.

Patients: ≥18 years old (n=399,927).

Main Outcome Measures: Dementia defined by ICD-10 codes (F01, F03, G30-32).

Methods: The exposure was CHL defined by ICD-10 codes (H90.0-90.2). The odds of dementia in subjects with and without CHL were assessed with multivariable regression, controlling for potentially confounding variables (age, sex, education).

Results: The mean (SD, range) age was 56 years (±17, 20-124). 242,911 (60.7%) participants identified as female. The cohort included 1,274 (0.3%) individuals with CHL and 398,653 (99.7%) without CHL. Overall, 6,425 (1.6%) participants had dementia. After controlling for covariates, the odds of dementia were 2.7 times (95% CI 2.1-3.4; $p<0.0001$) higher for those with CHL compared to those without CHL. The odds remained unchanged (OR=2.7, CI 2.1-3.5; $p<0.0001$) when examining only participants >60 years old w ho are in an age range at higher risk for dementia.

Conclusions: In the All of Us dataset, CHL was strongly associated with dementia. This supports CHL as a risk factor for cognitive disorders, and the theory that any sensory deprivation to the brain can be detrimental. As it is implausible for dementia to cause CHL, a purely peripheral process, the possibility of reverse causation as an explanation is eliminated.

Professional Practice Gap & Educational Need: The association between CHL and cognition is emerging, with additional investigation needed to improve understanding, monitoring, diagnosis, and management of the association between these chronic conditions.

Learning Objective: Participants will understand the association between CHL and dementia, while considering the utility and pitfalls of using national databases and EHRs in large epidemiologic investigations.

Desired Result: Participants will better understand the relationship between CHL and cognition.

Level of Evidence: IV

Indicate IRB or IACUC: All study procedures were confirmed as meeting criteria for non-human subjects research by the All of Us Research Program IRB.

Safety of Middle Cranial Fossa Repair of Spontaneous Cerebrospinal Fluid Leaks in Superobese Patients

Hunter Elms, MD; Douglas Totten, MD; Evan Cumpston, MD
Charles Yates, MD; Rick Nelson, MD, PhD

Objective: Determine how complication rates vary according to body mass index (BMI) in middle cranial fossa (MCF) repairs of spontaneous cerebrospinal fluid leaks (sCSF-L)

Study Design: Retrospective case series

Setting: Tertiary academic

Patients: Adults with MCF sCSF-L

Interventions: Middle fossa craniotomy skull base repair

Main Outcome Measures: 90-day rates of any perioperative complications according to American Surgical Association severity (grades 1-5) and rates of ipsilateral persistent leak within 90 days of initial surgery

Results: 125 patients (64% female), aged 28-81 (57.7±11.3) years, underwent MCF repairs of 143 spontaneous tegmental leaks (50% right-sided, 36% left-sided, 14% bilateral). Patient BMIs ranged from 23.6-85.4 (39.5±10.1) kg/m^2. 2.4% of patients were normal weight, 11.2% were overweight, 23.2% class 1 obese, 21.6% class 2, and 41.6% class 3. Successful initial surgical repair was accomplished in 96.8% of cases, with 91.2% of cases complication-free. When comparing BMI classes to each other, as well as comparing class 3 obese patients to all others, there were no significant differences in overall complication rates, severity scores, or rates of persistent CSF leaks.

Conclusions: In a population where 41.6% of patients had class 3 obesity, BMI and class 3 obesity did not significantly affect surgical success, complication rates, or severity of perioperative complications from MCF sCSF-L repairs. MCF repair had a first-case success rate >95%, with complication rates <10%.

Professional Practice Gap & Educational Need: level of surgeon willingness to offer MCF repair of sCSF-L to very obese patients

Learning Objective: Evaluate the effect of BMI on safety profile of MCF sCSF-L repair

Desired Result: Consideration of surgery for very obese patients who meet criteria

Level of Evidence: V

Indicate IRB or IACUC: Exempt

A Systematic Review and Meta-Analysis of Meningitis Risk Reduction after Repair of Spontaneous Lateral Skull Base Cerebrospinal Fluid Leaks

Khadija Khan, BA; Prishae Wilson, BS; Mayuri S. Patel, BSc
Estephania Candelo, MD; Zhen Wang, PhD; Tara Brigham, MLIS, AHIP-D; Mallory Raymond, MD

Objective: To estimate the relative risk of meningitis after repair of spontaneous lateral skull base cerebrospinal fluid (CSF) leaks through meta-analysis of published studies.

Data sources: PubMed, Medline, Embase, Cochrane, SCI-EXPANDED, ESCI, Epistemonikos, and WHO Global Index Medicus were queried for terms including and related to meningitis, CSF leak, surgical repair, and spontaneous from inception to April 02, 2024.

Study selection: Prospective and retrospective studies in any language reporting either preoperative or postoperative rates of meningitis in adult patients with spontaneous lateral skull base CSF leaks were included.

Data extraction: Two reviewers independently screened 2,564 studies identified by the search and extracted data and evaluated risk of bias in 57 studies that met inclusion criteria. Risk of bias was assessed using the JBI Critical Appraisal Checklist for Case Series and the Newcastle-Ottawa Quality Assessment Scale for Cohort Studies.

Data synthesis: Of 1,310 patients who met inclusion criteria, 1,239 underwent CSF leak repair. 52 studies reported rates of preoperative meningitis, and 27 studies reported rates of postoperative meningitis. 22 studies with a total of 511 patients reported both rates. The average follow-up period of 17 studies reporting duration of follow-up was 23.1 months. A random effects generalized linear mixed model was used to pool and compare logit transformed risk of meningitis before and after repair. The pre-operative pooled risk of meningitis was 0.16 (95% CI: 0.13 to 0.25, I^2=40.57%). The post-operative pooled risk was considerably lower at 0.01 (95% CI: 0.01 to 0.14, I^2=4.16%). With substantial heterogeneity (I^2=62.94%), we observed a relative risk of meningitis after repair of 0.02 (95% CI: 0.00 to 0.79, p=0.04).

Conclusions: Surgical repair significantly reduces the risk of meningitis in adults with spontaneous lateral skull base CSF leaks.

Professional Practice Gap & Educational Need: The risk reduction of meningitis from undergoing surgical repair of spontaneous CSF leaks is unknown. Without an estimate of both the pre- and postoperative risk of meningitis, counseling patients, especially those who are asymptomatic, on the need for surgical repair can be challenging. Pooled rates of pre- and postoperative meningitis can help to guide decisions on whether to proceed with surgical repair.

Learning Objective: To understand the relative risk of meningitis in adult patients after repair of spontaneous lateral skull base CSF leak.

Desired Result: Clinicians can quote the estimated rate of pre- and postoperative meningitis in patients with spontaneous lateral skull base CSF leak and the relative risk after surgical repair.

Level of Evidence: Level III.

Indicate IRB or IACUC: Exempt.

Intracranial Dural Arteriovenous Fistula Can Mimic Sigmoid Sinus Wall Anomalies Induced Pulsatile Tinnitus: Caution Before Considering It's Venous

Yue-Lin Hsieh, MD, PhD; Xu Liu, MD; Wuqing Wang, MD, PhD

Objective: To highlight that dural arteriovenous fistula (DAVF) can exist in subjects with unilateral vascular pulsatile tinnitus (PT), positive internal jugular vein (IJV) compression tests, and radiologic evidence of sigmoid sinus wall anomalies (SSWA). 2) To introduce the "moth-eaten sigmoid plate" sign and emphasize the importance of retroauricular compression in diagnosing PT.

Study Design: Retrospective data analysis.

Setting: Multi-institutional tertiary university medical centers.

Patients: 81 subjects with PT as sole symptom and intracranial DAVF.

Interventions: High-resolution temporal bone CT and magnetic resonance angiography (MRA) were conducted.

Main Outcome Measures: The moth-eaten sigmoid plate sign and DAVF-induced SSWA were defined, and their correlation with PT duration was studied.

Results: Significant differences were observed between ipsilateral IJV and retroauricular compression outcomes in DAVFs located at the transverse-sigmoid sinus ($p < 0.01$) and hypoglossal canal ($p < 0.01$). Among 71 subjects with CT data, the moth-eaten sign was found in 29 of 37 subjects (78.4%) with DAVFs at the transverse-sigmoid sinus. SSWA and JB anomalies were observed in 40.8% of subjects. PT duration significantly differed between subjects with SSWA and those without SSWA ($p < 0.01$).

Conclusions: The presence of SSWA on CT and a positive IJV compression test should not be considered conclusive for diagnosing venous PT. The "moth-eaten sigmoid plate" sign on non-contrast CT and positive retroauricular compression are strong indicators of DAVF as the primary cause of PT.

Professional Practice Gap & Educational Need: 1) A positive IJV compression test and non-contrast CT presence of SSWA is not sufficient for diagnosis of venous PT. 2) The "moth-eaten sigmoid plate" sign on non-contrast CT and positive retroauricular compression are strong indicators of DAVF as the primary cause of PT.

Learning Objective: Understanding the significance of conducting MRA examinations for patients with vascular PT is crucial to prevent misdiagnosing the vascular causes of PT. This understanding is essential for accurate diagnosis and appropriate treatment planning.

Desired Result: Improved diagnosis rates in treating PT caused by DAVF and decreased incidences of unnecessary and potentially harmful surgical interventions.

Level of Evidence – III

Indicate IRB or IACUC: The present study was approved by the medical ethics committee of the Eye, Ear, Nose, and Throat Hospital of Fudan University (No. 2024125) on January 2024.

Risk Factors and Developmental Patterns of Spontaneous New Encephaloceles Following Initial Repair

Keshav V. Shah, BS; Kevin Wong, MD; Timothy Shim, MD; Tiffany P. Hwa, MD
Douglas C. Bigelow, MD; Michael J. Ruckenstein, MD

Objective: To identify risk factors and temporal patterns for the spontaneous development of new encephaloceles following initial repair of skull base defects.

Study Design: Retrospective case-control study

Setting: Tertiary academic medical center

Patients: Consecutive adult patients with skull base defects repaired from October 2012 to October 2024.

Interventions: Electronic medical records of qualifying patients were searched for relevant demographics, medical history, disease characteristics, surgical approach, local and non-local encephalocele recurrence, and postoperative outcomes. Analysis was performed using Mann-Whitney U, Kruskal-Wallis, and Fischer's exact tests.

Main Outcome Measures: Risk factors for, median time to, and location of recurrent skull base encephaloceles.

Results: 176 adults met inclusion criteria. Mean age was 56.8 years old (SD 12.4 years), average BMI was 35.2 kg/m^2 (SD 8.5 kg/m^2), and 110 (62.5%) patients were female. 23 (13.1%) patients developed new encephaloceles after initial repair, with a median time to recurrence of 0.86 years (IQR [0.13, 2.63]). Of these newly developed skull base encephaloceles, 3 (13.0%) were contralateral, 7 (30.4%) were anterior, and 13 (56.5%) were ipsilateral. History of idiopathic intracranial hypertension (IIH) (OR 12.1 [4.4, 33.4]; $p<0.001$) was significantly associated with new encephaloceles; bilaterality (OR 2.6 [0.97, 7.1]; $p=0.07$), revision surgery (OR 3.0 [0.86, 10.6]; $p=0.09$), and history of sleep apnea (OR 2.1 [0.86, 5.2]; $p=0.10$) approached significance. BMI, when calculated both including and excluding patients with IIH, was not significant.

Conclusions: Although new spontaneous encephaloceles are uncommon following initial repair, the management of comorbid medical conditions and routine postoperative surveillance is crucial, especially for higher-risk individuals such as those with IIH. Higher-powered studies are warranted to further explore associations that approached significance in this study, such as sleep apnea, bilaterality, and revision surgery.

Professional Practice Gap & Educational Need: Skull base encephaloceles have become an increasingly common pathology in adults. It is critical to identify patients who are at risk for recurrent or new encephaloceles following an initial repair and elucidate their risk factors, developmental timeframe, and anatomic characteristics.

Learning Objective: 1) Recognize risk factors associated with locally and non-locally recurrent encephaloceles and 2) familiarize oneself with the typical timeframe and pattern in which they recur.

Desired Result: Synthesize pre-existing knowledge about encephalocele symptoms with empiric data about risk factors and temporal patterns to better monitor patients for local and non-local recurrence.

Level of Evidence: IV – Retrospective case-control study

Indicate IRB or IACUC: University of Pennsylvania Institutional Review Board (#856621)

Factors Associated with Cochlear Implant Utilization in Adults with Single-Sided Deafness

Matthew J. Wu, MD; Amit Walia, MD, MSCI; Shubhanjali Minhas, BA; Jill Firszt, PhD
Jacques A. Herzog, MD; Craig A. Buchman, MD; Matthew A. Shew, MD

Objective: Determine daily utilization of cochlear implants (CI) in adults with single-sided deafness (SSD)

Study Design: Retrospective, cross-sectional study (7/2018-9/2024)

Setting: Tertiary referral center

Patients: Adult CI recipients implanted for SSD (pure tone average [PTA] ≤35dB hearing loss [HL] in non-implanted ear)

Interventions: CI

Main Outcome Measures: Mean daily CI usage (in hours) determined through datalogging and speech perception measures at pre-op, 3- and 6-month intervals.

Results: One-hundred twenty-four adult patients underwent CI for SSD. The most common HL etiologies included sudden hearing loss (n=52, 41.9%) and unknown (n=42, 33.9%). Median length of audiometric follow-up was 1 year (range 0.1-8.1). Of the 112 patients with available datalogging, 71 (63.4%) were full-time users (≥6 hours/day). Analyses of the 41 partial users showed 41 (36.6%), 25 (22.3%), 12 (10.7%) and 2 (1.8%) patients used the device <6, <4, <2, or 0 hours/day, respectively. A logistic regression model was used to identify factors associated with CI utilization (≥6 hours/day). Age at implantation (β=1.02; 95%CI: 0.99–1.05), preoperative PTA (β=1.00; 95%CI: 0.98–1.03), HL duration (β=1.00; 95%CI: 0.96–1.05), and preoperative CNC word scores (β=1.01; 95%CI: 0.97–1.05) were not associated with utilization. A separate logistic regression was used to identify factors associated with use <2 hours/day. While controlling for duration of HL, 6-month CNC word scores (β=0.99; 95%CI: 0.94–1.04) were not associated with non-use.

Conclusions: Non-utilization of CI in SSD patients appears low although more limited use (<6 hours/day) is common. Patient factors did not explain more limited utilization. Future work is needed to better understand more limited daily utilization of CI in SSD patients.

Professional Practice Gap & Educational Need: Given the relatively recent expansion of indications for adult CI to include SSD, large scale analyses of daily utilization in this population are needed to inform patient and clinician expectations.

Learning Objective: Understand CI utilization rates in adults with SSD (full-time usage, partial usage, and non-usage).

Desired Result: Physicians will understand that traditional CI performance metrics may not explain under-usage in the SSD population. Datalogging in SSD patients may also not capture quality of life associations driving satisfaction. Future work needs to explore factors associated with use to improve patient counseling and selection.

Level of Evidence - IV

Indicate IRB or IACUC: Washington University in St. Louis IRB #202408206 (8/30/24).

NEUROTOLOGY FELLOW AWARD

Factors Associated with Delayed Loss of Residual Acoustic Hearing Following Cochlear Implantation

Michael W. Canfarotta, MD; Ankita Patro, MD, MS; Natalie Schauwecker, MD; Connie Ma, MD
Aaron C. Moberly, MD; Jourdan T. Holder, AuD, PhD; Elizabeth L. Perkins, MD

Objective: To identify factors associated with delayed loss of preserved low-frequency acoustic hearing following cochlear implantation.

Study Design: Retrospective cohort.

Setting: Tertiary referral center.

Patients: One hundred fifty-four adult cochlear implant (CI) recipients with initial "functional" hearing preservation (low-frequency pure-tone average [LFPTA; 125, 250, and 500 Hz] ≤80 dB HL) at 1 month postoperatively.

Interventions: Cochlear implantation with a straight (n = 114), precurved non-styletted (n = 26), or precurved styletted (n = 14) electrode array.

Main Outcome Measures: Binary logistic regression was performed to investigate variables associated with delayed loss of functional residual hearing during the first year after implantation.

Results: Among 154 CI recipients, 114 (74%) retained functional residual hearing through the first year postoperatively. Patients with a younger age at surgery (odds radio [OR], 0.96 [95% CI, 0.93-0.99]; p = 0.034), precurved styletted electrode array (OR, 5.5 [95% CI, 1.34-22.55]; p = 0.018), and higher LFPTA at the 1-month postoperative interval (OR, 1.31 [95% CI, 1.18-1.45]; p < 0.001) were more likely to experience delayed loss of functional residual hearing. There were no significant effects of biological sex, diabetes, postoperative steroid use, or initial LFPTA shift due to surgery ($p \geq 0.15$).

Conclusions: For the present cohort of CI recipients with initial low-frequency hearing preservation, younger age at surgery, implantation with a precurved styletted electrode array, and a higher LFPTA at 1 month postoperatively were associated with delayed loss of functional hearing. Additional studies are needed to determine the mechanisms by which these factors place patients at risk for delayed hearing loss.

Professional Practice Gap & Educational Need: While variables associated with acute and long-term hearing preservation have been extensively studied, there is limited data on factors contributing to delayed hearing loss in CI recipients that initially preserve low-frequency acoustic hearing. As we aim to reduce the postoperative inflammatory response with the use of robotics and drug-eluting electrode arrays, it will be imperative to understand baseline characteristics that are associated with delayed hearing loss.

Learning Objective: (1) Understand previously identified factors associated with acute and long-term hearing preservation. (2) Describe factors that are associated with delayed hearing loss in CI recipients that initially preserve low-frequency acoustic hearing.

Desired Result: At the conclusion of this presentation, providers should have a better understanding of factors related to delayed hearing loss following cochlear implantation and possible mechanisms to explain these findings.

Level of Evidence – Level IV

Indicate IRB or IACUC: IRB #240876, Vanderbilt University

Perimodiolar Electrode Locations Outperform Lateral Wall Arrays when Controlling for Cochlear Health and Speech Processing Strategy

Amit Walia, MD, MSCI; Matthew A. Shew, MD; Amanda Ortmann, PhD
Matthew Wu, MD; Shannon Lefler, AuD; Jacques A. Herzog, MD; Craig A. Buchman, MD

Objective: To assess how variations in scala tympani (ST) electrode position affect speech-perception performance, controlling for cochlear health and stimulation strategy.

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: Ninety-eight postlingual adult cochlear implant (CI) recipients participated—21 received lateral wall electrodes (CI624;20-mm) and 77 received perimodiolar electrodes (CI632;18.4-mm). All patients used the Advanced Combination Encoder (ACE) strategy with ST insertions. Cochlear health was assessed via pre-insertion round window electrocochleography-total response (ECochG-TR). Postoperative 3D CT-reconstructions determined electrode proximity to the modiolus (wrapping factor, WF) and angular insertion depth (AID).

Main Outcome Measures: Speech-perception testing at 6-months post-activation (CNC)

Results: A strong positive correlation existed between ECochG-TR and CNC scores (r=0.61; 95% CI:0.42-0.84). WF showed a weak negative correlation with CNC (r=-0.36; 95% CI:-0.53 to -0.16; tighter WF with better performance), while AID demonstrated a weak positive correlation (r=0.29; 95% CI:0.08-0.47; deeper AID with better performance). A regression model using ECochG-TR underestimated performance for electrodes with tighter WF and deeper AID, and overestimated performance for lateral wall location and shallower insertions. A multivariate regression combining ECochG-TR, AID, and WF improved speech perception estimation significantly (R^2=0.51; P=0.001).

Conclusions: Electrode location within the ST varies significantly, even within the same electrode type; perimodiolar arrays can reside along the lateral wall if over-inserted, and lateral wall arrays can approach the modiolus. Incorporating electrode location and ECochG-TR into speech-perception models is crucial for understanding differences between electrode types. When controlling for these variables using the same processing strategy, our study shows that perimodiolar electrodes with tighter WFs outperform lateral wall electrodes on 6-month CNC scores. This underscores the importance of controlling these factors to determine optimal electrode location.

Professional Practice Gap & Educational Need: Perimodiolar electrodes are designed to assume a position closer to the modiolus, in closer proximity to the neural elements for more precise stimulation. However, the wide variability in CI performance makes the numerous comparative studies on electrode type and location inconclusive. Controlling for cochlear health using electrocochleography-total response (ECochG-TR) allows for logical segmentation of the recipient population, thereby enabling comparisons of variables such as device type, electrode location, processing strategy, and many others. This study investigates whether controlling for stimulation strategy (i.e., Advanced Combination Encoder strategy) and cochlear health (i.e., ECochG-TR) can reveal the impact of intrascalar electrode location on performance. Notably, not all perimodiolar electrodes maintain close proximity to the modiolus. Without proper pull-back techniques, these arrays can be displaced to an anti-modiolar location, undermining the intent of the precurved design.

Learning Objective: To evaluate the impact of perimodiolar electrode proximity (i.e., WF) and angular insertion depth on speech-perception performance, emphasizing the impact of cochlear health and electrode position in CI studies.

Desired Result: Investigators will recognize the importance of cochlear health and electrode position when designing studies to improve CI outcomes—such as mapping, auditory rehabilitation, electrode selection, steroid use, and more.

Level of Evidence - IV

Indicate IRB or IACUC: Washington University in St. Louis IRB #202007087 (5/16/23).

One or Two Cochlear Implants? A Comparison of Bimodal Hearing Versus Bilateral Cochlear Implantation in a Large Cohort of Traditional Candidates

Ankita Patro, MD, MS; Michael W. Canfarotta, MD; Natalie Schauwecker, MD; Elizabeth L. Perkins, MD
David S. Haynes, MD; René H. Gifford, PhD; Aaron C. Moberly, MD

Objective: 1) To identify preoperative factors that impact the pursuit of bimodal hearing versus bilateral implantation among traditional cochlear implant (CI) candidates, and 2) To compare postoperative outcomes in these two groups.

Study Design: Retrospective cohort.

Setting: Tertiary referral center.

Patients: 499 adult CI recipients (386 bimodal, 113 bilateral CI users) with preoperative best-aided AzBio scores in quiet $\leq$ 60% in both ears.

Main Outcome Measures: Demographics; pure-tone average (PTA); AzBio in quiet; Speech, Spatial, and Qualities of Hearing Scale (SSQ); datalogging.

Results: Preoperatively, compared to bimodal recipients, bilateral CI recipients were significantly younger (58.6 vs. 67.7 years, $p<0.001$) and had worse audiometric thresholds (PTA in worse hearing ear: 95.4 vs. 88.4 dB HL, $p<0.001$; PTA in better hearing ear: 90.0 vs. 74.3 dB HL, $p<0.001$). Bilateral CI recipients had worse AzBio in quiet scores at initial CI evaluation: worse hearing ear (8.6% vs. 12.9%, $p=0.009$); better hearing ear (19.3% vs. 25.7%, $p=0.003$); and binaural (27.2% vs. 35.6%, $p=0.002$). Gender, race, duration of deafness, and preoperative SSQ scores were similar between the two groups ($p>0.05$). Compared to bilateral CI users after their second CI, bimodal patients had equivalent device usage (10.7 vs. 11.8 hours, $p=0.109$) but lower AzBio in quiet scores in the everyday listening condition at 12 months (60.0% vs. 73.3%, $p=0.005$). After controlling for datalogging, age, and preoperative scores on multivariable analysis, 12-month speech recognition scores remained higher in the bilateral CI group.

Conclusions: Traditional CI candidates who pursue bilateral implantation over a bimodal hearing configuration are younger and have worse preoperative hearing and speech recognition. Even after controlling for age and baseline scores, long-term speech recognition may be superior with bilateral CIs.

Professional Practice Gap & Educational Need: To our knowledge, the impact of preoperative factors on whether patients pursue one or two CIs, when both ears qualify, has not been reported. While the benefits of bimodal hearing and bilateral cochlear implantation have been explored in the literature in smaller sample groups, this is the first study to compare the benefits of bimodal hearing versus bilateral CIs in a large cohort of patients.

Learning Objective: 1) To understand factors that influence when patients pursue a bimodal hearing configuration versus bilateral cochlear implants, 2) To describe differences in postoperative outcomes between bimodal and bilateral CI users.

Desired Result: Providers will have knowledge about the impact of age and preoperative hearing on the pursuit of bilateral CIs when both ears qualify during initial evaluation. Moreover, they will understand differences in speech recognition performance between bimodal and bilateral CI users. These findings can help counsel patients in both the preoperative and postoperative settings.

Level of Evidence: Level IV – Historical cohort or case-controlled studies.

Indicate IRB or IACUC: IRB Exempt (240876, Vanderbilt University, approved 8/23/24).

Evaluating the Impact of Cochlear Implantation on Cognitive Outcomes in Older Adults: A 5-year Follow-up

Samira Takkoush, MD; Kevin Duff, PhD; Norman L. Foster, MD
Neil S. Patel, MD; Richard K Gurgel, MD, MSCI

Objective: To assess the impact of cochlear implantation (CI) on cognitive outcomes in older adults 5 years post-implantation.

Study Design: Prospective, interventional study.

Setting: Tertiary care center.

Patients: Cochlear implant recipients aged 65 or older.

Interventions: Subjects underwent pre-operative cognitive testing with a novel battery of neuropsychological tests including those assessing global cognition (Mini-Mental Status Exam), verbally-based cognition (Digit span, Stroop, Hopkins Verbal Learning Test – Revised, Hayling Sentence Completion) and comparable visually-based cognition (Spatial span, d2 Test of Attention, Brief Visuospatial Memory Test – Revised [BVMT-R], Trails A and B). Testing was repeated 5 years post-operatively.

Main Outcome Measures: Cognitive outcomes assessed with cognitive testing battery.

Results:
After 5.71 ± 1.14 years following cochlear implantation, 16 subjects (mean age 83 ± 7.22 years, 93.75% male, 87.5% with normal pre-operative cognitive status) repeated the cognitive battery. In comparison to pre-operative testing, subjects showed a significant improvement on the Hayling Sentence Completion test, which evaluates executive functioning (Wilcoxon signed rank: Z=-2.275, p=0.023). Conversely, there was a significant decrease in their scores on a verbal test of executive functioning (Stroop Color-Word: Z=-2.557, p=0.011) and visually-based tests of attention (d2 standardized score: Z=-2.24, p=0.025; Spatial span total score: Z=-2.388, p=0.017), memory (BVMT-R: Total T score Z=-2.500, p=0.012, delayed T score Z=-2.703, p=0.007), and executive functioning (Trails B seconds: Z=-2.158, p=0.031). Other test scores did not show a significant change on follow-up.

Conclusions: In a 5-year follow-up, participants demonstrated a significant improvement on a verbally based test of executive functioning from baseline, suggesting a beneficial role of cochlear implantation in enhancing this cognitive domain in older recipients. Other tests of cognition showed stable scores or a decline, highlighting how cognitive domains may be affected differentially with aging following CI.

Professional Practice Gap & Educational Need: The long-term effect of CI on cognitive status of older adults who are at risk of dementia associated with hearing loss.

Learning Objective: Learners will better understand the long-term impact of cochlear implants on cognition in older adults.

Desired Result: To demonstrate that cochlear implants in older adults can improve cognition in certain domains, while other domains are unaffected or continue to decline with age.

Level of Evidence: Level III

Indicate IRB or IACUC: IRB 00083983, The University of Utah.

Tone Adaptation among Cochlear Implant Candidates to Inform Hearing Preservation during Awake Cochlear Implantation

Karl R. Khandalavala, MD; Jill M. Gruenwald, AuD; Sarah E. Ostlie, AuD; Ashlee P. Kirtz
Christine M. Lohse, MS; Matthew L. Carlson, MD

Objective: Cochlear implantation (CI) under local anesthesia facilitates intraoperative behavioral patient feedback to potentially improve acoustic hearing preservation. The degree to which tone adaptation to a sustained pure tone threshold during electrode insertion impacts the accuracy of this feedback is a critical factor to understand and remains undefined.

Study Design: Prospective study.

Setting: Tertiary academic medical center.

Patients: Prospective cochlear implant candidates.

Interventions: Standard behavioral audiogram, audiogram obtained in ambient operating room (OR) background noise, and tone adaptation to sustained suprathreshold (+10 and +20dB) pure tones at 500, 1000, 2000, and 4000Hz in both quiet and in OR noise.

Main Outcome Measures: Pure tone average (PTA) in quiet and in ambient OR noise, timing of tone adaptation at different suprathreshold levels and frequencies, and reliability of perceived loudness changes.

Results: In total, 20 ears were included for study. The median PTA was similar between testing in quiet (68dB, IQR 9) and in ambient OR noise (68dB, IQR 11). For pure tone adaptation, 10 patients reported decreased perception of tone at +10dB, at a median time of 55 seconds (IQR 58), most commonly at 250 Hz. For perception of loudness change, all patients were able to report a difference of 10dB across the frequency range at both +10 and +20dB when testing in quiet and in ambient OR background noise.

Conclusions: Audiometry demonstrated similar testing in quiet and ambient OR background noise, with 50% of patients reporting neural adaptation at +10dB, and all patients perceiving a 10dB change in stimulus amplitude both in quiet and in ambient OR noise.

Professional Practice Gap & Educational Need: Pure tone testing in noise, rates of neural adaptation, and ability to perceive changes to loudness amongst patients with hearing loss who qualify for CI are unknown.

Learning Objective: To describe audiometric testing features, frequency of pure tone adaptation, and patient perception of loudness changes in patients who qualify for CI.

Desired Result: To report similarity in pure tone average testing, the relative frequency of pure tone adaptation, and the accurate perception 10dB changes in both quiet and testing in ambient OR background noise.

Level of Evidence – Level III

Indicate IRB or IACUC: IRB #24-002837, "Systematic Assessment of Patients' Perception of Amplitude (Loudness) Changes During Audiological Testing: Data to Inform Methods for Hearing Preservation Cochlear Implant Surgery Under Local Anesthesia", Approval date 3/28/2024

SELECTED ABSTRACTS

POSTER PRESENTATIONS

IN ORDER OF PRESENTATION

Bilateral Cochlear Implantation in the Elderly Patient Population

Maya Hatley, BA; Younes Attlassy, BS; Emily Spitzer, AuD; Susan Waltzman, PhD

Objective: Bilateral cochlear implantation (CI) is not routinely recommended in patients of advanced age due to concerns regarding cost effectiveness and the medical risks of multiple operations in this population. This study seeks to evaluate outcomes of bilateral CIs in post-lingually deafened adults over 65 years old.

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: 46 post-lingually deafened adults older than 65 years of age

Interventions: Bilateral cochlear implantation

Main Outcome Measures: The change in CNC word scores from before their 2nd CI (CI2) to 1 year follow-up.

Results: In this study population, the mean pre-CI2 bilateral CNC word score was 54.4%. Bilateral CNC scores were significantly improved compared to pre-CI2 scores at 3 months ($p<0.01$), 1 year ($p<0.01$), and most recent follow-up ($p<0.001$). Simple linear regression failed to detect a significant correlation between the change from pre-CI2 bilateral CNC scores and age at the time of either implantation or length of time between implantations. Multiple paired t-test showed the increase in bilateral CNC scores to be significantly greater in those who wore hearing aids before implantation at 3 months post-operatively ($p<0.05$), but not at 1 year post-operatively ($p>0.05$).

Conclusions: Patients > 65 years old who underwent bilateral cochlear implantation showed significant improvements in speech perception scores compared to pre-CI2 scores. Speech perception outcomes in this population of elderly patients who received bilateral CIs were not correlated with age at the time of implantation or length of time between implantations, suggesting that significant benefit can be seen even with advanced age at the time of implantation and longer time between implantations. One potential mediating factor of improvement in speech perception is the use of hearing aids prior to implantation, shown here to result in earlier gains of improved speech perception. However, a small sample size limits the strength of these conclusions as only 5 patients did not wear hearing aids before implantation.

Professional Practice Gap & Educational Need: There is a lack of literature on the outcomes of bilateral cochlear implantation in elderly patients. In the past, bilateral implantation was not done due to concerns about medical frailty of older patients undergoing multiple operations. Of particular importance is understanding the factors which may lead to improved or poorer speech outcomes in elderly patients to improve identification of candidates for bilateral implantation.

Learning Objective: To understand the outcomes of bilateral cochlear implantation in older adults.

Desired Result: Providers involved in the treatment of hearing loss understand the potential benefits of bilateral CIs in an elderly patient population, as well as factors to consider in the identification of candidates for bilateral implantation in this population.

Level of Evidence: IV

Indicate IRB: Approved at the New York University Grossman School of Medicine, IRB #: i23-01017.

The Impact of Age on Outcomes of Bevacizumab Treatment in NF2-Related Schwannomatosis

Maya G. Hatley, BA; Kaleb H. Yohay, MD; J. Thomas Roland, Jr., MD; Devorah Segal, MD, PhD

Objective: NF2-related schwannomatosis (NF2) is an autosomal dominant genetic disorder characterized by the development of schwannomas and meningiomas. Treatment with bevacizumab, a monoclonal antibody against VEGF that inhibits tumor angiogenesis, has been shown to result in decreased tumor size and hearing improvement in approximately 50% of NF2 patients. It is unknown whether the same degree of benefit is seen in younger patients compared to older patients. The objective of this study is to determine the impact of age on bevacizumab treatment outcomes in NF2.

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: Thirty-seven patients with NF2

Interventions: Bevacizumab

Main Outcome Measures: Change in tumor size of 20% or more, in accordance with the Response Evaluation in Neurofibromatosis and Schwannomatosis criteria, and change in hearing acuity on audiometric testing.

Results: This study included 37 patients with NF2 who were treated with bevacizumab at our institution between 2014 and 2024. They were divided into two groups: 22 adults over the age of 25 (26-71 years) and 15 adolescent and young adult (AYA) patients under the age of 25 (12-24 years). The average treatment duration was 2.93 years. Among older patients, 23.8% (n=5) had worsened hearing, 23.8% (n=5) had improved hearing, and 52.4% (n=11) had stable hearing during the treatment period. Of AYA patients, 21.4% (n=3) had worsened hearing, 42.9% (n=6) had improved hearing, and 35.7% (n=5) had stable hearing over the treatment period. There was no significant difference in the proportion of older and younger patients with hearing decline, improvement, or stability ($p>0.05$). Regarding radiographic response, tumor size was increased in 9.1% (n=2) of older patients, decreased in 42.9% (n=9), and stable in 50% (n=11) compared to pre-treatment imaging. Among AYA patients, 46.7% (n=7) had increased tumor size, 26.7% (n=4) had decreased tumor size, and 26.7% (n=4) had stable tumor size during treatment. The younger patient group had a significantly higher proportion of patients with tumor progression during the treatment period ($p= 0.017$).

Conclusions: AYA patients were significantly more likely to exhibit progression of tumor growth during bevacizumab treatment. However, there was no significant difference in hearing outcomes between the two groups. This study is limited by a small sample size of children with NF2 being treated with bevacizumab.

Professional Practice Gap & Educational Need: Further research is needed to understand how pediatric, adolescent, and young adult NF2 patients respond to bevacizumab, and how this response differs from that of older adults.

Learning Objective: To understand the impact of age on treatment response to bevacizumab in NF2.

Desired Result: Providers involved in the management of NF2 will better understand the likely outcomes of bevacizumab treatment in young adult and pediatric patients.

Level of Evidence: IV

IRB: New York University Grossman School of Medicine, IRB #S23-00840 (approved on 7/7/2023)

Analyzing Persistent Postoperative Vestibulopathy in Vestibular Schwannoma Patients through Physical Therapy-Based Assessments

Robert J. Macielak, MD; Kara Gillum, DPT; Matthew Bjelac, DPT; Yin Ren MD, PhD
Edward. E. Dodson, MD; Oliver F. Adunka, MD, MBA; Desi P. Schoo, MD

Objective: To define and assess vestibulopathy in vestibular schwannoma (VS) patients who have undergone microsurgical resection and have received vestibular rehabilitation therapy (VRT).

Study Design: Retrospective case series

Setting: Tertiary care center

Patients: Patients with persistent dizziness following microsurgical resection of sporadic VS referred to VRT from 1/2023 to 8/2024 using recently published Peripheral Vestibular Hypofunction Clinical Practice Guidelines.

Interventions: Microsurgical resection, VRT

Main Outcome Measures: Horizontal-Dynamic Visual Acuity (H-DVA), Functional Gait Assessment (FGA), and Dizziness Handicap Inventory (DHI)

Results: Eighteen patients (11 females, 61%) received VRT with a median age at surgery of 51-years-old (interquartile range [IQR] 41-55). Fifteen patients (83%) had tumors with a cerebellopontine angle component with a median tumor size of 17.7 mm (IQR 9.9-21.2), and 3 patients (17%) had intracanalicular tumors with sizes of 9.3, 12.5, and 13.0 mm. Seven patients (39%) underwent a translabyrinthine approach, and 11 patients (61%) underwent a retrosigmoid approach. After a median of 5 (IQR 3-10) guided VRT sessions, the H-DVA error to side of the tumor was 3.5 lines (IQR 2.0-4.3), with >2 lines representing dysfunction of the vestibulo-ocular reflex. The H-DVA error to the non-operative side was 2.5 lines (IQR 1.8-3.5) suggesting unanticipated contralateral gaze instability despite VRT. After VRT, the median FGA score was 26 (IQR 22.5-27.5), signifying near normal gait function, and the median DHI was 8 (IQR 4-34), representing minimal handicap.

Conclusions: Most VS patients with postoperative dizziness and H-DVA-confirmed vestibulopathy experience minimal dizziness symptoms and have near-normal dynamic balance skills after evidence-based guided VRT despite their continued gaze instability. Notably, the majority of patients undergoing H-DVA testing showed results consistent with bilateral gaze instability despite a course of VRT.

Professional Practice Gap & Educational Need: Despite the expectation for vestibulopathy after vestibular schwannoma resection, only limited prior studies have attempted to objectively analyze and define the prevalence, severity, and cause of post-resection dizziness.

Learning Objective: To better understand vestibulopathy in the postoperative period for vestibular schwannoma patients. To recognize the implications of different functional and symptom-based assessments in this population.

Desired Result: Increase awareness of the impact and course of postoperative vestibulopathy after vestibular schwannoma resection and the role of vestibular rehabilitation therapy.

Level of Evidence – Level V

Indicate IRB or IACUC: The Ohio State University IRB Protocol #2019H0363

Evaluating the Audiologic Implications of an Absent Round Window Reflex during Stapedectomy

Robert J. Macielak, MD; Vikas Munjal, BS; Edward E. Dodson, MD

Objective: The present study seeks to evaluate the implications of an absent round window reflex (RWR) during stapedectomy.

Study Design: Retrospective case series

Setting: Tertiary care center

Patients: Patients with conductive hearing loss treated via stapedectomy from 7/1/1996 to 1/1/2024 who were noted to have an absent RWR and had adequate records for analysis.

Interventions: Stapedectomy with placement of a bucket handle prosthesis

Main Outcome Measures: Pure-tone average (PTA) air-bone gap (ABG) on most recent postoperative audiometric testing

Results: During the study period, 7 out of 768 patients met inclusion criteria. Of these patients, 5 patients (71%) carried a diagnosis of otosclerosis, 1 patient (14%) had severe tympanosclerosis, and 1 patient (14%) had congenital stapes footplate fixation. No patients underwent prior stapes surgery. Preoperatively, the median PTA ABG of the cohort was 33.75 dB HL (interquartile range [IQR] 20.0-38.75). Intraoperatively, all patients underwent uncomplicated surgery with appropriate prosthesis positioning but did not have a visible RWR. Postoperatively, the median PTA ABG was 12.5 dB HL (IQR 6.87-20.0) at a median of 8.2 months after surgery. Only 3 patients (43%) obtained a PTA ABG less than 10 dB HL with an additional patient approaching this threshold (11.25 dB HL). Despite this, there was statistically significant improvement in PTA ABG (30.0 vs. 13.3 dB HL, p=0.004). No patients have undergone revision surgery, and two patients (29%) currently utilize hearing aids in their operative ear.

Conclusions: Despite its potentially negative implications, an absent RWR appears to have limited impact on the ultimate audiometric outcome after stapedectomy, with patients still having a statistically significant improvement in their hearing and almost half of patients obtaining a PTA ABG of 10 dB HL. Further study of this phenomenon is warranted.

Professional Practice Gap & Educational Need: The round window reflex appears to be a good marker of successful reconstitution of the conductive hearing mechanism, but its true implications on postoperative audiometric outcomes during stapedectomy are not well known.

Learning Objective: The learner should be able to comprehend the implications of an absent round window reflex during surgery.

Desired Result: The desired result is that providers can utilize these data in their own practice when performing surgery to guide intraoperative technique and decision-making.

Level of Evidence – Level V

Indicate IRB or IACUC: The Ohio State University IRB Protocol #2024H0071

Complication and Re-Operation Rates of Different Obliteration Materials in Subtotal Petrosectomy with Blind Sac Closure and Mastoid Obliteration: A Systematic Review and Meta-Analysis

Ronald S. Wang, BS; Allen Khudaverdyan, BS; Wenqing Yang, MA
Michele Santacatterina, PhD; J. Thomas Roland Jr, MD

Objective: To evaluate and compare the post-operative outcomes of different obliteration materials used in subtotal petrosectomy (STP) with blind sac closure in non-cochlear implant patients

Data Sources: A comprehensive search of Pubmed, Embase, Cochrane CENTRAL, Scopus, CINAHL complete, and Web of Science was performed from the databases' inception to July 1st, 2024.

Study Selection: Studies without missing data that included non-cochlear implant patients undergoing subtotal petrosectomy with blind sac closure were included. Of the initial 524 studies, 49 (9.4%) met selection criteria.

Data Extraction: Two reviewers independently assessed study eligibility using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Five mastoid obliteration techniques were identified: abdominal fat, bioactive material, fascial flaps, muscle grafts, and no obliteration material. Other extracted data included patient demographics, indication for subtotal petrosectomy, eustachian tube obliteration, follow-up time, follow-up imaging, and post-operative outcomes (complications and re-operation rates).

Data Synthesis: For the overall complication and re-operation rates across all obliteration material types, data was pooled through meta-analysis of inverse variance. Based on the heterogeneity across the selected studies, the random-effects model was used. The weighted summary proportion was calculated by the Freeman-Tukey transformation. Analysis of variance was used to separately compare complication and re-operation rates between the different obliteration material types used.

Conclusion: Out of all the mastoid obliteration techniques for subtotal petrosectomies with blind sac closure, abdominal fat grafts were by far the most used. No significant difference was found between the five types of obliteration techniques for post-operative complication or re-operation rates. Further studies utilizing non-abdominal fat grafts as mastoid obliteration material for subtotal petrosectomies with blind sac closure are needed.

Professional Practice Gap & Educational Need: Neurotologists have used different obliteration techniques for subtotal petrosectomies with blind sac closure. This study aims to compare post-operative complications and re-operations between commonly used obliteration techniques to guide future clinical care.

Learning Objective: Better understand the overall and individual post-operative outcomes associated with the different mastoid obliteration techniques in subtotal petrosectomy with blind sac closure

Desired Result: Increased knowledge regarding the outcomes associated with different obliteration material types in subtotal petrosectomies with blind sac closure in non-cochlear implant patients.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt.

The Effect of Otologic Comorbidities on Readmission Following Resection of Vestibular Schwannoma

Aneesh A. Patel, MD; Dean Kennedy, MSc; Genevieve Dupuis, MS
Jessica R. Levi, MD; Peter C. Weber, MD, MBA

Objective: To determine the impact of comorbid otologic comorbidities on readmission following vestibular schwannoma (VS) resection.

Study Design: Database review.

Setting: Nationwide Readmissions Database (NRD).

Patients: Patients with history of VS, identified by International Classification of Disease (ICD) 9 code 225.1 and ICD-10 code D33.3, who were readmitted following surgical resection (ICD-9 04.01, ICD-10-PCS 00BN0ZZ) in 2020. Those with otologic symptoms and otologic comorbidities identified by ICD-9/10 codes were compared to those without.

Main Outcome Measures: Duration of readmission stay, patient death, need for additional procedures, need for rehabilitation, demographic variables, comorbidities.

Results: The NRD query yielded a total of 1997 patients who were readmitted following resection of vestibular schwannoma in 2020. The 197 patients with vertigo had a significantly higher number of procedures completed (5.1 vs 4.3, p=0.016), longer length of readmission (6.3 vs 5.4 days, p=0.003), and need for rehabilitation (13.90% vs 4.40%, p<0.001). The 316 patients with cranial nerve had significantly more likely to have longer length of stay (7.7 vs 5.0 days, p<0.001) and need for rehabilitation services (15.80% vs 3.30%, p<0.001). Asymmetric loss and tinnitus largely did not demonstrate significant differences. Patients with migraines had higher need for rehabilitation (16.00% vs 4.60%, p<0.001).

Conclusions: Patients with vertigo and cranial nerve neuropathy had significantly longer readmission stays, more procedures performed, and higher need for rehabilitation.

Professional Practice Gap & Educational Need: There is limited evidence on the impact of otologic comorbidities on patients readmitted following resection of VS.

Learning Objective: Describe the impact of otologic symptoms and comorbidities on readmission following resection of VS.

Desired Result: Improved knowledge of the impact of otologic comorbidities on readmission following resection of VS.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Evaluating Cochlear Implant Outcomes in Children with Cochlear Nerve Deficiency and Single-Sided Deafness

Daniel Swanson, MD; Jasmine Gulati, MAPP; Christina Zhu, BS (presenter)
Anuja Shah, BA; Paul Chisolm, MD; Michael Hoa, MD

Objective: To evaluate cochlear implantation (CI) outcomes in children with cochlear nerve deficiency (CND) and single-sided deafness (SSD).

Study Design: Systematic review and meta-analysis.

Setting: Multiple retrospective and prospective studies on pediatric cochlear implantation.

Patients: Children with single-sided deafness due to CND, classified into cochlear nerve hypoplasia and aplasia subgroups.

Interventions: Cochlear Implantation

Main Outcome Measures: Key auditory and speech performance metrics, including the Meaningful Use of Speech Scale (MUSS), Meaningful Auditory Integration Scale (MAIS), Categorical Auditory Performance (CAP), Speech Intelligibility Rating (SIR), and word recognition scores.

Results: Cochlear nerve deficiency accounted for 37% of pediatric SSD cases. Children with cochlear nerve hypoplasia showed intermediate CI improvement (MUSS: 12, MAIS: 30, CAP: 5, SIR: 2, monosyllabic recognition: 60%, bisyllabic recognition: 90%), while those with aplasia had the least benefit (MUSS: 8, MAIS: 29, CAP: 4, SIR: 2, monosyllabic recognition: 38%, bisyllabic recognition: 40%). Control group scores were significantly higher.

Conclusions: Cochlear implants improve auditory and speech outcomes in children with CND and SSD, with better results in those with hypoplastic nerves. The outcomes indicate the need for more standardized measures and tailored CI candidacy criteria for this population.

Professional Practice Gap & Educational Need: Lack of standardized outcome measures and criteria for cochlear implantation in pediatric CND and SSD cases.

Learning Objective: Understand the variability in cochlear implant outcomes based on cochlear nerve status in pediatric SSD patients.

Desired Result: Improve candidacy guidelines for cochlear implantation in pediatric SSD cases due to CND.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

Time and Treatment Efficacy in Sudden Sensorineural Hearing Loss: A Large Retrospective Study

Chanan Shaul, MD PhD; Yehuda Taranovsky MD; Itay Chen, MD
Riki Salem, MD; Jean-Yves Sichel, MD; Ronen Perez, MD

Objective: To evaluate the relationship between time-to-treatment and hearing improvement in sudden sensorineural hearing loss (SSNHL), and to assess the efficacy of corticosteroid treatment by comparing outcomes of early-treated and late-presenting untreated patients.

Study Design: Retrospective cohort study.

Setting: Tertiary referral center**.**

Patients: 943 patients diagnosed with SSNHL between 2012 and 2023**.**

Interventions: Oral corticosteroids followed by intratympanic dexamethasone injection as salvage treatment when indicated.

Main Outcome Measures: Pure-tone average (PTA), speech recognition threshold (SRT), and speech discrimination (SD) scores.

Results: Patients were categorized into groups based on the presentation time: weeks 1-2 (early treatment group) and weeks 3-4 (late treatment group). We used their pre-treatment audiometric tests for the late-treatment group as a comparison point. This allowed us to compare hearing outcomes between those who received early treatment and the baseline of those who presented later, effectively serving as a snapshot of natural progression. A significant difference in hearing improvement was found between patients treated within two weeks of symptom onset and those treated after two weeks ($p < 0.001$). A weak but significant correlation was observed between time-to-treatment and degree of hearing improvement ($R = 0.23$, $p < 0.001$ for PTA). However, when comparing treated patients (weeks 1-2) with yet-untreated patients (weeks 3-4) at equivalent time points post-onset, no significant differences were found in PTA, SRT, or SD (e.g., PTA for week one vs. week 3: 36.7 ± 28 vs 37.5 ± 19 dB, $p = 0.55$).

Conclusions: While earlier treatment initiation correlates with better hearing outcomes, the lack of significant difference between treated and yet-untreated patients at equivalent time points questions the efficacy of corticosteroid treatment. The observed improvements may be mainly attributable to the natural healing process, which appears to occur predominantly within the first two weeks after symptom onset. These findings challenge current treatment guidelines and highlight the need for further research into SSNHL management.

Professional Practice Gap & Educational Need: Current guidelines emphasize early corticosteroid treatment for SSNHL, but evidence for its efficacy is limited. This study addresses the need to critically evaluate both the timing and overall effectiveness of current treatment protocols.

Learning Objective: To understand the complex relationship between treatment timing, apparent efficacy, and natural recovery in SSNHL and to critically evaluate current treatment paradigms.

Desired Result: Clinicians will consider both the timing and overall necessity of corticosteroid treatment in SSNHL**,** recognizing the need for further research to establish truly evidence-based treatment protocols.

Level of Evidence: Level III.

Indicate IRB or IACUC: Approved by the Institutional Review Board of Shaare-Zedek Medical Center.

Cochlear, but not Vestibular, Endolymphatic Hydrops Predominantly Affects Vestibular Function in Patients with Unilateral Meniere's Disease

Takeda H, MD; Morita Y, MD, PhD; Yagi C, MD, PhD; Izumi S, MD, PhD
Yamagishi T, MD, PhD; Ohshima S, MD, PhD; Horii A, MD, PhD

Objective: This study aimed to elucidate the role of cochlear and vestibular endolymphatic hydrops in audio-vestibular function in patients with unilateral Meniere's disease (MD).

Study Design: Retrospective.

Setting: University hospital.

Patients: Forty-eight patients with unilateral MD with mild or significant cochlear/vestibular hydrops on gadolinium-enhanced MRI were enrolled.

Main Outcome Measures: Audio-vestibular function, duration and stage of MD, and their correlation with the grades of cochlear and vestibular hydrops.

Results: Disease duration in patients with stage 3 MD was significantly longer than that with stage 1 MD. Patients with stage 2 and 3 MD showed significant cochlear or vestibular hydrops more frequently than those with stage 1 MD. The mean hearing thresholds in patients with significant cochlear or vestibular hydrops were significantly higher than those with mild hydrops. The percentage of canal paresis in the caloric testing and the deviation angle in the stepping test in patients with significant cochlear hydrops were significantly greater than those with mild hydrops. However, the results of caloric testing and stepping test in patients with significant vestibular hydrops did not differ from those with mild hydrops. The results of other vestibular function tests, such as vestibular-evoked myogenic potentials, video head impulse test, and questionnaires for vestibular and mental symptoms, did not differ between patients with significant and mild cochlear/vestibular hydrops.

Conclusions: Cochlear and vestibular hydrops gradually develop over time with the deterioration of hearing function, resulting in the progression of MD stage. Cochlear hydrops predominantly affects vestibular function in patients with MD, suggesting that potassium intoxication after rupture of cochlear hydrops, rather than high endolymphatic fluid pressure in the vestibule, impairs audio-vestibular function.

Professional Practice Gap & Educational Need: The correlation between endolymphatic hydrops and vestibular function in patients with MD remains controversial.

Learning Objective: To learn the role of endolymphatic hydrops in audio-vestibular function.

Desired Result: To understand that cochlear hydrops predominantly affects vestibular function in patients with MD.

Level of Evidence: V

Indicate IRB or IACUC: No. 2015-2449, Institutional Review Board of Niigata University Hospital.

Increased Costs and Complication Rates in Vestibular Schwannoma Resections for Neurofibromatosis Type 2

Rance J.T. Fujiwara, MD, MBA; Julia J. Shi, BA
Donald Tan, MD; Joe Walter Kutz, MD

Objective: To characterize inpatients costs and complication rates in sporadic and neurofibromatosis type 2 (NF2) patients undergoing resection of vestibular schwannoma (VS)

Study Design: Cross-sectional analysis

Setting: National Inpatient Sample, 1998-2021

Patients: 56,623 inpatient admissions after VS resection

Interventions: resection of VS

Main Outcome Measures: Patient- and hospital-level demographics for admissions following resection of VS, as well as postoperative medical and surgical complications, were tabulated. We evaluated average hospitalization costs and compared them between sporadic and NF2 patients. Multivariate analysis was performed to determine whether NF2 admissions had increased costs and length of stay.

Results: A total of 51,459 and 1,164 resections were recorded for sporadic and NF2 patients, respectively. Patients with NF2 were younger (mean age 35.3 [SE 0.9] vs. 51.1 [SE 0.2] years) and more likely insured by Medicaid (12.8% [SE 3.1] vs. 5.4% [SE 0.4]). The average cost for NF2 admissions was $49,141 (95% CI 42,527-55,754), relative to sporadic tumors at $38,204 (95% CI 36,408-40,000, $p<0.001$). NF2 patients had increased rates of surgical and medical complications, including facial nerve dysfunction (31.7% [SE 3.8] vs. 17.3% [SE 0.7], $p<0.001$), dysphagia (8.8% [SE 2.7] vs. 2.8% [SE 0.3], $p<0.001$), aspiration pneumonia (3.4% [SE 1.3] vs. 0.6% [SE 0.1], $p<0.001$), and sepsis (1.8% [SE 1.0] vs. 0.4% [SE 0.1], $p=0.01$), all of which were associated with increased costs. On multivariate analysis, NF2 as an independent factor was *not* associated with increased inpatient costs (b=$3,867 [95% CI -221 to 7,956], $p=0.06$).

Conclusions: Resections of NF2-related VS are associated with increased surgical and medical complications. While NF2 is not independently associated with increased hospital costs following surgery, the increased rates of complications in this patient population are likely the primary driver of increased costs.

Professional Practice Gap & Educational Need: Several studies have utilized national administrative databases to describe trends in treatment patterns in vestibular schwannoma. To date, few studies have described differences in postoperative inpatient outcomes and hospitalization costs following resection of sporadic and NF2-related vestibular schwannomas.

Learning Objective: To understand differences in complication rates and hospitalization costs following vestibular schwannoma resections in sporadic and NF-2 related tumors

Desired Result: To increase awareness of costs and complications in unique patient populations following vestibular schwannoma resections, which may aid in counseling patients preoperatively

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Increasing Inpatient Costs and Complication Rates Following Vestibular Schwannoma Resections from 1998 to 2021

Rance J.T. Fujiwara, MD, MBA; Donald Tan, MD; Hitomi Sakano, MD, PhD
Brandon Isaacson, MD; Joe Walter Kutz, MD

Objective: To examine temporal trends in inpatient costs and postoperative surgical and medical complications following vestibular schwannoma (VS) resections

Study Design: Cross-sectional analysis

Setting: National Inpatient Sample, 1998-2021

Patients: 50,991 admissions

Interventions: VS resection

Main Outcome Measures: Surgical and medical complications following VS resection were recorded annually. The annual average cost of inpatient hospitalization and length of stay were also documented each year. Multivariate analysis was performed to determine whether subsequent calendar years were associated with changes in costs.

Results: From 1998 to 2021, the annual average number of VS resections decreased 32.7% from 3,813 to 2,557. Rates of surgical and medical complications increased from 18.2% to 34.2% (b=0.73% [95% CI 0.53-0.93], p<0.001), and from 4.3% to 7.6% (b=0.17% [95% CI 0.11-0.22], p<0.001), respectively. While the percentage of admissions with complications increased, no significant changes were observed in the absolute number of complications from 1998 to 2021. Concurrently, comorbidity burdens significantly increased, with 84.8% (SE 1.5) of patients from 1998 to 2001 presenting with ≤1 comorbidity, compared to 58.5% (SE 1.5) in 2018 to 2021. The mean inpatient cost per admission increased from $30,922 to $45,973, which was statistically significant on multivariate regression (b=$412 [95% CI 208-615], p<0.001), despite a decrease in average inpatient stay from 5.4 (SE 0.5) to 4.5 (SE 0.3) days.

Conclusions: As the number of VS surgeries has decreased, the percentage with postoperative complications has increased, likely due to changes in patient selection as well as increasing comorbidities in operative cases. Healthcare expenditures for postoperative admissions have increased significantly over the last two decades, resulting in a roughly $15,000 increase in mean inflation-adjusted inpatient costs per postoperative admission.

Professional Practice Gap & Educational Need: Several studies have utilized national administrative databases to describe trends in treatment patterns in vestibular schwannoma. No study to our knowledge has analyzed long-term trends in hospitalization costs or changes in rates of surgical and medical complications over time.

Learning Objective: To understand rates of postoperative complications and hospitalization costs following vestibular schwannoma surgery

Desired Result: As increasing importance is placed on quality of care and quality measures, we hope to increase awareness of costs and complications following vestibular schwannoma surgery, as well as the potential role of comorbidities and patient selection.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Middle Fossa Approach for Preserving Hearing in Small Neurofibromatosis-2 (NF-2) Related Vestibular Schwannomas

Osama Tarabichi, MD; Nir Ben-Shlomo, MD; Marlan R. Hansen, MD
Bruce J. Gantz, MD; Alexander D. Claussen, MD

Objective: To evaluate audiometric outcomes and hearing preservation rates in NF-2 patients undergoing vestibular schwannoma resection by middle fossa approach.

Study Design: Retrospective review.

Setting: Tertiary referral center.

Patients: NF2 patients with small vestibular schwannomas undergoing resection by middle fossa approach with goal of hearing preservation from 2012-2022 at the University of Iowa.

Interventions: microsurgical resection by middle cranial fossa approach.

Main Outcome Measures: Pre- and post-operative word recognition scores (WRS).

Results: 10 NF-2 patients were identified who underwent middle fossa approach to remove vestibular schwannomas over review period. A total of 12 tumors were excised as 2/10 patients underwent bilateral surgery. Age at time of surgery ranged from 7-63 years old with average age of 31.58 +/-17.95. Gross total resection of the tumor was achieved in all but one case in which residual tumor adherent to the facial nerve was left behind. Average tumor size was 6.17 +/- 3.14 mm in greatest dimension on axial T2 MRI sequence. All patients had preoperative WRS >70% and this was preserved postoperatively in 10/12 cases. 2/12 cases had significant decline in hearing postoperatively. Auditory brainstem responses were present and persisted throughout tumor dissection in all but one case in which thresholds were present but reduced after tumor dissection and this was associated with decline in hearing postoperatively.

Conclusions: Removal of NF-2 related vestibular schwannomas by middle fossa approach with goal of hearing preservation is feasible and yields comparable outcomes to those seen in patients with sporadic vestibular schwannomas.

Professional Practice Gap & Educational Need: Surgical management of small NF-2 related vestibular schwannomas.

Learning Objective: Middle cranial fossa approach for resection of small NF-2 related vestibular schwannomas is effective at achieving hearing preservation**.**

Desired Result: Poster presentation.

Level of Evidence – Level IV.

Indicate IRB or IACUC: University of Iowa IRB 201410713.

Association of Patient Factors and Safety-Net Hospital Status with Complications Rates and Cost following Vestibular Schwannoma Resection

Dakota D. Lipps, MD; Rance J.T. Fujiwara, MD, MBA; Hitomi Sakano, MD, PhD
Brandon Isaacson, MD; J. Walter Kutz, MD

Objective: To examine the impact of patient characteristics and safety-net hospital status on complication rates and healthcare costs for patients who underwent resection of vestibular schwannoma (VS).

Study Design: Cross-sectional analysis.

Setting (Data Source): National Inpatient Sample, 1998 to 2021.

Patients: The National Inpatient Sample was queried for adults aged ³18 years who underwent excision of a sporadic VS using pertinent *International Classification of Diseases (ICD)* coding. Patient demographic information as well as preexisting medical comorbidities were obtained for each encounter. Hospital characteristics including hospital bed capacity, geographic region, and teaching status were obtained. Safety-net burden was calculated as the proportion of Medicaid or uninsured patients admitted to a given hospital for any indication annually, and centers in the highest quartile were defined as safety-net hospitals.

Interventions: Resection of vestibular schwannoma.

Main Outcome Measures: 1) any surgical/central nervous system (CNS)-related or medical complication in the postoperative setting, 2) total inpatient costs associated with each hospital encounter.

Results: The final cohort included 50,991 (SE 3,995) inpatient admissions following VS resection, with 13,245 (SE 1,832) occurring at safety net hospitals. For surgical complications, safety-net hospitals had increased rates of hydrocephalus (6.0% [SE 0.6] vs. 3.8% [SE 0.3], p=0.001) and dysphagia (4.3% [SE 0.6] vs. 2.2% [SE 0.3], p<0.001); there were no differences in rates of facial nerve dysfunction. Among medical complications, patients in safety-net hospitals had increased rates of pulmonary edema (2.1% [SE 0.4] vs. 1.1% [SE 0.2], p=0.01) and sepsis (0.9% [SE 0.3] vs. 0.2% [SE 0.1], p<0.001). Safety-net hospitals were independently associated with increased odds of medical complications (OR 1.30 [95% CI 1.01-1.70], p=0.04) but not surgical complications (OR 1.10 [95% CI 0.94-1.27], p=0.23). Higher comorbidity burden, as measured by Elixhauser comorbidity indices, was independently associated with increased odds of complications. Mean admission cost was significantly greater in safety-net hospitals, with a mean of $42,749 (SE 1,892) relative to $36,456 (SE 993) for non-safety net hospitals (p=0.003). After controlling for patient- and hospital-related factors which were associated with hospital costs, safety net designation was independently associated with $3,566 (95% CI $503-6,630, p=0.02) increased costs per admission. There was no difference in the average number of surgeries performed between safety-net and non-safety net hospitals, though each additional surgery performed at a given hospital was associated with $75 (95% CI $58-92, p<0.001) decrease in average inpatient costs.

Conclusions: Safety net hospitals provide valuable care regardless of an individual's payor status. However, among patients undergoing VS resection, safety-net status alone is associated with increased post-operative medical complications and certain surgical complications, as well as increased overall admission costs.

Professional Practice Gap & Educational Need: Need for further investigation into safety net hospital specific factors that lead to increased expenses and medical complications for VS admissions.

Learning Objective: To understand safety net status impact on complications and cost for resection of VS.

Desired Result: Increase clinical awareness of the cost and post-operative complication differences based on safety net status for resection of VS with future aims to improve healthcare quality and/or lower costs at these institutions.

Level of Evidence: Level IV.

Indicate IRB or IACUC: Exempt.

HearRing HP Classification System in Assessment of HP in Different Group of Recently Implanted Patients, According to Initial Hearing

Piotr Henryk Skarzynski Prof.; Artur Lorens Prof.; Elzbieta Gos PhD; Henryk Skarzynski Prof.

Objective: The aim of this analyses was to apply the HearRing HP classification system in assessment of HP in different group of recently implanted patients, according to initial hearing.

Study Design: The retrospective study included adult patients with profound hearing loss who underwent cochlear implantation.

Setting: Tertiary referral center.

Patients: There were 70 patients who underwent cochlear implantation (40 women and 30 men) aged between 18 and 83 years. Their mean age was 52.0 years (SD = 14.4). The patients were categorized into four groups based on their preoperative hearing thresholds (EC, EAS, and ES) and the type of electrode used (Flex 24 or Flex 26).

Interventions: Minimally invasive cochlear implantation via round window.

Main Outcome Measures: Hearing thresholds were measured using pure-tone audiometry before operation and during activation (about month after surgery). Hearing preservation rate was calculated according to the hearing preservation formula by Hearring Group.

Results: The best HP was observed in EC patients who received the Flex 24 electrode, the HP rate at CI activation ranged from 1.3% to 92.9%, averaging 61.3% (*SD* = 22.9). The lowest HP rate was observed in ES patients who received the Flex 26 electrode, with rates at CI activation ranging from 0% to 112.2%, averaging 52.0% (*SD* = 42.2).

Conclusions: Better hearing preoperatively predicts better hearing preservation.

Professional Practice Gap & Educational Need: Currently, studies are comparing HP for different electrodes in patients with different initial audiograms.

Learning Objective: Proper qualification of patients and use of appropriate electrodes in patients with different types of hearing loss.

Desired Result: Comparison of HP achieved for different electrodes will be done for patients with similar initial audiograms.

Level of Evidence – III

Indicate IRB or IACUC: KB.IFPS 16/2021

Natural History of Incidental Vestibular Schwannomas in the Better Hearing Ear

Douglas J. Totten, MD, MBA; Hunter L. Elms, MD
Evan C. Cumpston, MD; Rick F. Nelson, MD, PhD

Objective: To describe and assess a unique phenomenon whereby vestibular schwannomas (VS) are identified in a better hearing ear

Study Design: Retrospective case series

Setting: Tertiary referral center

Patients: Eight patients who underwent magnetic resonance imaging (MRI) to assess unilateral sensorineural hearing loss (SNHL) and/or tinnitus and were found to have unilateral VS in the contralateral, better-hearing ear.

Main Outcome Measures: Audiometric results including pure-tone average (PTA), MRI findings, tumor laterality, change in symptoms and imaging findings over time.

Results: Eight patients (6 females) aged 45-81 presented with left-sided asymmetric hearing loss or pulsatile tinnitus at an average of 62 (standard deviation 14) years of age. Patients presented with normal ranging to severe left SNHL (PTA 44 [range 16 – 74] dB) and mean word recognition score (WRS) of 84.5 (range 68-100). Patients had normal-to-moderate right hearing (PTA 16 [range 12-44] dB) (WRS 97.5 [92-100]) with 5 of 8 (62.5%) patients having WRS of 100% in the right, tumor ear. All patients had MRI showing right intracanalicular tumor consistent with VS with an average size of 4.1 (standard deviation 1.9) mm. All patients were managed with wait-and-scan approach. Fluid fundal cap was present in four (50%) patients. No patients reported change in hearing in either ear at an average follow-up period of 23 (SD 19) months. No patients experienced tumor growth (defined as ³1 mm in any dimension) or symptom progression over the follow-up period.

Conclusions: Patients with small incidental intracanalicular tumors in a better hearing ear exhibit no hearing decline or change in tumor size at an average follow-up of nearly 2 years. A wait-and-scan approach is recommended. Longer follow-up is needed.

Professional Practice Gap & Educational Need: While VS are often found incidentally, it is rare to identify a VS in a better hearing ear when the purpose of imaging was assess for asymmetric hearing loss of the contralateral ear. This study describes this unique phenomenon and proposes a reasonable management strategy.

Learning Objective: VS identified in the better hearing ear are rare, often small, and should be managed with a wait-and-scan approach.

Desired Result: VS identified in better hearing ears are rare and should be managed conservatively

Level of Evidence – Level IV

Indicate IRB or IACUC: Indiana University IRB #13133 (approved 10/14/2022)

Superior Semicircular Canal Dehiscence Patients Have Reduced Skull Thickness Compared to Matched Controls and Patients with Spontaneous Cerebrospinal Fluid Leaks

Douglas J. Totten, MD, MBA; William Schneider, BS; Hunter L. Elms, MD
Leah Dauterman, BS; McKenzie Stewart; Evan Cumpston, MD; Rick F. Nelson, MD, PhD

Objective: To assess whether semicircular canal dehiscence (SSCD) may result from pressure-induced thinning or developmental factors

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: Patients with radiographically confirmed SSCD without spontaneous cerebrospinal fluid (sCSF) leaks and control patients without SSCD were matched by age, gender, body mass index (BMI) and race. Skull base height was also compared to non-matched sCSF leak patients without SSCD.

Main Outcome Measures: Differences in thickness of calvarium, zygoma and/or skull base between SSCD and control and/or sCSF leak patients

Results: 38 SSCD patients [21 (61%) female, 53 (95%) white, 17 (45%) with bilateral SSCD] presented at an average (standard deviation) age of 55 (14) years with an average BMI of 30 (9). Control patients were selected to match gender, age, BMI, and race. There was no significant difference in rates of obstructive sleep apnea (SSCD: 36%, Control: 24%, p=0.27). SSCD patients had significantly thinner calvarium thickness [1.93 (0.37) mm] compared to control patients [2.35 (0.51) mm, p<0.0001] and lower calvarium to zygoma thickness ratio [0.43 (0.09) vs. 0.50 (0.10), p=0.0008], but did not have significantly different zygoma thickness [4.54 (0.89) vs. 4.72 (0.72) mm, p=0.0889]. SSCD patients had significantly thinner skull base height compared to the both the control cohort [2.86 (0.87) vs. 4.61 (1.15) mm, p<0.0001] and compared to 83 non-matched sCSF leak patients [2.86 (0.87) vs 3.37 (1.25) mm, p=0.0003).

Conclusions: SSCD patients have significantly reduced calvarium and skull base thickness compared to matched controls and thinner skull base compared to sCSF leak patients. SSCD may occur as a defect in skull base development rather than from pressure-related thinning.

Professional Practice Gap & Educational Need: Factors contributing to the development of SSCD remain controversial. This study utilized matched controls and sCSF leak patients to assess whether skull and calvarial thinning may be more likely to occur due to developmental factors or due to pressure-induced thinning.

Learning Objective: The development of SSCD may be related to defective skull base development as opposed to chronic pressure-induced thinning.

Desired Result: Patients with SSCD appear to have reduced calvarium and skull base thickness compared to matched controls

Level of Evidence – Level IV

Indicate IRB or IACUC: Indiana University IRB #13133 (approved 10/14/2022)

Hearing Damage Induced by Precise Blast Overpressure in a Rat Model

José D. Ríos, PhD; Wensheng Zhang, MD, PhD; Tushar Kailu, MS
Ricardo Mejia-Alvarez, PhD; Tony T. Yuan, PhD; Isaac D. Erbele, MD

Hypothesis: A single-level blast to one ear can cause threshold shift without injury to the contralateral ear in a rat model.

Background: Hearing loss is a leading cause of disability in veterans and injury may come from noise or blast. In this study, we fabricated a tunable shock tube with controllable overpressure duration and pressure level to model and better evaluate blast-induced auditory injury resulting from improvised explosive devices.

Methods: Eighteen rats in three groups of six had one ear exposed to single-blast overpressure levels of 73 kPa (~10 Psi), 119 kPa (~17 Psi), and 138 kPa (~20 Psi), respectively, compared to two controls. Auditory brainstem response (ABR) was measured in pre-blast and post-blast at day 8 post-blast. Animals were euthanized 8 days after blast exposure and tissues (cochlea, brain, and brainstem) were harvested for histopathology assessment.

Results: On day 8 post-blast, there was a significant threshold shift of 60–80 dB SPL in the exposed rats' ear at 8, 16, and 32 kHz in all three groups. The threshold value on the contralateral ear and control ears was 20 dB SPL at 8, 16, and 32 kHz. Higher blast overpressure was correlated with greater hearing loss. Thresholds were elevated compared to the contralateral ears, baseline, and controls, and remained elevated 8 days post-blast.

Conclusions: A single blast to the ear causes threshold shifts in rats, and the designed shock tube injures a single ear without significant exposure to the contralateral ear.

Professional Practice Gap & Educational Need: Elucidate the injury mechanisms and functional pathways that drive sensorineural hearing loss after direct blast overpressure exposure to the ear. A mechanistic understanding of blast injury may lead to effective therapeutic interventions. Additionally, consistent with humane experimental technique, use of animals as a self-control allows for minimizing the number of animals used in experimentation.

Learning Objective: To understand the natural history of sensorineural hearing loss due to blast exposure.

Desired Result: Recognize blast as a cause of hearing disability.

Level of Evidence: Does not apply (animal study)

Indicate IRB or IACUC: FWH20230035AR

A Novel Translational Model of Ovine Auditory Injury

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Objective: Assess temporary and permanent auditory threshold shifts of single and repeated low-level blast overpressures (shockwaves) in an ovine model.

Hypothesis: Sheep exposed to a single 4psi overpressure would experience a temporary auditory threshold shift while repeated exposure to overpressures would result in a permanent threshold shift.

Background: Given similarities between the sheep and human auditory system, sheep may be an especially valuable preclinical model for hearing injury due to sound overpressures.

Methods: Ten female sheep had a single ear subjected to either a single 4psi blast overpressure (n=5) or 10 consecutive 4psi blast overpressures (n=5) each delivered 30 minutes apart. The blast overpressures were created by bursting a PTFE membrane in a custom-fabricated shock tube having a Helium-pressurized driver. Auditory brain response testing was conducted at baseline, immediately following the application of the blast overpressures, and repeated at day 3, 7, and 14. The contralateral ear was used as a control at each time point. Differences in auditory threshold compared to the control ear were assessed using a Fisher's Exact test.

Results: Sheep receiving a single 4psi blast overpressure experienced a temporary threshold shift immediately following blast exposure (P=0.028) with no increase in threshold compared to the contralateral ear by day 3. Sheep receiving multiple 4psi blast overpressures had an increased auditory threshold compared to the control ear immediately following blast exposure (P=0.016) and 14 days following exposure (P=0.047). No other adverse effects were found.

Conclusions: Application of low-level blast overpressures using a custom-fabricated shock tube resulted in a reproducible threshold shift in an ovine pre-clinical model of auditory injury.

Professional Practice Gap & Educational Need: Rodents are frequently used in foundational research to evaluate hearing changes, but their frequency range is much higher than that of humans. There are expected physiologic differences between auditory systems of rodents and humans, and the physics of high frequency sound limit the ability to evaluation air-bone gaps. Reliable large animal models of hearing loss may allow closer approximation to human hearing.

Learning Objective: Understand roles of animal studies in modeling human hearing, evaluate blast as a source of hearing injury, and evaluate multiple blasts as a source of permanent threshold shifts.

Desired Result: Recognize the ovine model as a reliable hearing injury model, recognize multiple blast as a source of permanent threshold shift.

Level of Evidence – Does not apply (animal study)

Indicate IRB or IACUC: Cornell University, IACUC #2022-0176

Transmastoid Endoscopic Assisted Outpatient Repair of Superior Semicircular Canal Dehiscence Syndrome

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De'Andre Warren, MD; Nauman F. Manzoor, MD

Objective: Investigate outcomes of trans-mastoid endoscopic-assisted (TM-EES) underwater repair of superior semicircular canal dehiscence (SSCD) in an outpatient setting and describe audiometric, vestibular, and quality of life (QOL) outcomes as well as safety profile of an outpatient approach for SSCD repair.

Study Design: Retrospective review.

Setting: Single provider neurotology practice spanning two institutions.

Patients: Adult patients who meet diagnostic criteria for SSCD (Barany Society).

Interventions: TM-EES underwater repair/plugging of SSCD.

Main Outcome Measures: Surgical, audiometric, vestibular, and QOL outcomes.

Results: A total of 8 patients were included in this study with the mean age of 56 (range 36-91) years. Average length of the SSCD defect was noted to be 4.375mm (range 3.5-5.7mm) and most involved the arcuate eminence only. Majority of the patients presented with audiologic and sound induced symptoms. All patients underwent successful plugging of the SSCD under endoscopic guidance and all, but one was discharged on the same day. There were no peri-operative complications. Post-operative short term audiometric evaluation showed no significant changes in word recognition scores in all patients. Patients who presented with elevated dizziness handicap inventory (DHI) scores pre-operatively showed improvement after the procedure.

Conclusion: Trans mastoid endoscopic assisted underwater repair of SSCD is a safe and effective procedure for outpatient repair of symptomatic SCD. Short term outcomes (subjective, audiometric, and QOL) are encouraging and high powered multi-institutional studies with long term follow-up are needed to further investigate its safety and efficacy in surgical management of SSCDs.

Professional Practice Gap & Educational Need: Improve upon current surgical approaches for superior semicircular canal dehiscence.

Learning Objective: Understand TM-EES approach and its utility in repair of SCD as well as expected outcomes.

Desired Result: Demonstrate feasibility of an outpatient repair with no increased risk of hearing loss

Level of Evidence - Level III

Indicate IRB or IACUC: IRB 20211639

Delayed Facial Nerve Weakness Following Middle Fossa Tegmen Repair

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Ethan Hoasjoe, BS, MS; Moises Arriaga, MD, MBA

Objective: Identify the incidence and risk factors associated with delayed facial nerve weakness after middle fossa repair of tegmen dehiscence.

Study Design: Cross-sectional study

Setting: Tertiary referral center

Patients: From a cohort of 594 middle fossa tegmen repairs (MFTR) between 2017 and 2024, 15 cases (13 patients) experienced ipsilateral delayed facial paresis (DFP) and 0 immediate paralysis. Two patients underwent bilateral surgery on different dates and developed DFP following both surgeries. Average age was 49 years and 10 cases (66.7%) were female.

Interventions: Preauricular**,** MFTR using a three-layer repair (acellular dermis (AD) + autologous bone + AD). The procedures included intraoperative steroids but did not utilize a retractor, lumbar drain, foley catheter, or osmotic diuresis.

Main Outcome Measures: DFP, defined as House-Brackmann (HB) grade II – VI, beginning ≥1 day following surgery.

Results: DFP mean operative time was 52.6 minutes (SD = 16.4) and onset of weakness was 5.1 days (SD = 3.2). None had aberrant intraoperative facial nerve activity, and all had normal GSPN stimulation. No cases had postoperative CSF leakage, intracranial complications, or wound complications. Facial nerve function reached a nadir of HB grade II in 4 (26.7%), III in 7 (46.7%), IV in 1 (6.7%), V in 2 (13.3%), and VI in 1 (6.7%). DFP was treated with steroids, antivirals, and eye care. The final recovery was HB grade I in all cases reported. Preoperative imaging showed 6 (40%) with geniculate ganglion dehiscence, 4 (26.7%) with "honeycomb" pneumatization incorporated into the tegmen defect, and 11 (73.3%) with multiple distinct tegmen defects. Statistical analysis did not identify significant patient factors or operative techniques associated with DFP.

Conclusions: While the incidence is low (2.5% overall, 0.5% HB grade V/VI) and recovery complete, DFP is distressing. The two patients with bilateral DFP suggest viral reactivation, and prospective investigation of prophylactic antiviral medication should be considered.

Professional Practice Gap & Educational Need: There is a need to identify patients at risk of developing delayed facial nerve weakness following surgical repair of tegmen dehiscence.

Learning Objective: The learner is expected to gain knowledge of increased risk factors of delayed facial nerve weakness after surgical repair of tegmen dehiscence.

Desired Result: The present study aims to increase knowledge of risk factors that correlate with higher risk of postoperative facial nerve weakness. This new knowledge can be used to counsel patients on expected postoperative course and possible complications.

Level of Evidence: Level III

Indicate IRB or IACUC: LSU Health Sciences Center, IRB Protocol #581

Impact of Adult Cochlear Implantation on Caregiver Disability and Quality of Life

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Objective: Assess the impact of adult cochlear implantation on the disability and quality of life (QOL) of caregivers of cochlear implant (CI) recipients

Data sources: MEDLINE, Embase, Cochrane CENTRAL, Science Citation Index Expanded and Emerging Sources Citation Index were searched from inception to June 14, 2024.

Study selection: Retrospective, prospective and randomized controlled studies in any language that reported disability or QOL measures of caregivers of adult CI recipients either pre- or post-CI.

Data extraction: Three reviewers independently screened studies for inclusion, extracted data and evaluated risk of bias. Outcomes were both qualitative and quantitative pre- and post-CI measures of caregiver disability or QOL.

Data synthesis: 1615 studies were screened. Nine studies with 549 caregivers met the inclusion criteria. Five studies utilizing different scales (Significant Other Scale for Hearing Disability Questionnaire (SOS-HEAR) [1], Index Relative Questionnaire [1], unvalidated QOL questionnaires [1], open-ended questionnaires [2]) demonstrated improvement in caregiver pre- to post-CI QOL measures. One study assessed associations between caregiver characteristics and post-CI SOS-HEAR scores, but did not assess pre- to post-CI score change. One study utilizing an open-ended questionnaire found significantly higher scores among caregivers of CI recipients than caregivers of patients awaiting implantation, however one assessing spouse pleasant activity between groups found no difference. Only one study assessed disability and found that caregivers scored worse than the general population. Duration of CI recipient hearing loss did not impact caregiver QOL in any study.

Conclusions: Though homogenous data on QOL of caregivers of CI recipients is limited, studies suggest that caregivers of CI recipients may have worse QOL than the general population but better QOL than caregivers of patients who qualify for a CI. Additionally, cochlear implantation may improve caregiver QOL.

Professional Practice Gap & Educational Need: Much attention has been devoted to improvement in CI recipient quality of life after cochlear implantation but there is limited data on the impact of cochlear implantation on the caregivers of cochlear implant recipients. This data could aid in preoperative counselling of patients and their families.

Learning Objective: To understand the impact of cochlear implantation on the disability and quality of life of caregivers of adult cochlear implant recipients

Desired Result: Participants will recognize 1) that limited data suggests that caregivers of adult cochlear implant recipients experience an improvement in quality of life after cochlear implantation and 2) caregivers of adult cochlear implant recipients still have worse quality of life than the general population.

Level of Evidence: Level III

Indicate IRB or IACUC: Exempt

Comparison of Significant Improvements in Speech Perception Versus Patient-Reported Outcome Measures in Adult Cochlear Implant Users

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David S. Haynes, MD; Theodore R. McRackan, MD; Aaron C. Moberly, MD

Objective: 1) To assess clinically significant improvements in speech perception and patient-reported outcome measures (PROMs) in cochlear implant (CI) users and 2) to identify factors that influence both outcomes.

Study Design: Retrospective cohort.

Setting: Tertiary referral center.

Patients: Adult CI users with pre- and 6-12 month-post-operative CI-specific PROMs and speech perception testing.

Main Outcome Measures: Pre- and post-operative CI-only AzBio Quiet and CIQOL scores; datalogging, hearing history, demographic variables.

Results: For 86 patients, average age at implantation was 65 years (SD=15.7), and average device use was 11.3 hours/day (SD=3.8). Mean CI-only AzBio score increased from 21% (SD=23.9, median 10%, IQR=38) preoperatively to 65% (SD=29.1, median 76%, IQR=37) 6-12 months post-operatively. Mean CIQOL outcome scores were 38.5 (SD=7.3, median 37.5, IQR=11) preoperatively and 51.1 (SD=6.8, median 51, IQR=14) post-operatively. 85% showed significant improvement in CI-only speech perception testing, and 62% showed significant improvement in CIQOL. Only 2 (2%) patients demonstrated no improvement in AzBio nor CIQOL. CIQOL and AzBio improvements were significantly associated with lower pre-CI AzBio scores (below cohort's median, 9.5, p=0.014 and p=0.032). Younger age (p=0.039) was only associated with CIQOL improvement. Datalogging and duration of hearing loss were not associated with significant CIQOL or AzBio improvement.

Conclusions: Speech perception and PROMs should be viewed as complementary assessments of CI outcomes. Individual patient factors may contribute differently to these outcomes and can inform counseling regarding expected outcomes.

Professional Practice Gap & Educational Need: The relationship between speech perception testing and PROMs is complex. Ultimately, a better understanding of this relationship will allow clinicians to identify specific patient factors that may influence individual outcomes and allow for more personalized and realistic CI counseling.

Learning Objective: Understand the relationship between speech perception and PROMs in CI users; identify patient-specific factors that may influence these outcomes.

Desired Result: Improve individual CI counseling and outcome prediction by providing further evidence of the relationship between speech perception and PROMs and the impact of specific patient factors.

Level of Evidence – Level IV: Historical cohort or case-controlled studies.

IRB: IRB Exempt (240876, Vanderbilt University, approved 8/23/24).

Development and Evaluation of a Novel Pitch Discrimination Test for Cochlear Implant Users

Angeline A. Truong, MS, Audrey Limb, Patpong Jiradejvong, Charles Limb, MD

Objective: To develop and evaluate a novel pitch discrimination test in cochlear implant (CI) users and normal hearers (NH).

Study Design: Cross-sectional survey.

Setting: Tertiary care center.

Patients: Phase 1 - 24 CI, 20 NH. Phase 2 - 12 CI, 13 NH.

Interventions: The test involved a volume-roved, pseudo-randomized semitone sequence on a C4 chromatic scale. Participants clicked a button upon detecting pitch changes. Phase 1 utilized pure tones, while Phase 2 employed piano tones. Average test duration was 97±5 seconds.

Main Outcome Measures: Precision, recall, accuracy, F1-score

Results: In Phase 1, CI users clicked more often (20 vs. 13), with wider response range (75 vs. 16) than NH. CI users demonstrated lower precision (0.49 vs. 0.86, $p<0.001$), recall (0.66 vs. 0.91, $p<0.01$), accuracy (0.84 vs. 0.97, $p<0.001$), and F1-score (0.51 vs. 0.88, $p<0.001$) than NH. Average semitone resolution was poorer for CI users (1.41 vs. 1.08) than NH. No significant F1-score differences were found amongst CI users by musical background, age of deafness onset, duration of CI use, or length of deafness without CI. In Phase 2, CI users had lower precision (0.78 vs. 0.93, $p=0.06$), recall (0.66 vs. 1.00, $p<0.001$), accuracy (0.93 vs. 0.99, $p=0.001$), and F1-score (0.67 vs. 0.96, $p<0.001$) than NH. CI users had higher precision (0.78 vs. 0.49, $p=0.002$), recall (0.93 vs. 0.84, $p=0.005$), and F1-score (0.67 vs. 0.51, $p=0.03$) on piano vs. pure tones, but similar accuracy (0.66).

Conclusions: We demonstrate the feasibility of a <5 minute pitch discrimination test feasible in busy clinical settings, starting with a piano tone test to gauge initial capabilities and a pure tone version for a more rigorous evaluation.

Professional Practice Gap & Educational Need: CI users are known to have poor music perception, but few studies have explored solutions for this gap.

Learning Objective: Understand the potential for implementation of a rapid pitch discrimination test.

Desired Result: Promote importance of exploring factors that impact pitch discrimination in CI users.

Level of Evidence - III

Indicate IRB or IACUC: 15-17330, UCSF

Patient-Reported Changes in Vestibular Symptoms Following Cochlear Implantation

Karl R. Khandalavala, MD; Eric E. Babajanian, MD; John P. Marinelli, MD; Brennan G. Olson, MD
Christine M. Lohse, MS; Brian A. Neff, MD; James R. Dornhoffer, MD

Objective: To describe patient-reported changes in dizziness severity and frequency following cochlear implantation (CI) among adults with a preexisting diagnosis of dizziness.

Study Design: Historical cohort.

Setting: Tertiary academical medical center.

Patients: Adults with a preoperative diagnosis of dizziness who underwent CI from 2000 to 2024.

Interventions: Cochlear implantation.

Main Outcome Measures: Patient-reported changes in vestibular symptoms following CI, including dizziness severity and frequency.

Results: In total, 222 patients (55% men) undergoing CI with a preexisting diagnosis of dizziness were eligible for study, with a median age of 66 (IQR 56-76) years. The most common etiologies of dizziness included Ménière's disease (60%), vestibular hypofunction (20%), and recurrent benign postural positional vertigo (BPPV) (10%), with most patients (70%) reporting rotary vertigo as their predominant symptom phenotype. Overall, 84% of patients reported either improvement or stability in both dizziness severity and frequency following CI after a median of 1.1 (IQR 0.2-2.8) years of post-CI follow-up. Patient-reported changes in dizziness severity or frequency did not significantly differ between men and women ($p=0.19$ for severity and $p=0.2$ for frequency), by age at CI ($p=0.18$ for severity and $p=0.7$ for frequency), or among those with Ménière's disease, vestibular hypofunction, and BPPV ($p=0.9$ for severity and frequency).

Conclusions: In patients with a preoperative diagnosis of dizziness, the severity and frequency of symptoms generally improved, rather than worsened, after CI. While likely representative of disease progression/resolution or continued compensation with time, these data provide some assuredness that patients with preexisting dizziness can receive benefit from CI with a low likelihood of worsening sensations of dizziness.

Professional Practice Gap & Educational Need: To understand the changes to dizziness amongst adult patients undergoing cochlear implantation.

Learning Objective: To characterize the changes in dizziness in patients undergoing cochlear implantation.

Desired Result: To demonstrate that cochlear implantation in patients with preoperative diagnosis of dizziness is associated with subjective improvements in both dizziness severity and frequency.

Level of Evidence – Level IV

Indicate IRB or IACUC: IRB ID: 22-000183

20 Years of Surgical Management and Outcomes of Pediatric Lateral Skull Base Malignancies: The MD Anderson Experience

Kaitlyn A. Brooks, MD; Marc-Elie Nader, MD; Paul W. Gidley, MD

Objective: To present surgical management paradigms and outcomes of pediatric patients with malignant lateral skull base pathology.

Study Design: Retrospective case series.

Setting: Single institution academic center.

Patients: Eleven pediatric patients (aged 1 to 17 years) with lateral skull base resection and treatment course from 2004 to 2024.

Interventions: Surgical management and reconstruction.

Main Outcome Measures: Treatment course, complications, facial nerve function, hearing rehabilitation, 5-year overall survival with Kaplan-Meier analysis.

Results: Five (45.5%) patients had a primary parotid malignancy, 5 (45.5%) patients had a primary head and neck sarcoma, and 1 (9%) patient had an endolymphatic sac tumor. Surgical approaches included transmastoid with facial nerve decompression (5), lateral or subtotal temporal bone resection (5), middle fossa craniotomy (1), transcochlear approach (1), and total petrosectomy (1). Gross-total resection was achieved in 9 (82%) patients. Four (36%) patients had disease recurrence or progression requiring salvage treatment; median time to salvage was 5 months (range 2 – 55 months). Six (55%) patients received adjuvant chemotherapy while 9 (82%) patients received adjuvant radiotherapy. Seven (64%) patients had intact facial function pre-operatively; 6 (55%) patients required facial nerve resection at time of surgery and underwent cable graft reconstruction with best obtained final function as a House-Brackmann score 3. Four (36%) patients experienced maximal conductive hearing loss and were rehabilitated with bone-anchored hearing aid placement. Three (27%) patients died in follow-up and overall 5-year survival was 66%.

Conclusions: Pediatric malignancies requiring lateral skull base resection are extremely rare, with outcomes varying based on tumor aggressiveness, location, and pre-operative symptomatology.

Professional Practice Gap & Educational Need: The educational need is because this pathology in pediatric patients is very rare, which makes reporting of outcomes limited, leaving no clear guidelines, particularly in challenging cases.

Learning Objective: To consider surgical management strategies and learn outcomes, particularly as it pertains to adjuvant treatment, rate of recurrence, and survival, for this patient population.

Desired Result: Improved pre-operative counseling and multidisciplinary discussion of challenging pediatric skull base malignancy cases.

Level of Evidence: Level V

Indicate IRB or IACUC: MD Anderson Cancer Center IRB # PA19-0106.

Extended High-Frequency Audiometry and Imaging Characteristics in Vestibular Schwannoma Patients

Jason K. Adams, MD; Adriana I. Baez Berrios, BS; Katherine Scigliano, AuD; Zachary G. Schwam, MD
Enrique Perez, MD; Maura Cosetti, MD; George Wanna, MD

Objective: The purpose of this study is to identify magnetic resonance imaging (MRI) risk factors associated with extended high-frequency hearing loss in treatment-naive patients with vestibular schwannoma

Study Design: Retrospective cohort

Setting: Tertiary, specialty clinic

Patients: Adult patients with treatment-naive vestibular schwannoma

Interventions: Extended high-frequency (EHF) audiometry from 8 – 20 kHz

Main Outcome Measures: Pure-tone average (PTA) at 500, 1, 2, 4 kHz; EHF-PTA (including all measured frequencies from 8kHz to 12.5kHz), word recognition score (WRS), cochlear fluid intensity on T2 MRI), fundal cap, tumor location and size (cm)

Results: 26 patients (mean age 60 years, range 29-88; n=12 female,) underwent EHF audiometry with an average: PTA of 44 dB (range 9-110), WRS 60% (range 0-100), and EHF-PTA of 63 dB (range 5–110). Tumors with abnormal MRI T2 cochlear signal were significantly different from those with normal signal at 3kHz (34 vs 59 dB, p=0.03), 6kHz (37 vs 59 dB, p=0.04), 8Khz (41 vs 66 dB, p=0.04), 11.2KHz (50 vs 75 dB, p=0.03), response at 16kHz (8 vs 3, p=.04), and WRS (83 vs 45% p=0.01). There were no statistically significant differences between PTA, WRS, or EHF PTA comparing IC or CPA tumors or between those with/without a fundal cap. Ultra-EHF thresholds (14-20 kHz) were assessed categorically (present yes/no), and there was no significant difference in comparison of presence of a fluid fundal cap or tumor location. Linear regression showed no correlation between tumor size and EHF-PTA.

Conclusions: EHF audiometry is a promising tool for monitoring and evaluating patients with vestibular schwannoma and may have imaging correlates, such as abnormal cochlear T2 signal, useful for predicting hearing outcomes. Further study is needed to assess the role of EHF in timing of intervention or tumor surveillance.

Professional Practice Gap & Educational Need: The role of extended high-frequency audiometry has not been well established within the field of neurotology.

Learning Objective: Learners will recognize the utility of assessing extended-high frequency hearing in patients with vestibular schwannoma.

Desired Result: Improve understanding of the role of EHF audiometry in evaluation and management of patients with vestibular schwannoma.

Level of Evidence - IV

Indicate IRB or IACUC: Icahn School of Medicine at Mount Sinai IRB, 22-01733

Radiomorphometric Comparison of Internal Auditory Canal Access: Retrolabyrinthine, Retrosigmoid, and Middle Cranial Fossa Approaches

Arman Saeedi, MD, MPH; Lawrance Lee, MD; Nauman F. Manzoor, MD

Objective: To compare predicted internal auditory canal (IAC) volume access via retrolabyrinthine, retrosigmoid, and middle cranial fossa (MCF) approaches.
Study Design: A radiomorphometric analysis of cadaveric temporal bones.
Interventions: High-resolution computed tomography scans of six cadaveric temporal bones were used to generate 3D segmentations of the internal auditory canal. A 30° angle, at the level of the IAC, was utilized to project the exposure of the IAC without violating the inner ear structures via retrolabyrinthine, retrosigmoid, and middle cranial fossa approaches.

Main Outcome Measures: Radiographically predicted accessible volume of the internal auditory canal.

Results: Four cadaveric temporal bones (2 right, 2 left) were included. The mean IAC volume was 0.23 ± 0.07 cm^3. Of the three hearing preservation approaches, the retrosigmoid approach was projected to have the greatest relative IAC volume exposure (81.1%), followed MCF (73.2%), and retrolabyrinthine (53.3%) approaches. The mean lengths of inaccessible posterior IAC wall were 0.58 cm, 0.51 cm, and 0.29 cm, for the retrolabyrinthine, retrosigmoid, and MCF approaches, respectively, while the mean total posterior IAC wall length was 1.27 cm.

Conclusions: While established hearing preservation approaches to the IAC remain the gold standard for maximizing lateral IAC exposure, the retrolabyrinthine approach may be suitable in select patients with limited involvement at the fundus of the IAC. This approach has the substantial advantage of avoiding craniotomy as well as complications associated with intracranial manipulation and prolonged parenchymal retraction. Larger feasibility studies to delineate favorable anatomy and disease phenotypes are needed.

Professional Practice Gap & Educational Need: With improvement in endoscopic-assisted surgical techniques, there is a critical need to understand how to further optimize existing techniques for approaching the IAC and explore the benefits and limitations of previously inaccessible approaches.

Learning Objective: Predict the degree of IAC exposure between various hearing-preserving surgical approaches to guide pre-surgical decision-making.

Desired Result: Highlight need for preoperative surgical planning to identify optimal approach to IAC tumors.

Level of Evidence - III

Indicate IRB or IACUC: Exempt

Factors Associated with Pursuance and Deferral of Cochlear Implantation among Adult Candidates

Kevin Biju, MD; Kaitlin Hori, BS; Diba Nayeri, BS; Debra Schrader, EdD; Janet S. Choi, MD, MPH

Objective: The aim of this study is to identify and compare demographic and clinical factors between those who pursue and those who defer cochlear implant (CI) surgery.

Study Design: Retrospective case-control study

Setting: Tertiary academic center in an urban setting

Patients: Adult patients 18 years of age or older who met criteria for CI at a tertiary care center between 2021 and 2023

Interventions: Cochlear implantation

Main Outcome Measures: Demographic and clinical factors associated with pursuance and deferral of CI were identified based on logistic regression analysis

Results: A total of 324 patients met criteria for CI between 2021 and 2023. Our cohort consisted of a racially diverse population with varying socioeconomic backgrounds (59% non-White, 28.7% Hispanic, 13% below federal poverty level). In this cohort, 150 patients (46.3%) elected to defer surgery. Patients who pursued surgery tended to be more privately insured than publicly insured (odds ratio 1.61; 95% CI [1.01, 2.58]), have less co-morbid anxiety (OR 0.39; 95% CI [0.14, 0.98]), and have lower age of hearing loss onset (43.5 vs. 49.9; p=0.031). In multivariable logistic regression analysis, anxiety (OR 0.30; 95% CI [0.11, 0.74]), public insurance status (OR 0.58; 95% CI [0.34, 0.99]), and single-sided deafness (OR 0.51; 95% CI [0.30, 0.85]) were significant predictors of cochlear implant deferral.

Conclusions: Consistent with prior studies, the deferral rate of cochlear implant surgery remains high in our cohort. Patients with anxiety, public insurance, and single-sided deafness were more likely to defer cochlear implant surgery. These patients may benefit from enhanced support and pre-operative counseling following their CI evaluation.

Professional Practice Gap & Educational Need: Despite the demonstrated benefits of cochlear implantation, there continue to be high deferral rates. In order to provide a personalized approach, it is essential for surgical providers to understand potential patient barriers associated with deferral of cochlear implantation.

Learning Objective: Providers will recognize the demographic and clinical characteristics of CI candidates who chose to defer surgery.

Desired Result: Providers may identify patients who require additional socioeconomic support or medical management prior to CI surgery. This could facilitate personalized discussions and treatment plans to navigate these barriers and increase patient pursuit of CI.

Level of Evidence - III

Indicate IRB or IACUC: Exempt (USC ID UP-24-00059)

Comparative Utility Study of CT versus MRI in the Assessment of Adult Cochlear Implant Candidates

Jasmine Wu, BS; Kevin Wong, MD; Randall Harley, MD; Keshav V. Shah, BS
Tiffany P. Hwa, MD; Douglas C. Bigelow, MD; Michael J. Ruckenstein, MD

Objective: The purpose of this study was to compare the clinical utility of computed tomography (CT) and magnetic resonance imaging (MR) for the preoperative workup of adult cochlear implant (CI) candidates.

Study Design: Retrospective chart review.

Setting: Single tertiary care center.

Patients: 499 consecutive adults who underwent cochlear implantation.

Interventions: CT, MRI

Main Outcome Measures: Finding on CT or MR leading to a change in patient management

Results: 499 subjects were included, with a mean age of 63.7 years (range: 19 to 96 years, SD=16). Most subjects (450, 90%) were post-lingually deaf, 44 subjects (9%) were congenitally deaf and 5 subjects (1%) were pre-lingually deaf. In total, 371 patients (74.3%) had preoperative MR scans, 327 patients (66%) had CT scans, and 216 patients (43%) had both. Among those with both scans, MR was the initial scan in 92 patients (43%) while CT scan was first in 36 patients (16%). MR led to a change in management in 6 cases (2%, 6/371), including 3 reports of decreased T2 cochlear signal, one labyrinthitis ossificans, one cochlear malformation, and one vestibular schwannoma. CT led to a change in management in 14 cases (4%, 14/327): 5 reports of labyrinthitis ossificans, 7 related to surgical anatomy (aberrant facial nerve, sclerotic mastoid, obstructing jugular bulb), one cochlear malformation, and one petrous apex lesion. Among subjects with an initial CT, two required subsequent MR imaging based on CT findings; no subjects with an initial MR required additional CT imaging based on MR findings.

Conclusions: Both CT and MR are suitable for preoperative candidacy planning before cochlear implantation. CT may provide more insight into surgical anatomy, however, MR is the preferred single-modality option due to superior ability to offer definitive diagnostic information.

Professional Practice Gap & Educational Need: As a part of the preoperative assessment of adult CI candidates, CT and MR scans may be ordered to evaluate candidacy and surgical anatomy. While some surgeons opt for MR scans only, others prefer CT scans, and still others routinely order both. As there is no standardized practice, this study aims to evaluate the comparative clinical utility of CT versus MR in the preoperative assessment of implant candidates.

Learning Objective: The objective of this study is to investigate the utility of preoperative MR vs. CT imaging in adult patients undergoing cochlear implantation.

Desired Result: 1) improve understanding of the variable benefits and limitations of available preoperative imaging modalities for CI candidacy evaluation and 2) recognize the indications for which each modality may be most helpful.

Level of Evidence – Level 4

Indicate IRB or IACUC: 856621 - University of Pennsylvania

Short-term Vestibular Functional Outcomes after Blast Exposure in a Preclinical Rodent Model using a Novel Blast Apparatus

Pavan S. Krishnan, MD; Yuan Gao, MS; Megan Barber, BS; Federica M. Raciti, PhD
Curtis King, MS; Michael Hoffer, MD; Suhrud Rajguru, PhD

Objective: Developing a standardized blast apparatus is crucial for establishing a preclinical model to study injury mechanisms an explore therapeutic interventions post-blast. Our objective was to (1) develop and characterize a blast apparatus that generates reliable and reproducible blast overpressures, and (2) evaluate cervical vestibular evoked myogenic potentials in a preclinical rodent model at varying blast intensities.

Study Design: Equipment validation, cohort study using a rat preclinical model

Setting: Concrete blast room; ambient temperature and humidity of the blast apparatus environment was monitored and kept constant at 20-25 degrees Celsius and 50-5%, respectively.

Patients: NA (animal study)

Interventions: Blast overpressures

Main Outcome Measures: Blast output characterized by peak pressure measurements (ICP® pressure sensors, PCB Piezotronics), cervical vestibular evoked myogenic potentials (cVEMPs)

Results: A blast apparatus was constructed at a local machine shop and uses a 1:4 acetylene to oxygen ratio for complete combustion The blast apparatus was modulated to produce peak pressure between 0.8 and 20 psi based on number of loading cycles. The generated peak pressures showed a positive correlation (r^2=0.96) with the number of loading cycles, with significant increases observed between each incrementing loading cycle (*$p<0.05$) except for between 2 and 3. Furthermore, peak pressure did not significantly vary when blasts were performed on different days nor when different operators performed blasts. We found that blasts with peak pressures of 10-12 psi caused significant threshold shifts in cVEMP responses of Brown Norway rats at 1 and 8 kHz (*$p<0.05$). Thresholds increased by 31.2±5.0 and by 33.8±13.7 dB SPL for 1 kHz and 8 kHz, respectively, on day 1 post-blast. No tympanic membrane perforations were observed.

Conclusions: We constructed a blast apparatus generating reproducible and reliable blasts translating to varying intensities of blast injury. This system offers a flexible setup that can be adapted to explore mechanisms of injury in the cochlea and vestibular endorgans as well as other physiological systems. Our team and others will use this apparatus to elucidate the functional, behavioral, morphological effects and mechanisms of blast injury in the preclinical rodent model.

Professional Practice Gap & Educational Need: The most reported symptoms after blast exposure are audiovestibular in nature, including hearing loss, tinnitus, dizziness, vertigo, and balance problems. There are few studies that have investigated the impact blast overpressures have on the peripheral vestibular endorgans. Further, the existing literature features non-standardized blast delivery systems which often deliver varying levels of blast intensities at different distances resulting in a wide range of reported outcomes. Ultimately, this work will change how our field implements blast injuries in the preclinical rodent model.

Learning Objective: To learn about preclinical vestibular functional and behavioral testing, how blast overpressures affect the inner ear, and how blast overpressures can be delivered in a standardized manner to a preclinical model.

Desired Result: Attendees will learn about a novel blast apparatus that reliably produces predictable blast overpressures, and how studying blast injuries can further the field's basic understanding of vestibular physiology and pathophysiology.

Level of Evidence – Does not apply (equipment validation and animal study)

Indicate IRB or IACUC: IACUC-approved (IPROTO202100000129)

Management of Persistent Nystagmus, Tinnitus, Imbalance, and Oscillopsia after Pontine Hemorrhage

Pavan S. Krishnan, MD; Hillary Snapp, AuD, PhD

Objective: To describe a case of pontine hemorrhage causing nystagmus, tinnitus, imbalance, and oscillopsia

Study Design: Case report

Setting: Tertiary care hospital system

Results: This case study describes a 56-year-old male who developed persistent vertical oscillopsia related to pendular nystagmus following pontine hemorrhage in 2022. Upon initial evaluation he was noted to have binocular horizontal diplopia, skew deviation, constant bilateral tinnitus, and imbalance with sensations of sliding and being pushed. Despite early recognition of his symptoms, the patient went untreated for 24 months due to a series of mismanaged referrals and lack of sufficient expertise from consulting healthcare providers, resulting in him becoming wheelchair bound. Eventual neuro-ophthalmic consult led to collaborative evaluation and management by vestibular specialists. Cervical vestibular-evoked myogenic potentials showed absent responses bilaterally for 1000 and 500 Hz. Auditory brainstem response testing was absent bilaterally. Videonystagmography showed a constant vertical pendular nystagmus that upon right gaze, right eye took on a horizontal pendular nystagmus while left eye remained vertical. There was failure of fixation suppression. Although these exam findings indicated a central lesion, it was not possible to rule out a peripheral component. To stabilize the eyes, patient underwent bilateral orbitotomy with titanium T-plate placement in the inferior rectus. Subsequent vestibular assessment found significant reduction in the degree of vertical nystagmus, and the patient reported significant improvement in gaze stabilization and imbalance. Following stabilization of the eye the patient was able to reduce reliance on his wheelchair, initiate physical therapy, and has improved functioning in oculomotor reliant tasks such as reading.

Conclusions: We describe a patient who experienced delays in management of his imbalance and severe nystagmus due to lack of access to appropriate healthcare. This case demonstrates how coordinated interdisciplinary collaboration enabled accurate diagnosis effective management of this patient's complex post-stroke nystagmus.

Professional Practice Gap & Educational Need: Nystagmus is a key exam finding that can distinguish causes of dizziness. However, it often remains poorly documented and poorly described by many clinicians. Due to this, patients with vestibular symptoms can experience significant delays in accurate diagnosis and treatment. This case highlights the critical need for timely and accurate referral pathways for post-stroke complications. Discrimination of central and peripheral vestibular disorders is highly critical in the clinical environment, and inability to identify causes of symptoms can lead to suboptimal management and thus suboptimal outcomes.

Learning Objective: To understand the vestibulo-ocular reflex pathway, differentiate the effects of central versus peripheral insults to the vestibular system, and learn how to implement multidisciplinary approaches for managing vestibular disorders.

Desired Result: Attendees will gain familiarity with the vestibular reflex pathways, identify classical exam signs of central versus peripheral disorders related to the vestibular system, and understand potential surgical options for recalcitrant nystagmus.

Level of Evidence – Level V

Indicate IRB or IACUC: Exempt

Impact of COVID-19 Pandemic and Associated Lockdowns on Acute Otitis Media and Mastoiditis: A Comprehensive Retrospective Study

Moriah Peyser-Rosenberg, MD; Aylon Hadar MD; Nitzan Sofer
Jean-Yves Sichel, MD; Ronen Perez, MD; Pierre Attal MD, PhD; Chanan Shaul MD, PhD

Objective: To evaluate the impact of the COVID-19 pandemic and associated lockdowns on the incidence, severity, complications, and microbiology of acute otitis media (AOM) and acute mastoiditis (AM) in pediatric patients.

Study Design: Retrospective cohort study.

Setting: Tertiary referral center**.**

Patients: Pediatric patients diagnosed with AOM or AM between March 2014 and February 2023**.**

Interventions: None.

Main Outcome Measures: Incidence of AOM and AM, complication rates, types of complications, mastoidectomy rates, clinical parameters (age, WBC count, CRP levels), and microbiology across three periods: pre-COVID (March 2014 - February 2020), during COVID (March 2020 - February 2021), and post-COVID (March 2021 - February 2023).

Results: AOM cases decreased significantly during the COVID period (312/year) compared to pre-COVID (556/year, $p<0.001$), but increased substantially post-COVID (770/year, $p<0.001$). AM cases showed a similar trend with 38, 25, and 45 cases per year in the pre-, during, and post-COVID periods, respectively ($p<0.05$ for all comparisons). The average age of AM patients was lower during COVID (1.52 years) compared to pre- and post-COVID periods (2.38 years, $p<0.01$). Complication rates for AM changed from 25% pre-COVID to 32% during COVID-19 and then to 23% post-COVID ($p=0.07$ for trend). Complications included sigmoid sinus thrombosis, meningitis, epidural abscess, and brain abscess. In response to these complications, mastoidectomy rates were 21% pre-COVID, increased to 28% during COVID, and then decreased to 18% post-COVID ($p=0.06$ for trend). The main pathogens identified in AM cases were Streptococcus group A, Fusobacterium, and Streptococcus pneumoniae, with no significant change in their prevalence across the three periods.

Conclusions: The COVID-19 pandemic and associated lockdowns significantly altered the patterns of AOM and AM in pediatric patients. The initial decrease in cases during lockdowns, likely due to reduced transmissibility, was followed by a substantial rebound effect post-pandemic. The lower average age during the pandemic suggests more severe presentations in younger children, possibly due to delayed care-seeking. The consistency in the prevalence of main pathogens throughout the study period suggests that changes in disease patterns were primarily due to factors such as reduced social contact during lockdowns and altered healthcare-seeking behavior rather than shifts in microbial etiology. The fluctuation in mastoidectomy rates, particularly the increase during COVID-19, highlights the pandemic's impact on managing severe cases, possibly influenced by delayed presentations during lockdowns.

Professional Practice Gap & Educational Need: There is a lack of comprehensive understanding of how the COVID-19 pandemic and associated lockdowns affected the incidence, severity, complications, and microbiology of common pediatric otolaryngological conditions like AOM and AM.

Learning Objective: To understand the changes in incidence, severity, complications, management, and microbiology of AOM and AM in pediatric patients before, during, and after the COVID-19 pandemic, focusing on the impact of lockdowns and reduced transmissibility.

Desired Result: Attendees will gain insights into the pandemic's impact on pediatric ear infections, including the effects of lockdowns on disease transmission, types of complications encountered, and the stability of causative pathogens.

Level of Evidence: Level III.

Indicate IRB or IACUC: Approved by the Institutional Review Board of Shaare-Zedek Medical Center.

Cochlear Implantation in Patients with CHARGE Syndrome: A Systematic Review and Meta-Analysis

Kalena Liu, BS; Jacob Beiriger, BS; Eric Fei, BS; Jacob B Hunter, MD

Objective: Currently, there are limited large studies exploring cochlear implantation (CI) outcomes in patients with CHARGE Syndrome. We aim to evaluate pre- and post-operative speech and auditory outcomes in patients with CHARGE syndrome undergoing CI from a review of published single center studies.

Data Sources: A comprehensive search was conducted across databases from January 2000 onwards, in collaboration with a medical librarian.

Study Selection: Studies reporting on patients with CHARGE syndrome undergoing CI were included (n=22). Exclusion criteria included review articles, non-English manuscripts, and studies that did not report both pre- and post-operative outcomes.

Data Extraction: A total of 22 studies were included for analysis, encompassing 169 CHARGE patients with a total of 158 implanted ears. Extracted data included demographic information, study characteristics, and speech perception and auditory outcomes.

Data Synthesis: Pooled analyses of scaled auditory outcome measures were performed using standardized mean differences (SMDs). Risk of bias was assessed using the Joanna Briggs Critical Appraisal Checklist to evaluate the quality and validity of included studies.

Conclusions: This meta-analysis demonstrates significant global postoperative improvement in auditory outcomes for patients with CHARGE syndrome who underwent CI. Individual level data showed improvements across several auditory outcomes, including IT-MAIS (2.41 pre vs 17.23 post-implantation, n=18, $p<0.0001$) CAP (0.54 pre vs 3.43 post-implantation, n=49, $p<0.001$), and SPC (0.99 pre vs 2.69 post-implantation, n=42, $p<0.001$). Despite the complexity of inner ear malformations in this population, our findings contribute to the growing body of evidence supporting the use of CIs in CHARGE patients.

Professional Practice Gap & Educational Need: This study addresses the limited understanding of the efficacy of CI in patients with CHARGE syndrome, especially given their diverse presentations.

Learning Objective: To understand the impact of cochlear implantation on speech and auditory outcomes in patients with CHARGE syndrome.

Desired Result: Improved clinical decision-making regarding the suitability of CI for patients with CHARGE syndrome, leading to optimized auditory rehabilitation strategies.

Level of Evidence: Level III

IRB or IACUC Approval: Exempt.

Socioeconomic and Demographic Trends of Non-English Speaking Cochlear Implantees: A Large National Database Analysis

Christopher Z. Wen, MD; Marcelina Puc, MS; Charlyn Gomez, BS; Danielle S. Powell, AuD, PhD
David J. Eisenman, MD; Adam C. Kaufman, MD, PhD

Objective: To describe national trends in cochlear implantation for non-English speaking cochlear implant (CI) users

Study Design: Retrospective cohort study

Setting: US institutions participating in the Epic Cosmos database

Patients: Cochlear implantees between 2015 and 2023

Main Outcome Measures: Implantation rate, age at implantation, and measures of socioeconomic status

Results: 25883 patients (47% female) received 29693 cochlear implants. 1138 (4.4%) spoke a non-English language, with the largest languages represented being Spanish (73.4%), Arabic (4.7%) and Chinese (3.0%). Non-English speakers were implanted at lower population-adjusted rates across all age groups compared to English speakers. However, the percentage of non-English speaking CI recipients (4.6±0.4%) changed little from year to year. A greater proportion of non-English (53.8%, OR 4.31; 95% CI 3.86-4.82) and Spanish-speaking (58.5%, OR 5.23; 95% CI 4.60-5.95) CI users were children compared to English-speaking (21.2%) cochlear implantees. Compared to English-speaking CI users (79.5%), non-English speaking CI recipients (93.1%, OR 3.49; CI 2.76-4.41) and Spanish-speaking CI recipients (91.8%, OR 2.88, CI 2.24-3.71) were more likely to live in urban areas. Both were also more likely to live in ZIP codes with greater social vulnerability as measured by the social vulnerability index (V=0.15, V=0.16). There were no differences in explantation rates between English and non-English speakers.

Conclusions: There exists evidence of disparities in rates of cochlear implantation based on spoken language at a national level, with rates of cochlear implantation in non-English speakers remaining unchanged over the past nine years. Non-English CI users are more likely to be implanted as children and are more likely to live in urban areas and ZIP codes with higher SES and SVI compared to English-speaking CI users.

Professional Practice Gap & Educational Need: Few studies have investigated the ways in which non-English speaking CI users within the US compare to their English-speaking counterparts.

Learning Objective: To describe the disparities that exist for non-English speaking CI users and the unique aspects of this population.

Desired Result: Greater awareness of disparities facing the non-English speaking CI population and potential areas for further investigation and improvement

Level of Evidence: IV

Indicate IRB or IACUC: Exempt

Changing Patterns of Cochlear Implant Use Over Time and Associations with Quality of Life

Isabelle J. Chau, BS; Kelly C. Harris, PhD; Theodore R. McRackan, MD, MSCR
Kara C. Schvartz-Leyzac, AuD, PhD

Objective: To examine changes in datalogging characteristics, specifically average hours of daily cochlear implant (CI) use and time spent in different sound environments, in adults during their first post-CI year and evaluate their impact on Cochlear Implant Quality of Life (CIQOL) scores.

Study Design: Retrospective longitudinal cohort study.

Setting: Tertiary medical center.

Patients: 108 adult CI users with bilateral hearing loss.

Main Outcome Measures: Hours of device use per day, proportions of use in various sound environments (quiet, noise, speech, music), and pre-/post-CI CIQOL-35 Profile domain scores were recorded at 1, 3, 6, and 12 months post-activation and assessed using a linear mixed-effects model. Individual patient differences, as well as changes in speech recognition scores in relation to datalogging patterns, will be evaluated in forthcoming analyses.

Results: Daily hours of CI use increased significantly between 1 and 6 months post-activation and returned to 1-month usage by 12 months. Between 1 and 12 months, the proportion of time patients spent in quiet increased (41% vs. 46%, $p<0.01$), while time spent in speech declined (31% vs. 28%, $p<0.05$). When assessing CIQOL domains, positive correlations were observed between time spent in music and CIQOL-Entertainment (r=.33, $p=0.007$) and between time spent in speech and CIQOL-Social scores (r=.39, $p=0.006$).

Conclusions: These results suggest that patients increasingly use their CI during the first six months post-activation but spend less time listening to speech over time. Associations between listening environments and certain CIQOL domains demonstrate how listening patterns and functional abilities might influence each other. Determining causality between use patterns and functional abilities in future studies may enable more individualized counseling on device use for an improved early CI experience.

Professional Practice Gap & Educational Need: Prior studies have demonstrated an association between CI use and speech recognition performance in adults over the first year of use, but associations between use patterns and CIQOL scores are poorly understood. While device use and experience in certain sound environments may impact patient-reported outcome measures, patient perspectives may also impact how patients use their device. Understanding this relationship may allow for improved CI counseling during this early adjustment period.

Learning Objective: To recognize the associations between CI device use, time spent in different sound environments, and cochlear implant-related quality of life outcomes in adult CI users during the first year of CI experience.

Desired Result: The audience will gain a better understanding of how patients use their CI device in the first postoperative year and be able to recognize associations between patterns of device use and functional abilities.

Level of Evidence: III.

Indicate IRB or IACUC: IRB #Pro00126243 approved (exempt) on March 10, 2023.

Cochlear Implantation: What Patients are Hearing from the Internet

Arpan Bose; Keelin Fallon; Soomin Myoung; Kassia Love; Aaron K. Remenschneider, MD
Judith S. Kempfle, MD; Divya A.Chari MD

Objective: In May 2024, Google Chrome introduced an artificial intelligence (AI) overview feature that generates AI responses to user queries. Here, we examine the types of sources and the reliability of both AI-generated responses and traditional webpages related to cochlear implantation.

Study Design: SearchResponse.io, a database that archives People Also Ask (PAA) data from Google was used to determine the most popular questions using the keyword "cochlear implant". Google Chrome's AI response to these questions along with the top five webpage results were recorded. Questions were categorized using the Rothwell classification (fact, policy, value) and sources were sorted into categories (social media, government, medical practice, academic, commercial). Reading ease was measured using the Flesch Reading Ease and Flesch-Kincaid Grade Level. Quality of sources was determined using DISCERN criteria.

Results: Of 28 unique questions identified, 16 questions were fact-based, 3 were policy-based, and 9 were value-based. Of 140 webpages, 26 were from government sources, 16 from social media, 28 from commercial, 58 from a medical practice, and 12 from academic. Fact and value-based questions were more likely to stem from medical practice sources and policy-based questions had no commercial responses ($p<0.05$). Medical practice and social media sources were significantly easier to read than the other sources ($p<0.0001$). The average DISCERN rating for all sources was 3.27 out of 5, while commercial sources and AI-generated responses had significantly lower DISCERN scores of 2.7, and 2.9, respectively ($p<0.05$).

Conclusions: Webpage source is significantly associated with question type. AI-generated responses provided significantly lower quality compared to government and medical practice sources, but not compared to commercial sources.

Professional Practice Gap & Educational Need: Google Chrome is the most commonly used search engine in the United States. Patients may rely on information from online sources to guide decision making. Physicians should be aware of the questions raised by patients and the quality and readability of the information being delivered.

Learning Objective: Recognize that question type impacts the quality of internet responses and that AI generated responses may be inferior compared to other sources. Generally, not high quality.

Desired Result: By understanding the types of questions being asked on the internet, physicians will be better able to counsel patients regarding cochlear implantation, thereby improving therapeutic relationships.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Cochlear Implantation in Patients with Charcot-Marie-Tooth Disease: A Case Series on Auditory and Genetic Challenges

Sarah Hughes, BA; Emily Z Stucken, MD

Background: Charcot-Marie-Tooth disease (CMT) is a hereditary neuropathy sometimes presenting with sensorineural hearing loss (SNHL) or auditory neuropathy spectrum disorder (ANSD). While cochlear implants (CIs) are widely used for rehabilitation of SNHL, their effectiveness in CMT is not well understood due to the central neurological profile.

Methods: Three CMT patients with SNHL or ANSD received CIs. Preoperative clinical profile and postoperative outcomes of auditory performance were assessed.

Results: Case 1: A 60-year-old woman with CMT (confirmed on genetic testing), bilateral ANSD, and multiple sclerosis received a CI. Her Consonant-Nucleus-Consonant (CNC) word score improved from 8% to 68% in the implanted ear, with AzBio score of 64% postoperatively (not tested preoperatively). Case 2: A 20-month-old boy with X-linked CMT1X, developmental delay, and bilateral ANSD, received a CI at age 2. Postactivation speech testing demonstrated Multisyllabic Lexical Neighborhood Test (MLNT) score of 100% in the implanted ear. Finally, a 32-year-old man with CMTX5, severe bilateral congenital (prelingual) SNHL, and progressive vision loss received a left CI at age 32. Post-CI, he achieved environmental sound awareness, detecting sounds at 20-30 dB HL. Speech perception gains were neither expected nor observed due to prolonged auditory deprivation (AzBio 0% pre- and postoperatively).

Conclusions: In patients with CMT that receive CI, auditory outcomes were similar to those expected in the mainstream population of CI recipients. Despite the neurologic complexities of CMT, patients can achieve speech recognition if their timeline of implantation is otherwise favorable. As in the general population, speech understanding with CI is not anticipated following prolonged auditory deprivation. These cases underscore the importance of a personalized approach to hearing rehabilitation, considering genetic background and early intervention to rehabilitation to optimize outcomes.

Professional Practice Gap & Educational Need: Limited understanding exists regarding CI outcomes in CMT patients, highlighting a need for comprehensive genetic profiling and tailored intervention strategies.

Learning Objective: To assess CI outcomes in CMT patients, considering the impact of central and genetic factors on auditory prognosis.

Desired Result: Improved selection and management of CI candidates with CMT.

Level of Evidence – Level V

Indicate IRB or IACUC: IRB HUM00224858, University of Michigan

Association Between Neighborhood Socioeconomic Status and Cochlear Implant Outcomes

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John Parsons, AuD; Debra Schrader, Ed.D., LSLS Cert. AVT; Janet S. Choi, MD, MPH

Objective: Examine associations between neighborhood socioeconomic status (SES) and pre- and post-cochlear implant (CI) word scores among adult CI recipients.

Study Design: Retrospective cohort.

Setting: Tertiary academic medical center.

Patients: 216 adult patients who underwent CI 2/2014 to 7/2023.

Main Outcome Measures: CNC word scores at CI evaluation and 1-year post-CI. Neighborhood SES variables extracted from census data based on patients' addresses included social vulnerability index; old age dependency ratio; median household income; percent of occupied housing with: no vehicle, no computers including smartphones, no internet subscription, limited English, high school graduates, and bachelor's degrees.

Results: Study cohort mean±SD age was 59.5±18.2 years; 42.1% were female; 46.8% identified as white race, 26.4% Hispanic, 7.9% Black, and 7.9% Asian; 88.4% were English speaking. 38.9% had Medicaid, 35.6% Medicare, and 23.6% private insurance. Multivariable analysis controlling for demographic factors found neighborhood SES factors significantly associated with lower pre-CI CNC scores were: higher percentage of housing without computers (β:-0.91, 95% CI: -1.5 to -0.3), without internet (β:-0.46, 95% CI: -0.8 to -0.1), and higher old age dependency (β: 0.11, 95% CI: 0.02 to 0.18). There were no associations between neighborhood SES [including no computers (β: 0.22, 95%CI -0.85 to 1.3), no internet (β: -0.11, 95% CI: -0.75 to 0.53), and old age dependency (β:0.11, 95% CI: -0.28 to 0.5)] and post-CI CNC scores in multivariable models adjusting for demographic factors. Post-CI CNC scores were comparable between those with low and high-SES neighborhoods.

Conclusions: In this cohort, there was significant association between lower neighborhood SES and poorer pre-CI CNC scores, indicating patients from low-SES neighborhoods may experience delays in CI evaluation resulting in poorer hearing at presentation. However, there was no association between neighborhood SES and post-CI CNC scores, suggesting lower SES does not necessarily lead to poorer CI outcomes.

Professional Practice Gap & Educational Need: Socioeconomic status (SES) plays an important role in health outcomes. Prior studies demonstrated that adult patients with lower SES are more likely to qualify for a CI, but less likely to undergo implantation. However, outcomes of adult CI recipients have not been studied in relation to neighborhood SES.

Learning Objective: Patients with lower neighborhood socioeconomic status have worse pre-CI CNC word scores but still gain benefit and attain similar outcomes at 1 year after cochlear implantation.

Desired Result: Increase awareness of hearing loss especially in communities with lower socioeconomic status and encourage patients to seek treatments and referral for hearing healthcare and potential CI evaluation.

Level of Evidence – Level IV – Historical cohort study

Indicate IRB or IACUC: IRB Exempt (USC HS-24-00185, approved 4/5/2024)

Outcomes of Bilateral Eustachian Tube Balloon Dilation: Impact of Procedural Order on Audiometric and Surgical Outcomes

Adriana I. Baez Berrios, BS; Jason K. Adams, MD
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Objective: Balloon dilation of the eustachian tube (BDETD) may be performed concurrently with otologic surgery, however best practices for procedural order are unknown. This study investigates whether timing of BDETD (before/after the primary otologic procedure) impacts audiologic and surgical outcomes.

Study Design: Retrospective cohort study.

Setting: Tertiary, specialty clinic.

Patients: Adult patients (n = 25) who underwent otologic surgery in combination with simultaneous bilateral BDETD.

Interventions: Bilateral ETD performed before or after primary otologic procedures, with subgroup analysis by tympanoplasty, mastoidectomy, and ossiculoplasty.

Main Outcome Measures: Pre- and post-operative Word Recognition score (WRS), 4-frequency (500, 1000, 2000, 4000 Hz) Pure Tone Average (PTA), and Air-Bone Gap (ABG).

Results: Patients (n = 25) with BDETD before primary otologic procedures had a mean ABG improvement of -12.8 dB compared to -12.5 dB for those with BDETD after the primary procedure (p = 0.954). There were no significant differences in WRS or PTA between the groups. Neither group experienced any complications, including no residual perforation. Subgroup analysis by cholesteatoma history revealed greater ABG improvement in patients with prior cholesteatoma (-21.9 dB, p = 0.003), while no significant differences were observed between the yes/no tympanoplasty, mastoidectomy, or ossiculoplasty groups.

Conclusions: The timing of BDETD relative to simultaneous otologic procedures did not significantly impact hearing or surgical outcomes. Prior history of cholesteatoma may be associated with greater improvement in ABG post-operatively.

Professional Practice Gap & Educational Need: Further research is needed to determine the clinical significance of procedural order in ETD and its impact on audiometric outcomes.

Learning Objective: To understand the effect of procedural order of ETD on audiometric outcomes.

Desired Result: Optimize the procedural approach for patients undergoing combined otologic and ETD interventions to improve hearing outcomes and reduce complications.

Level of Evidence - IV

Indicate IRB or IACUC: Icahn School of Medicine at Mount Sinai IRB, 22-01733.

The Association of Anxiety and Depression with Meniere's Disease and Benign Paroxysmal Positional Vertigo

Koyal Ansingkar, MS; Najm S. Khan, MBS; Kayla Powell, MD; Jeffrey T. Vrabec, MD

Objective: Investigating the prevalence of anxiety and depression in patients with Meniere's Disease (MD) and benign paroxysmal positional vertigo (BPPV).

Study Design: Retrospective cohort database study of All Of Us Research Program from Summer 2017 to January 1, 2022

Setting: The National Institute of Health's All Of Us Research Program is a national database containing health data from a diverse population of 409,425 patients.

Patients: Patients were categorized into three groups based on ICD-10 codes: Meniere's Disease, BPPV, or both Meniere's Disease and BPPV. Controls were matched to experimental groups in a 4:1 fashion based on the racial distribution of the US 2020 Census.

Interventions: Observational

Main Outcome Measures: Multivariate logistic regression was conducted with anxiety and depression as output variables, while accounting for the following comorbidities: tobacco dependence syndrome, alcoholism, diabetes, dyssomnia, hypothyroidism, osteoporosis, and migraine.

Results: Among a total of 46,095 (including controls), there were 983 patients with Meniere's Disease, 7,938 BPPV patients, and 298 patients with both. Prevalence of anxiety was 8% in controls, 16% in Meniere's Disease, 17% in BPPV, and 27% in both. Prevalence of depression was 23% in controls, 40% in Meniere's Disease, 40% in BPPV, and 43% in both. Patients with both diagnoses (OR=3.23, [95% CI, 2.52, 4.14]) had the highest likelihood of having anxiety, followed by BPPV (OR=2.12, [95% CI, 2.00-2.25]), and Meniere's Disease (OR=1.90, [95% CI, 1.60-2.25]). Patients with both diagnoses had the highest likelihood of having depression, with Meniere's Disease (OR=1.72, [95% CI, 1.53-1.93]), and BPPV (OR=1.72, [95% CI, 1.65-1.79]) having a similar association.

Conclusions: This study using the All Of Us database suggests that mental health disorders are common among patients with Meniere's Disease and BPPV. Additionally, patients with both conditions have an increased likelihood of anxiety and depression.

Professional Practice Gap & Educational Need: Psychological factors can contribute to the morbidity of Meniere's Disease and BPPV. This study aimed to determine the relationship between mental health disorders and BPPV in a diverse national sample.

Learning Objective: Understand the prevalence of anxiety and depression in patients with Meniere's Disease and BPPV.

Desired Result: Promote discussion and future research surrounding the psychological factors that contribute to Meniere's Disease and BPPV.

Level of Evidence: Level III

Indicate IRB or IACUC: Exempt

AI-Powered Automated Speech Perception Scoring

Rohit Makol, BS; Maya Hatley, BA; Megan Eitel, AuD
Mahan Azadpour, PhD; Mario Svirsky, PhD; Ariel Edward Hight, PhD

Hypothesis: Whisper, an open-source speech-to-text AI tool, can automate CNC word and phoneme scoring with accuracy comparable to expert human scorers.

Background: Speech perception testing is crucial for evaluating outcomes in cochlear implant (CI) users. While manual scoring is the current standard, automated methods could potentially offer advantages in efficiency and consistency, particularly in settings where expert scorers are not readily available.

Methods: Two experienced CI users each completed word recognition tests using six unique CNC30 word list pairs. Audio recordings were transcribed using Whisper AI, supported by voice activity detection and grapheme-to-phoneme mapping. Orthographic transcriptions by CI users served as the benchmark. We calculated Intraclass Correlation Coefficient (ICC) estimates and their 95% confidence intervals (CIs) to assess inter-rater reliability between Whisper and two expert human scorers.

Results: Whisper-produced transcription errors relative to the orthographic benchmark averaged -1.38% ± 3.35% for words and -1.00% ± 1.87% for phonemes, compared to expert human scorers' errors of 2.38% ± 2.71% for words and 2.11% ± 1.43% for phonemes. Speech perception scores based on orthographic transcriptions averaged 73.67% ± 4.3% and 40.08% ± 4.72% for the two CI subjects. The ICC for Whisper against orthographic transcriptions was 0.979 (95% CI: 0.931–0.994). The ICCs for human scorers against orthographic transcriptions was 0.970 (95% CI: 0.832-0.992) and 0.981(95% CI: 0.911–0.995). The ICC for Whisper against human scorers was 0.966 (95% CI: 0.866-0.991).

Conclusions: Whisper demonstrates strong potential for automating speech perception scoring in CI users, showing excellent agreement with both manual scoring and benchmark orthographic transcriptions. This approach could contribute to standardizing CI outcome tracking, particularly in settings where access to expert evaluators is limited, and may enhance the efficiency of clinical assessments.

Professional Practice Gap & Educational Need: Current speech perception scoring for cochlear implant (CI) users relies heavily on manual methods by expert scorers. There is a need for efficient, standardized, and accessible scoring methods that can maintain accuracy while reducing reliance on expert human scorers especially in areas where access to expert evaluators is limited.

Learning Objective: Participants will be able to describe the process, accuracy, and potential benefits of using AI-based tools like Whisper for automating speech perception scoring in CI users.

Desired Result: Increased awareness and consideration of AI-based tools for standardizing and automating speech perception scoring in clinical practice and research, potentially leading to more consistent and accessible CI outcome tracking.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt.

Effect of Anti-Vascular Endothelial Growth Factor-A Monoclonal Antibody in a Xenograft Model of Vestibular Schwannoma

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Christina Fernandez-Valle, PhD; Christine T. Dinh, MD

Background: Vestibular schwannomas (VS) are intracranial tumors of vestibulocochlear nerves that cause hearing loss and dizziness. Bevacizumab is a humanized anti-vascular endothelial growth factor-A (VEGF-A) monoclonal antibody utilized as an off-label chemotherapy for patients with neurofibromatosis type 2 with variable success. To understand the effect of anti-VEGF-A antibodies for VS, we measured tumor growth, hearing, balance, renal, and hepatic function in a xenograft VS model treated with B20-4.1.1 (anti-VEGF-A antibody).

Methods: Pharmacokinetic studies were conducted in Fischer rats to assess B20-4.1.1 concentration in plasma and vestibulocochlear nerves. A xenograft model of VS was treated with vehicle (n=7) or B20-4.1.1 (10mg/kg intraperitoneal weekly for 4 weeks; n=8). Tumor bioluminescence imaging, auditory brainstem response (ABR), rotarod balance tests, and renal and hepatotoxicity test were performed. Final tumor weight was measured.

Results: B20-4.1.1 levels in plasma and vestibulocochlear nerves peaked at ~6 and 24 hours after drug administration, respectively, and persisted for at least 7 days. After 1 week of treatment, tumor size was found to be significantly smaller in B20-4.1.1-treated rats, when compared to controls ($p<0.05$). B20-4.1.1 prevented progression to severe-to-profound hearing loss at several frequencies. B20-4.1.1 improved overall survival at study endpoint (29% in vehicle- versus 63% in B20-4.1.1-treated rats), but this did not reach statistical significance.

Conclusion: Our *in vivo* study using a xenograft model of VS suggests that anti-VEGFA monoclonal antibodies may delay tumor progression, prolong hearing, and improve overall survival.

Professional Practice Gap & Educational Need: To identify combination therapies that can improve long-term tumor control, hearing preservation, balance function, and survival in NF2 patients.

Learning Objective: To understand the therapeutic utility and limitations of anti-VEGFA antibodies in treating NF2-associated VS.

Desired Result: Participants should better appreciate the potential role of anti-VEGFA antibodies in treating NF2-associated VS.

Level of Evidence: Not applicable

Indicate IACUC: Protocol #16-187

Management of Temporal Bone Fractures in Patients with Inability to Examine the Facial Nerve

Jumah G. Ahmad, MD; Nathaniel Hunter, BS; Aidan Wright, BS;
Ahmad Abdelhadi, BS; David Z. Allen, MD; Vivian F. Kaul, MD

Objective: To assess the rate of facial nerve paresis in patients with temporal bone fractures who cannot initially undergo a facial nerve examination due to intubation or neurologic injuries.

Study Design: Retrospective study.

Setting: Tertiary referral center.

Patients: Consecutive patients with traumatic temporal bone fractures confirmed via CT imaging between 10/8/2019 and 03/22/2024.

Interventions: Diagnostic evaluation.

Main Outcome Measures: Rate of facial nerve paresis among patients initially unable to undergo facial nerve exam due to intubation or neurologic injuries.

Results: Among 590 temporal bone fractures, facial nerve exam was initially unfeasible in 188 cases (32%). Of those who eventually received a facial nerve exam, 27 of 125 (22.0%) had facial nerve paresis. In contrast, facial nerve paresis was observed in 36 of 402 (8.9%) patients able to undergo immediate facial nerve exam ($p = 5.5e-05$, 95% CI: 1.8-5.9). Mean time from injury to ability to perform exam in those with facial nerve paresis was 14 days.

Conclusions: Facial nerve paresis is more likely in patients with temporal bone fractures who cannot initially undergo a facial nerve exam than those in which facial nerve exam is immediately possible. Prophylactic steroid therapy can be carefully considered for select patients to prevent delay in therapy, especially when the expected time to exam is either prolonged or unknown.

Professional Practice Gap & Educational Need: There is currently a gap in knowledge regarding the natural course of patients with temporal bone fractures who cannot initially undergo a facial nerve exam due to intubation or neurologic injuries. We hypothesize that these patients are likely to have more severe fractures with an increased rate of facial nerve paresis. The delay in assessing facial function can lead to delay in treatment.

Learning Objective: To better understand and consider the implications of inability to perform immediate facial nerve exam on patients with temporal bone fractures.

Desired Result: Improve the management and outcomes of patients presenting with facial nerve paresis secondary to traumatic temporal bone fractures.

Level of Evidence – Level IV.

Indicate IRB or IACUC: UTHealth Houston HSC-MS-24-0358.

Extent of Resection and its Impact on Long-Term Outcomes after Partial Removal of Large Vestibular Schwannomas

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Daniel M. Trifiletti, MD; Joseph T. Breen, MD

Objective: To examine how the extent of tumor resection in patients with large vestibular schwannomas (VS) relates to the need for additional treatment, including repeat surgery or stereotactic radiosurgery (SRS), and long-term facial nerve outcomes.

Study Design: Retrospective case series.

Setting: Tertiary referral institution.

Patients: Adult patients with large VS, defined as Koos grade 4 or greater than 3 cm in maximum axial dimension, treated initially with less than total tumor resection between 2003-2021.

Interventions: Microsurgical tumor removal and stereotactic radiosurgery.

Main Outcome Measures: Preoperative and postoperative tumor volume on MRI scans, rates of undergoing SRS or additional tumor removal surgery, time to additional treatment, and facial nerve outcomes using the House-Brackmann (HB) scale.

Results: Twenty-five patients with post-operative follow-up of at least 3 years (range 3.26-14.4, median 5.30 years) were included. Volumetric extent of resection as estimated by the initial postoperative MRI ranged from 43 to 99% (median 84%). Patients who underwent a greater than 90% resection were significantly less likely to require additional treatment during the follow-up period (11% vs 63%, $p = 0.033$). There was no significant difference in rates of acceptable (HB 1-2) facial nerve outcomes between patients who underwent a greater than 80% resection and those with a lesser resection ($p = 0.0518$), with a trend towards better facial function in the group with more extensive resection. No patients who underwent a greater than 80% resection required additional surgery.

Conclusions: Greater extent of resection was associated with significantly lower incidences of repeat surgery and SRS, while long-term facial nerve outcomes were not significantly worse. A more aggressive partial resection can effectively reduce the need for subsequent intervention.

Professional Practice Gap & Educational Need: There is ongoing debate regarding the efficacy of and long-term outcomes following incomplete resection for large vestibular schwannomas.

Learning Objective: To evaluate how varying extents of resections correlate with the need for additional interventions and provide insight to enhance surgical decision making in the treatment of large VS.

Desired Result: To improve understanding of treatment strategies for patients with large VS, ultimately reducing the need for additional interventions and improving long-term patient outcomes.

Level of Evidence – Level III

Indicate IRB or IACUC: Mayo Clinic IRB Protocol 24-008225. Approved 8/21/2024.

Low-Frequency Hearing Preservation in Robotically Assisted Cochlear Implant Electrode Array Insertion

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Bruce J. Gantz MD; Marlan R. Hansen MD

Objective: Analyze the longitudinal outcomes of robotically assisted cochlear implant electrode array on preservation of low frequency acoustic hearing.

Study Design: Retrospective cohort control study.

Setting: Single academic tertiary care center.

Patients: 57 patients implanted with Med-El Flex 20-26 with 30 robotic and 27 manual. 46 patients implanted with AB Slim-J with 14 robotic and 32 manual. A pre-operative low-frequency pure tone average (LF-PTA) threshold of at least 60 dB-HL was used for inclusion in the study.

Interventions: Robotically assisted and manually inserted cochlear implant electrode array insertion.

Main Outcome Measures: Pre- and post-operative low-frequency audiograms. Hearing preservation was defined as follow-up LF-PTA greater than 80 dB-HL. Hearing preservation ratios were calculated with chi-square to test for statistical significance.

Results: Retrospective analysis of the Med-El cohort at 1-2 year follow-up demonstrated (17/27) 63% hearing preservation for manual insertion versus (26/30) 87% for robotic (p=0.040); AB demonstrated (20/32) 63% hearing preservation for manual versus (10/14) 71% for robotic (p=0.56). With overall combined cohort (37/59) 63% hearing preservation for manual versus (36/44) 82% for robotic (p=0.036). Postoperative hearing remained relatively stable in patients with robotics-assisted insertion, while some of the patients with manually inserted arrays experienced ongoing hearing loss after initial preservation and some robotically inserted arrays experiencing improving audiometric thresholds.

Conclusions: Results from these initial studies suggest that robotics assisted insertion may enhance long-term hearing preservation compared with manual insertion. This finding may highlight relative surgical trauma and relative cochlear healing capacity given insertion method and severity of trauma. In addition to insertion method, multiple variables in this multidimensional space likely influence long term hearing preservation. Future studies will focus on post-operative imaging trauma analysis.

Professional Practice Gap & Educational Need: Share early outcomes of robotically driven cochlear implant array insertion with the larger community.

Learning Objective: Learn about robotically driven cochlear implant array insertion with relation to low frequency acoustic hearing preservation.

Desired Result: Understand the performance of robotically driven cochlear implant electrode array insertion with respect to low frequency acoustic hearing preservation.

Level of Evidence - Level III.

IRB: This study was approved by University of Iowa's IRB Committee.

Angiotensin Receptor Blockade Decreases the Odds for Meniere's and Defining Symptoms – A Multi-National Database Study

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Objective: Determine if angiotensin receptor blockade (ARB) therapy associates with decreased odds for Meniere's disease and defining symptoms including sensorineural hearing loss (SNHL), tinnitus, and cochlear implantation.

Study Design: Retrospective cohort database study.

Setting: TriNetX is a live HIPPA-compliant federated cloud electronic health record research network representing pooled data from 125-million patients from 95 healthcare organizations in the United States, Taiwan, Japan, Brazil, and India.

Patients: Subjects with Meniere's disease not on an ARB and no other first-line anti-hypertensive. Separate cohorts were generated for patients >30-years-old for each class of first-line anti-hypertensive drugs. Patients were matched using propensity score matching for medical comorbidities and Meniere's risk factors.

Interventions:

Main Outcome Measures: Odds-ratios with 95% confidence intervals (OR, 95%CI) for SNHL, tinnitus, cochlear implantation, and Meniere's disease (non-Meniere's cohorts only) after Meniere's diagnosis or starting the anti-hypertensive of interest.

Results:
There were 1,958 patients with Meniere's that were on an ARB and no other class of anti-hypertensive that were 1:1 propensity score matched to patients with Meniere's having never taken any anti-hypertensive medication prior to diagnosis. The average age was 67.7 years old, with 56% female patients. The risk for SNHL was 14.20% compared to 17.80% in controls (OR: 0.76, 0.61-0.96). For patients 30-years and older taking an ARB and no other anti-hypertensive medication (n=858,111) versus a thiazide diuretic (n=847,2020) demonstrated a risk for Meniere's of 0.071% versus 0.67% (OR: 0.11, 0.097-0.12). ARBs also associated with protection for SNHL, tinnitus, and cochlear implantation in these cohorts.

Conclusions: For Meniere's patients, ARB treatment associates with decreased risk for disease progression. Use of ARBs compared to other first-line anti-hypertensives associates with decreased odds for diagnosis of Meniere's, SNHL, tinnitus, and cochlear implantation.

Professional Practice Gap & Educational Need: Meniere's is in part a microangiopathic hypertensive disease process similar to hypertension-related kidney failure and hypertensive retinopathy. This work describes the protective association of ARBs compared to other first-line anti-hypertensive drugs.

Learning Objectives: Understand the protective associations of ARBs for diagnosis and progression of Meniere's.

Desired Result: Motivate future clinical trials on the topic of ARBs and otoprotection.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

Assessing Recent Events with Magnet- Based MRI Splints in Cochlear Implant Patients

Shambavi J. Rao, MD; Robert J. Macielak, MD; Joshua D. Palmer, MD; Yin Ren, MD, PhD
Oliver F. Adunka, MD, MBA; Edward E. Dodson, MD; Desi P. Schoo, MD

Objective: To report non-serious adverse events in patients with earlier generation hearing rehabilitation devices undergoing magnetic resonance imaging (MRI) utilizing a magnet-based cochlear implant splint kit

Study Design: Case series

Patients: Patients with earlier generation hearing rehabilitation devices receiving MRI

Interventions: Securing of the cochlear implant with a magnet-based implant splint kit

Main outcome measures: Critical assessment of non-serious adverse events

Results: MRI safety in patients with hearing rehabilitation devices has become well-established with the introduction of self-aligning magnets. While safety concerns related to MRI in these patients have decreased, many patients continue to have earlier generation devices requiring splinting prior to MRI. Cochlear Americas Corporation designed a magnet-based cochlear implant splint to improve safety in this patient population. This study reports on 4 patients who experienced non-serious adverse advents while undergoing MRI using the magnet-based splint. 2 patients experienced splint displacement despite following the manufacturer's instructions. While patients did not experience any event-associated injuries, displacement of the splint may place the patient at risk for displacement of the internal magnet, patient discomfort, device failure, need for revision surgery, and need for repeat imaging. Additionally, 2 patients undergoing planning imaging for radiosurgery required re-imaging due to magnet artifact that substantially interfered with scan quality and precluded safe therapy. Based on these results, the authors of this study have reverted to non-magnet-based splinting with thermoplastic splints or ear mold putty.

Conclusions: While the magnet-based splint is reported as safe and effective, some concerns may still arise. In such instances, clinicians may use readily available clinical supplies as an alternative in patients with earlier generation hearing rehabilitation devices.

Professional Practice Gap and Education Need: To develop a universal approach to splinting earlier generation hearing rehabilitation devices without significant adverse events not limited to displacement, patient comfort, and imaging artifacts.

Learning Objective: To report adverse events associated with magnet-based splinting kit utilization during MRI in the setting of earlier generation hearing implants.

Desired Result: Inform providers of adverse events that may be encountered while splinting earlier generation implantable hearing devices with magnet-based splint kits.

Level of evidence: V

IRB: The Ohio State University 2023H0410

Microtia and Canal Atresia Treatment Trends and Disparities – A Multi-National Database Study

Peter D.A. Eckard, BS; Emma Jackson, BS; Zachary D. Urdang, MD, PhD; Robert A. Saadi, MD

Objective: Investigate trends in microtia and canal atresia aural rehabilitation and reconstruction. Investigate racial and ethnic disparities in management of microtia.

Study Design: Retrospective cohort database study.

Setting: TriNetX is a live HIPPA-compliant federated cloud electronic health record research network representing pooled data from 125-million patients from 95 healthcare organizations in the United States, Taiwan, Japan, Brazil, and India.

Patients: Subjects with a diagnosis of microtia and canal atresia. Separate cohorts were generated by racial and ethnic group for external ear reconstruction, bone anchored hearing aid (BAHA), or bone conduction hearing implant. Propensity score matching for age, medical comorbidities, and congenital syndromes.

Main Outcome Measures: Odds-ratios with 95% confidence intervals (OR, 95%CI) for microtia and canal repair and BAHA implantation.

Results: There were 13,265 patients identified with microtia and canal atresia. The average age was 8.86 (SD 13.3) years old with 42.98% female patients. Management with a BAHA or bone conduction hearing implant has become increasingly common with a 5.03-fold increase in incidence proportion over the last 25 years. During the same period, the incidence proportion of surgical repair had a 2.05-fold increase with a 2.81-fold increase from 1999-2014, followed by a 1.38-fold decrease from 2014-2024. Surgical repair is the most common treatment (n=2,962, 21.7%), but BAHA implantation is increasing (n=1,069, 8.1%). White non-Hispanic patients were more likely to receive reconstruction (OR 1.169, 95%CI 1.071-1.277) or BAHA (OR 1.776, 95%CI 1.533-2.058) than non-White patients.

Conclusions: Management of microtia and canal atresia involves both reconstruction and functional rehabilitation. Over the last 20 years, an increasing number of patients are receiving aural rehabilitation with a BAHA or a bone conduction hearing implant. However, treatment disparities still exist.

Professional Practice Gap & Educational Need: Microtia and canal atresia are frequently managed by a multidisciplinary team for reconstructive surgery and BAHA implantation. Clarification of treatment trends may help promote effective multidisciplinary care.

Learning Objectives: Understand treatment trends for aural rehabilitation in patients with microtia and recognize disparities in care received by racial and ethnic minorities.

Desired Result: Inform on treatment trends and disparities and motivate future clinical trials to explore the optimal aural rehabilitation for patients with microtia.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

Cochlear Fistula by Facial Schwannomas of the Geniculate Ganglion: Incidence, Hearing Loss, and Surgical Outcomes

Steven D. Curry, MD; Armine Kocharyan, MD; Sudhir Manikavel, MD
Derald E. Brackmann, MD; William H. Slattery III, MD

Objective: Cochlear fistula by facial nerve tumors has a risk of complete ipsilateral hearing loss with tumor resection. This study aimed to identify signs and symptoms of cochlear fistula by facial schwannomas and determine risk factors for complications with tumor resection.

Study Design: Retrospective case series.

Setting: Single-institution tertiary referral center.

Patients: 23 patients with facial schwannomas.

Main Outcome Measures: Symptoms, facial nerve function, tumor characteristics, imaging, audiometry, and post-treatment outcomes.

Results: 23 patients (47.8% female) with a mean (standard deviation [SD]) age of 49.8 (15.0) years with facial schwannomas were identified. 16 of 23 patients had tumor involvement at the geniculate ganglion, and 4 patients had a mean (SD) cochlear fistula measuring 2.4 (1.1) mm. Ipsilateral hearing was significantly worse for air- (AC, 42 vs. 19 dBHL, p=.002) and bone-conduction (BC, 28 vs. 17 dBHL, p=.0497) pure tone average (PTA), but not for word recognition score (87% vs. 98%, p=.08) compared to the contralateral ear. There was no significant difference in hearing with/without cochlear fistula or pre-/post-treatment. One patient had tumor invasion of the cochlea and ipsilateral profound hearing loss. Vestibular symptoms were not significantly different between patients with/without cochlear fistula, and no patients reported mobile third window symptoms. Surgical treatments included 8 decompressions without tumor excision and 2 tumor resections with great auricular nerve grafts. One patient underwent radiosurgery. Mean (SD) facial nerve House-Brackmann grade was 2.0 (1.1) at presentation and 2.7 (1.7) at last follow-up a median (interquartile range) of 1.6 (0.85 to 4.9) years.

Conclusions: Facial schwannomas at the geniculate ganglion can cause asymptomatic cochlear fistula without mobile third window symptoms. This study identified a high incidence of cochlear fistula.

Professional Practice Gap & Educational Need: Facial schwannomas are rare tumors that can occur at any segment(s) of the facial nerve. Management guidelines are based on expert opinion, with poor facial nerve grade cited as a criterion for determining candidacy for tumor resection. The incidence of cochlear fistula with facial schwannomas, the role of hearing status in clinical decision making, and the risks of hearing loss with observation vs. intervention are incompletely understood.

Learning Objective: To characterize the presenting signs and symptoms of facial schwannoma and compare outcomes of patients with vs. without geniculate ganglion involvement of tumor and cochlear fistula.

Desired Result: Participants will understand the characteristics of facial schwannomas of the geniculate ganglion and the risk of hearing loss with observation or excision of tumors that have caused a fistula of the otic capsule of the cochlea.

Level of Evidence: Level IV

Indicate IRB or IACUC: Exempt

Racial and Ethnic Disparities in Cochlear Implant Clinical Trials

Jason E.O. Muka, BS; Peter D.A. Eckard, BS; John Dornhoffer, MD; Robert A. Saadi, MD

Objective: Investigate the racial and ethnic disparities in patients enrolled in cochlear implant (CI) clinical trials in the U.S., promote more inclusive recruitment in future trials to ensure generalizable results, and improve healthcare equity.

Data Sources: ClinicalTrials.gov was queried from inception to September 2024 for trials concerning cochlear implants.

Study Selection: Clinical trials with a primary aim concerning CI outcomes were screened for reported racial or ethnic demographic data available on ClinicalTrials.gov or associated publications indexed in PubMed. Studies without a U.S. based study location were excluded after the initial screening due to variability in study type.

Data Extraction: Demographic data on race, ethnicity, and gender were collected.

Data Synthesis: Frequencies and percentages of aggregated racial and ethnic diversity were calculated and compared to national racial and ethnic diversity levels as reported by the U.S. Census Bureau.

Results: There were 523 trials screened, and 8 met inclusion criteria, comprising a total of 164 study participants. In aggregate, participants were 47.06% (n=77) female, 79.27% (n=130) White, 1.83% (n=3) Black or African American, 0.61% (n=1) American Indian or Alaskan Native, 4.27% (n=7) Asian, 0% (n=0) Native Hawaiian or other Pacific Islander descent, and 4.88% (n=8) of other/unspecified race, compared to national distribution of 50.5%, 75.3%, 13.7%, 1.3%, 6.4%, and 0.3%, respectively. Ethnic demographics of participants were 1.22% (n=2) Hispanic and 35.98% (n=59) non-Hispanic, compared to 19.5% and 50.5% nationally.

Conclusions: CI clinical trials lack adequate racial and ethnic representation, and only a small number of trials publish demographic data. Addressing these gaps will help enable improved access to CI technology for underrepresented populations.

Professional Practice Gap & Educational Need: There is a significant underrepresentation of racial and ethnic monitories in U.S.-based cochlear implant clinical trials, leading to non-generalizable outcomes and limiting access to CI technology for these populations.

Learning Objective: Recognize the disparity in minority representation in CI trials and its impact on research validity.

Desired Result: Physicians and researchers will increase their knowledge of racial and ethnic disparities in CI trials and advocate for more inclusive practices for better health equity.

Level of Evidence - III

Indicate IRB or IACUC: Exempt.

Socioeconomic and Demographic Trends of Patients Undergoing Eustachian Tube Dilation: A Large National Database Analysis

Robert H Weigman, BS; Christopher Z. Wen, MD; Marcelina Puc, MS; Adam C. Kaufman, MD, PhD

Objective: To describe national trends in patients receiving balloon dilation of the eustachian tube (BDET)

Study Design: Retrospective cohort study

Setting: US institutions participating in the Epic Cosmos database

Patients: Adult and pediatric patients undergoing BDET between January 2020 and June 2024

Main Outcome Measures: Sociodemographic and socioeconomic measures, procedure setting, complications

Results: 8753 patients who underwent BDET were included, of which 4873 (55.7%) were female and 493 (5.6%) were pediatric. Pediatric ($p<0.0001$; OR 1.83) patients and non-urban patients ($p<0.0001$; OR 1.28) were more likely to undergo bilateral procedures. The most vulnerable quintile of patients, as defined by the social vulnerability index (SVI), had 1.34 higher odds ($p<0.0001$) of undergoing bilateral BDET compared to the least vulnerable quintile. Black ($p=0.02$; OR 1.47), Hispanic ($p<0.001$; OR 2.02;), and rural patients ($p<0.0001$; OR 1.49) were more likely to receive care in the operating room rather than clinic. Complications included patulous eustachian tube (0.3%), acute epistaxis (0.5%), and acute otitis media (2.6%). Complications did not vary by laterality or setting but were more common in pediatric patients ($p<0.0001$; OR 2.21) and were more common in high SVI patients ($p=0.002$, OR 1.51-2.15).

Conclusions: Overall BDET is a safe and common procedure. More vulnerable patient populations were more likely to undergo bilateral BDET, less likely to have BDET performed in an office setting, and had a higher rate of complications. Further study is needed to understand the causes of these disparities.

Professional Practice Gap & Educational Need: Balloon dilation of the eustachian tube is increasingly commonly performed procedure, but little literature exists in understanding the sociodemographic

Learning Objective: To describe the disparities that exist for patients undergoing balloon dilation of the eustachian tube

Desired Result: Greater understanding that healthcare disparities exist for patients undergoing balloon dilation of the eustachian tube and highlight potential areas for further investigation and improvement

Level of Evidence: IV

Indicate IRB or IACUC: Exempt

Cochlear Implantation Outcomes in Paget's Disease of the Bone: A Systematic Review

Alexander Burnett, BS; Peter D.A. Eckard, BS; Abigail Doran, BS; Ammar Hudefi, BS
Soroush Farsi, BS; John Dornhoffer, MD; Robert A. Saadi, MD

Objective: Review disease specific prognostic factors of Paget's disease of the bone on cochlear implant (CI) outcomes.

Data Sources: PubMed, Embase, and Web of Science were each queried from inception to January 2024 for case reports and case series available in English language.

Study Selection: Following PRISMA guidelines, articles describing CI outcomes in patients with Paget's disease were reviewed.

Data Extraction: Data were collected on demographics, Paget's disease activity and history, hearing, and surgical outcomes. Study validity was assessed using the Joanna Briggs institute's critical appraisal tools and AMSTAR2 criteria.

Data Synthesis: Incidence and percentages were calculated for imaging characteristics, insertion technique, and implant type. Temporal bone imaging findings were compared to hearing outcomes using Fischer's exact test.

Results: Of the 125 abstracts screened, 8 articles met the inclusion criteria, comprising 9 cases. The cohort included 4 males and 5 females, median age of 62 (IQR 60-77). Hyper-osteoblastic changes in the petrous part of the temporal bone and/or the otic capsule were observed on CT in 5 patients. Electrode insertion favored cochleostomy (n=4) over round window technique (n=1). All patients had initial improvement in hearing and speech recognition scores. Long term hearing outcomes at 36-72 months were reported in 4 cases with 3 maintaining improved hearing outcomes and 1 reporting gradual worsening by 36 months. Radiographic evidence of osteoblastic changes was not associated with long term hearing outcomes (p=0.81). No complications were reported.

Conclusions:
Cochlear implantation can effectively treat hearing loss in patients with Paget's disease of the bone. CT imaging may help guide planning of insertion approach. Larger cohort studies are needed to quantify the risks.

Professional Practice Gap & Educational Need: This study provides a systematic review of surgical considerations and hearing outcomes following cochlear implantation in patients with Paget's disease of the bone.

Learning Objective: To appreciate the disease specific considerations of Paget's disease of the bone and to describe hearing and surgical outcomes for cochlear implantation in this patient population.

Desired Result: Review evidence to help guide cochlear implant decisions in patients with Paget's disease of the bone and to promote future cohort investigations to quantify specific risk associated with cochlear implantation in patients with Paget's disease of the bone.

Level of Evidence - III

Indicate IRB or IACUC: Exempt.

Low-Frequency Hearing Preservation Outcomes Following Cochlear Implantation

Emily C. Wong, MD; Qianjie Fu, PhD; Akira Ishiyama, MD

Objective: To identify factors associated with hearing preservation among cochlear implant recipients at a single academic institution

Study Design: Retrospective cross-sectional study

Setting: Tertiary referral center

Patients: Adults over the age of 18 with preoperative low-frequency (125–1000 Hz) pure-tone averages (LFPTA) below 80 dB, who underwent cochlear implantation between 2020–2023 at a single academic institution

Interventions: Patients who met criteria for cochlear implantation using hearing preservation technique underwent routine pre-implantation audiometric evaluation followed by cochlear implantation. Standard post-implantation audiometric evaluations were performed at 1 and 3 months post-implantation. Clinical variables, including demographics, etiology of hearing loss, duration of hearing loss, surgical approach, type of device implanted, and surgical technique were examined.

Main Outcome Measures: Hearing preservation, measured using the Skarzynski hearing preservation classification system

Results: A total of 38 cochlear implants were performed in adults with residual low-frequency hearing during the study period. Of these patients, 42.9% of them were male and 57.1% were female. The average LFPTA preoperatively was 52.2, and there were no differences in preoperative PTA related to sex or age of the patients or implant side. Partial or complete hearing preservation (HP) was achieved in 33 patients (88.6%). The average post-operative LFPTA was 77.8. There was a trend towards higher postoperative LFPTA with longer CI electrodes, although this was not statistically significant in our limited sample size. Application of steroid to the round window intraoperatively was not associated with improved HP, and there were no differences between lateral wall or pre-curved electrode arrays in HP outcomes. CNC scores were not associated with improved LFPTA. Our study did identify female sex as a predictor of improved HP ($p=0.01$).

Conclusions: Hearing preservation following cochlear implantation is possible regardless of cochlear implant electrode type, but longer electrodes may be associated with poorer postoperative LFPTAs. Other patient-specific factors may play an under-studied role in hearing preservation surgery, and further studies are needed to better characterize these relationships.

Professional Practice Gap & Educational Need: Soft surgery techniques have been proposed for cochlear implantation in individuals with residual low-frequency hearing but whose high-frequency hearing is not serviceable for everyday functioning. However, to date it is unclear whether surgical techniques, patient-related factors, or a combination of these can play a role in improving individuals' hearing performance following hearing-preservation cochlear implantation.

Learning Objective: To characterize hearing outcomes following cochlear implantation at a single academic institution, and to explore factors associated with these hearing outcomes

Desired Result: Individuals will be able to characterize the pre- and post-operative LFPTAs in our patient population and identify some surgery-related factors and some patient-related factors associated with hearing preservation following cochlear implantation.

Level of Evidence – Level V

Indicate IRB or IACUC: IRB protocol #22-001587

The Assessment of Otology/Neurotology Functions in Patients with Vertigo/Dizziness After Sudden Sensorineural Hearing Loss

Masaharu Sakagami, MD, PhD; Tomoyuki Shiozaki, PhD; Tadashi Kitahara, MD, PhD

Objective: To assess the neuro-otological functions in patients with prolonged vertigo/dizziness after sudden sensorineural hearing loss (SSNHL).

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: We encountered 661 successive vertigo/dizziness patients for short-term hospitalization at the Vertigo/Dizziness Center in Nara Medical University between May 2014 and March 2023. Among those, 53 patients (53/661: 8.0%) had been previously diagnosed and treated for SSNHL. Of these patients, 23 patients who also performed vHIT were included in this study.

Interventions: None (retrospective analysis)

Main Outcome Measures: Otology/neurotology tests such as the pure-tone audiometry (PTA) test, caloric test (C-test), video Head Impulse Test (vHIT), vestibular evoked cervical myogenic potential (cVEMP) measurement, vestibular-evoked ocular myogenic potential (oVEMP) measurement.

Results: Among the 23 patients in this study, vHIT abnormalities of horizontal, anterior, and posterior semicircular canals (SCCs) were observed in 9 (39.1%), 4 (17.4%), and 12 (52.2%) patients, respectively. 9 (39.1%) patients had abnormalities in the C-test. 4 (17.4%) patients had abnormal results in cVEMP and oVEMP. Comparing the average hearing level on the affected side between the 12 patients with abnormalities in the posterior SCC in vHIT and the other 11 patients, there was no significant difference in average hearing level. Meanwhile, focusing on the high-frequency range, the thresholds for the patients with abnormal vHIT results in posterior SCC were significantly higher than those without abnormal vHIT results in posterior SCC on the affected side.

Conclusions: SSNHL patients with prolonged vertigo/dizziness with posterior SCC impairment in vHIT have hearing impairment in the high-frequency range.

Professional Practice Gap & Educational Need: Although there have been many clinical studies after SSNHL, clinical studies of SSNHL with prolonged vertigo are limited.

Learning Objective: Understand the pathophysiology of prolonged vertigo/dizziness after SSNHL

Desired Result: Considering the dominance of blood flow in the inner ear, SSNHL patients with these characteristics could present impaired blood flow in the vestibulocochlear artery branches.

Level of Evidence – IV

Indicate IRB or IACUC: Certificate number: 0889, Nara Medical University

Computerized Dynamic Posturography Outcomes in Vestibular Migraine

Mohammad Aleinati, MD; Munib Ali, MD; Euna Hwang, MD, FRCSC
Suresh Subramaniam, MD, MSc, FRCPC; Melanie Oszust, RN; Justin T. Lui, MD, FRCSC

Objective: Characterize computerized dynamic posturography (CDP) findings in patients with vestibular migraine (VM).

Study Design: Retrospective chart review

Setting: Ambulatory, multidisciplinary neurovestibular clinic

Patients: Patients aged 20 to 79 years diagnosed with VM who underwent CDP between 2015 and 2022.

Interventions: Sensory Organization Test (SOT), Motor Control Test (MCT), Adaptation Test (ADT)

Main Outcome Measures: SOT (composite score, condition equilibrium scores, sensory analysis ratios), MCT (composite latency and individual translation latencies), and ADT (sway energy and adaptation patterns).

Results: Among 196 patients (mean age 46.9 ± 12.7 years; 3:1 female-to-male ratio), 37.4% showed abnormal SOT composite scores. In 51.5% of the cohort, SOT scores were specifically abnormal in Condition 3, suggesting increased visual dependence. Although sensory analysis ratios were normal in half of our cohort, the most common abnormality encountered was a preference for visual input. Although 22.5% of our cohort had at least one abnormal latency on MCT, the overall composite latency was abnormal in only 3.6%. While ADT sway energy scores were largely normal, those with abnormal ADT (41.8%) showed paradoxical increases in sway energy with repeated perturbations, suggesting impaired adaptation.

Conclusions: VM patients may exhibit maladaptive visual preference on SOT and impaired adaptation on ADT. Conversely, latencies on MCT do not seem to be significantly affected. These findings add to our understanding of VM, both from a pathophysiologic and diagnostic standpoint.

Professional Practice Gap & Educational Need: A gap exists in understanding of VM abnormalities in CDP.

Learning Objective: To identify and interpret CDP abnormalities in vestibular migraine patients.

Desired Result: Establish a baseline understanding of the manifestations of vestibular migraine in CDP

Level of Evidence - III

Indicate IRB or IACUC: REB22-1122 – University of Calgary REB

RECIPIENTS OF ANS GRANTS & AWARDS

THE ANS RESEARCH GRANT AWARD
established in 2014
Funding provided by the American Neurotology Society

The purpose of the American Neurotology Society (ANS) Research Grant is to encourage and support academic research in sciences related to the investigation of otology and neurotology. Appropriate areas of research include diagnosis, management, and pathogenesis of diseases of the ear and/or skull base. Grants that focus on addressing clinical gaps are especially encouraged. Grants may involve cell/molecular studies, animal research, or human subjects research.
The maximum award request is $25,000 per year (US dollars) and is annually renewable on a competitive basis. ANS may distribute up to three $25,000 grants each finding cycle. Indirect costs (overhead) are not allowed. **Grants are available to physician investigators in the United States and Canada only.** We particularly encourage those individuals without a history of K08, R03, R21, or R01 funding to apply.

Christine T. Dinh, MD - 2015
"Cochlear Irradiation and Dosimetry: Apoptosis, Necrosis, and Hearing Loss"
University of Miami - Miami, FL

Harrison Lin, MD - 2016
"Chronic Implantation of the Facial Nerve for Selective Facial Muscle Contraction"
University of California - Irvine, Orange, CA

Michael S. Harris, MD -2017
"Verbal Memory as Outcome Predictor in Adults Receiving Cochlear Implants"
Medical College of Wisconsin - Milwaukee, WI

Ksenia A. Aaron, MD - 2018
"Modelling and Restoring Hearing and Vestibular Deficit of Non-Syndromic Deafness"
University of California - Los Angeles, CA

Dunia Abdul-Aziz, MD - 2019
"Targeting Epigenetic Modifying Enzymes for Hair Cell Regeneration"
Massachusetts Eye & Ear - Boston, MA

Douglas Bennion, MD and **Megan (Foggia) Jensen, MD** - 2020
"Durable Zwitterionic Thin Film Coatings for Cochlear Implant Biomaterials"
University of Iowa - Iowa City, IA

Courtney C.J. Voelker, MD, PhD – 2020
"In Vivo Neuronal Mapping of the Auditory Pathway in Pediatric Patients with Congenital Unilateral Sensorineural Hearing Loss and those with Normal Hearing"
University of Southern California - Los Angeles, CA

Tatiana Correa, MD, MPH - 2020
"Comparison of Surgical Routes for Localized Inner Ear Viral Vector-Mediated Gene Therapy in the Guinea Pig Using Helper-Dependent Adenovirus Type 5"
University of Iowa - Iowa City, IA

Ashley Kita, MD - 2021
"Prolonged Elution of Cytokines for Inner Ear Rehabilitation"
University of California (UCLA) - Los Angeles, CA

Bing Teh, MBBS, PhD - 2021
"The Impact of Vestibular Dose on Post Gamma Knife Balance Function"
Columbia and Cornell Universities - New York, NY

Aida Nourbakhsh, MD, PhD – 2022
"Molecular Mechanisms of Hypofractionation and Radiation Resistance in Vestibular Schwannoma."
University of Miami – Miami, FL

Vivian F. Kaul, MD – 2022
"Improving Patient Satisfaction and Quality of Life Outcomes for Cochlear Implant Patients Through an Interactive Web and Mobile-Based Patient Education Platform"
Ohio State University - Columbus, OH

Amit Walia, MD – 2022
"Predicting Performance in Background Noise for Cochlear Implant Recipients using Electrocochleography"
Washington University - St. Louis, MO

Nir Ben-Shlomo, MD -2023
"*Sustained Drug Release of Dexamethasone and Neurotrophic Agents from Zwitterionic Thin Film Coatings for Decreased Inflammation and Improved Spiral Ganglion Neuron Survival following Cochlear Implantation*."
University of Iowa, Iowa City, IA

Janet Choi, MD - 2023
"*Big Data to Personalized Hearing Health: Developing an Open Database for Hearing Devices and a Matching System*"
University of Southern California, Los Angeles, CA

Adam C. Kaufman, MD, PhD – 2023
"The Role of Sweet Taste Receptors in Middle Ear Mucosal Defense."
University of Maryland, Baltimore, MD

Yin Ren, MD, PhD - 2023
"*Extracellular Matrix Remodeling and Tumor Inflammation Markers in Aggressive Vestibular Schwannomas*"
Ohio State University, Columbus, OH

Douglas M. Bennion, MD, PhD - 2024
"*Characterizing the Translational Treatment Potential of Losartan After Acoustic Trauma***"**
University of California San Diego

Alexander Chern, MD – 2024
"Psychometric Validation of an Item Bank and Development of a Profile Instrument Assessing Music Enjoyment in Individuals with Hearing Loss."
John Hopkins University, Baltimore, MD

Ankita Patro, MD, MS – 2024
"*Developing a Validated Adult Cochlear Implant Referral Guideline Using Machine Learning.*"
Vanderbilt University Medical Center, Nashville, TN

Many thanks to the ANS Research Committee, led by Dr. Aaron K. Remenschneider.

Aaron K. Remenschneider, MD, MPH, Chair
Christine T. Dinh, MD
Courtney C.J. Voelker, MD, PhD
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Ana H. Kim, MD
David Friedmann, MD, MSc
James Saunders, MD
Divya Chari, MD
Charlotte Hughes, MD (DI Committee representative)

ADVANCING DIVERSITY, EQUITY, INCLUSION, AND ACCESSIBILITY (DEIA) IN OTOLOGY AND NEUROTOLOGY GRANT

In an effort to incorporate, recognize, and foster diversity, equity, inclusion, and accessibility within Otology and Neurotology, the ANS seeks to fund proposals that address these concepts in the areas of patient care, education, research, and membership. As it relates to the mission of the ANS, these endeavors will contribute to a better understanding of our increasingly intersectional organization and patient populations and allow for initial steps towards improving alignment of our membership with the needs of our clinical populations. This is particularly important as one focus is to translate knowledge to quality care for our patients.
Applications will be accepted and reviewed at the same time as the ANS Research grant applications. Up to $10,000 is allocated for this grant mechanism annually.
Applicants may be any member of the ANS in good standing at the time of the application and award. In addition, an applicant who is not a member of the ANS may be sponsored by an ANS member in good standing.

Jonathan D. Neukam, AuD - 2025
"Assessing Barriers to Adult Cochlear Implantation in Underserved Populations"
Vanderbilt University, Nashville, TN

Terrin Tamati, PhD - 2025
"Assessing Barriers to Adult Cochlear Implantation in Underserved Populations"
Vanderbilt University, Nashville, TN

MICHAEL E. GLASSCOCK SCIENTIFIC MERIT AWARD

Award established in 2024.

The American Neurotology Society is pleased to announce the creation of the **Michael E. Glasscock Scientific Merit Award** for the highest scoring abstract submitted for the annual Spring meeting. This Award is being granted in recognition of Dr. Glasscock's lifetime commitment to education, research and the advancement of our field. Beginning in 2024, the primary author who receives the highest composite score for their abstract submitted for consideration at the annual ANS Spring meeting, will be named as the first recipient of the prestigious Michael E Glasscock Scientific Merit Award.

John P. Marinelli, MD - 2024
Cochlear Implantation with Sporadic Inner Ear Schwannomas: An International Multi-Institutional Study of 90 Patients
Mayo Clinic, Rochester MN
San Antonio Military Medical Center, San Antonio, TX

Hannah N. W. Weinstein, BA – 2025
Conductive Hearing Loss is Associated with Dementia in the All of Us Research Program
Columbia University, New York, NY

HERBERT SILVERSTEIN AWARD FOR RESEARCH EXCELLENCE IN OTOLOGY/NEUROTOLOGY

Award established in 2024.

This annual award is generously supported by Dr. Herbert Silverstein, founder of the Ear Research Foundation, located in Sarasota, FL. Dr. Silverstein has been a member of ANS since 1970.

The **Herbert Silverstein Award for Research Excellence in Otology/Neurotology,** will be awarded annually to a trainee (Otolaryngology resident/Neurotology fellow) or early career clinician (1st five years of practice) for the best research manuscript submission for presentation at the annual ANS Scientific Meeting. The topic should be focused on Meniere's disease, vestibular diseases, cochlear implants, vestibular schwannomas or otosclerosis. The ANS Executive Council shall judge the yearly applications.

Adam Y. Xiao, MD, PhD - 2024
Expression of TGFÎ²-1 and CTGF in the Implanted Cochlea and its Implication on New Tissue Formation
UCLA, Los Angeles, CA

Benjamin T. Ostrander, MD, MSE - 2025
Whole Genome Sequencing of Sporadic Vestibular Schwannoma Identifies Novel Molecular Pathways
University of California San Diego, CA

NEUROTOLOGY FELLOWSHIP AWARD

First awarded: 1998

Funding provided by: Dr. Derald Brackmann, Dr. Robert Jackler & the American Neurotology Society

Colin L.W. Driscoll, MD - 1998, Palm Beach, FL

Robert M. Owens, MD - 1999, Palm Desert, CA

Katrina R. Stidham, MD - 2000, Orlando, FL

Zoran Becvarovski, MBBS - 2001, Palm Desert, CA

John S. Oghalai, MD - 2002, Boca Raton, FL

Anthony O. Owa, MD - 2002, Boca Raton, FL

Richard J. Kennedy, MD - 2003, Nashville, TN

Ana H. Kim, MD - 2006, Chicago, IL

Marc D. Eisen, MD - 2007, San Diego, CA

Benjamin T. Crane, MD, PhD - 2008, Orlando, FL

R. Mark Wiet, MD - 2008, Orlando, FL

Kevin D. Brown, MD, PhD - 2009, Phoenix, AZ

Jerry W. Lin, MD, PhD - 2009, Phoenix, AZ

John C. Goddard, MD - 2010, Las Vegas, NV

Matthew L. Bush, MD - 2011, Chicago, IL

Felipe Santos, MD - 2011, Chicago, IL

Alicia Quesnel, MD - 2012, San Diego, CA

Mia Miller, MD - 2013, Orlando, FL

Peter L. Santa Maria, MBBS, PhD -2014, Las Vegas, NV

Christine T. Dinh, MD - 2015, Boston, MA

Seth E. Pross, MD - 2016, Chicago, IL

Michael S. Harris, MD – 2017, San Diego, CA

Kathryn Y. Noonan, MD – 2018, National Harbor, MD

Enrique Perez, MD – 2018, National Harbor, MD

Ksenia A. Aaron, MD – 2019, Austin, TX

James G. Naples, MD – 2019, Austin, TX

Matthew G. Crowson, MD, MPA – 2020, Virtual

Kenny F. Lin, MD – 2020, Virtual

Matthew A. Shew, MD – 2021, Virtual

Alexander L. Luryi, MD – 2021, Virtual

Nathan R. Lindquist, MD – 2022, Dallas, TX

Mallory J. Raymond, MD – 2022, Dallas, TX

Pawina Jiramongkolchai, MD - 2023, Boston, MA

Evan Cumpston, MD – 2024, Chicago, IL

Ankita Patro, MD – 2024, Chicago, IL

John P. Marinelli, MD – 2025, New Orleans, LA

ANS TRAINEE AWARD

First awarded: 1990

Funding provided by: Dr. Joseph Touma 1990-99 & the American Neurotology Society

Thomas R. Pasic, MD - 1990, Palm Beach, CA
University of Washington, Seattle, WA

Charles A. Syms III, MD - 1991, Hawaii, HI
USAF Medical Center, Lackland AFB, TX

Eric Tallan, MD - 1992, Palm Desert, CA
Mayo Clinic, Rochester, MN

Mark E. Reiber, MD - 1993, Los Angeles, CA
Vanderbilt University Medical Center, Nashville, TN

Gary B. Coleman, MD - 1994, Palm Beach, FL
University of Michigan, Ann Arbor, MI

Donald D. Robertson, MD - l995, Palm Desert, CA
University of Manitoba, Winnipeg, Manitoba Canada

Greg A. Krempl, MD - l997, Scottsdale, AZ
University of Texas, San Antonio, TX

Bac H. Nguyen, MD - 1998, Palm Beach, FL
University of Minnesota, Minneapolis, MN

Jennifer L. Maw, MD - 1999, Palm Desert, CA
Hearing Institute for Children & Adults, San Jose, CA

Wayne E. Berryhill, MD - 2000, Orlando, FL
University of Minnesota, Minneapolis, MN

Dmitriy Niyazov - 2001, Palm Desert, CA
Medical Student, Los Angeles, CA

Stacey L. Halum, MD - 2003, Nashville, TN
Medical College of Wisconsin

Norman N. Ge, MD - 2004, Phoenix, AZ
Davis Medical Center, Sacramento, CA

Ritvik P. Mehta, MD - 2005, Boca Raton, FL
Massachusetts Eye & Ear; Harvard Medical School

Wade Chien, MD - 2006, Chicago, IL
Massachusetts Eye & Ear, Harvard Medical School

Hideko Heidi Nakajima, MD, PhD - 2009, Phoenix, AZ
Massachusetts Eye & Ear; Harvard Medical School

Yuri Agrawal, MD - 2012, San Diego, CA
Johns Hopkins University, Baltimore, MD

Samuel A. Spear - 2013, Orlando, FL
The Ohio State University, Columbus, OH

Christine T. Dinh, MD - 2014, Las Vegas, NV
University of Miami, Miami, FL

James Naples, MD - 2015, Boston, MA
University of Connecticut, Farmington, CT

Jacob B. Hunter, MD - 2016, Chicago, IL
Vanderbilt University, Nashville, TN

Yarah M. Haidar, MD – 2017, San Diego, CA
University of California at Irvine, Orange, CA

Ashley M. Nassiri, MD - 2018, National Harbor, MD
Vanderbilt University Medical Center, Nashville, TN

Matthew Shew, MD – 2019, Austin, TX
Washington University, St Louis, MO

Armine Kocharyan, MD - 2020, Virtual Meeting
Case Western Reserve University

John P. Marinelli, MD – 2020, Virtual Meeting
Mayo Clinic

Susan E. Ellsperman, MD – 2021, Virtual Meeting
University of Michigan

Douglas M. Bennion, MD, PhD – 2021, Virtual Meeting University of Iowa

Hunter L. Elms, MD – 2022 - Dallas, TX
Duke University

Amit Walia, MD – 2022 - Dallas, TX
Washington University

Lisa Zhang, MD – 2023 - Boston, MA
The Ohio State University

Ankita Patro, MD – 2023 - Boston, MA
Vanderbilt University

Ryan T. Judd, MD – 2024 – Chicago, IL
The Ohio State University

Krish Suresh MD – 2025 – New Orleans, LA
Massachusetts Eye and Ear, Boston, MA

NICHOLAS TOROK VESTIBULAR AWARD

First awarded: 1990

Funding provided by: Dr. & Mrs. Nicholas Torok & the American Neurotology Society

Stephen P. Cass, MD - l990, Palm Beach, FL
Michigan Ear Institute, Farmington Hills, MI

P. Ashley Wackym, MD - 1992, Palm Desert, CA
University of Iowa Hospitals and Clinics, Iowa City, IA

Robert P. Muckle, MD - 1993, Los Angeles, CA
University of Minnesota, Minneapolis, MN

Thomas A. Salzer, MD - 1994, Palm Beach, FL
Baylor College of Medicine, Houston, TX

Akira Ishiyama, MD - 1995, Palm Desert, CA
UCLA School of Medicine, Los Angeles, CA

Anil K. Lalwani, MD - 1998, Palm Beach, CA
University of California, San Francisco, CA

Lloyd B. Minor, MD - 1999, Palm Desert, FL
Johns Hopkins University, Baltimore, MD

Vincent B. Ostrowski, MD - 2000, Orlando, FL
Northwestern University Medical School, Chicago, IL

D. Bradley Welling, MD, PhD - 2001, Palm Desert, CA
The Ohio State University, Columbus, OH

John P. Carey, MD - 2003, Nashville, TN
Johns Hopkins University, Baltimore, MD

John C. Li, MD - 2005, Boca Raton, FL
Loyola University Medical Center, Chicago, IL

Judith A. White, MD, PhD - 2006, Chicago, IL The Cleveland Clinic, Cleveland, OH

Abraham Jacob, MD - 2007, San Diego, CA
The Ohio State University - Columbus, OH

Rahul Mehta, MD - 2014, Las Vegas, NV
Louisiana State University - New Orleans, LA

Benjamin T. Crane, MD, PhD - 2015, Boston, MA
University of Rochester Medical Center - Rochester, NY

Jeffrey D. Sharon, MD - 2016, Chicago, IL
Johns Hopkins University - Baltimore, MD

Anne K. Maxwell, MD – 2017, San Diego, CA
University of Colorado Hospital – Aurora, CO

Renee M. Banakis Hartl, MD – 2018, National Harbor, MD University of Colorado Hospital – Aurora, CO

Tiffany P. Hwa, MD – 2020, Virtual
University of Pennsylvania- Philadelphia, PA

Steven D. Curry, MD, MPH – 2021 - Virtual
University of Nebraska Medical Center

Miriam R. Smetak, MD, MS – 2022 - Dallas, TX
Vanderbilt University

Eric J. Formeister, MD, MS – 2023 - Boston, MA
Duke University

D. O'Neil Danis, III, MD – 2024 – Chicago, IL
Tufts Medical Center, Boston, MA

Graham D. Cochrane, MD, PhD – 2025
New Orleans, LA
University of North Carolina, Durham, NC

RECIPIENTS OF THE SILVERSTEIN AWARD
ANS/AAO-HNS/F OTOLOGY/NEUROTOLOGY RESEARCH AWARD
Funding provided by Dr. Herbert Silverstein/ANS/AAO

Lawrence R. Lustig, MD - 7/1999
Johns Hopkins University

David R. Friedland, MD - 7/00-6/02
Johns Hopkins University

Rose Mary Stocks, MD - 7/02-6/204
University of Tennessee

Clifford R. Hume, MD, PhD - 7/03-6/05
University of Washington

Alan G. Micco, MD - 7/04-6/06
Northwestern University

Romaine Johnson, MD - 7/05-6/07
Children's Hospital Cincinnati

Joseph P. Roche, MD - 7/08-6/10
University of North Carolina

Alan Cheng, MD - 07/10 - 06/12
Stanford University

Yuri Agrawal, MD - 07/10 - 06/12
Johns Hopkins University

Nathan Schularick, MD - 07/12 - 06/14
The University of Iowa

Dylan Chan, MD, PhD - 07/14 - 06/16
University of California-SF

David H. Jung, MD, PhD - 07/16 - 06/18
Harvard University/ MEEI

Elliot D. Kozin, MD - 7/18 - 6/20
MEEI/Harvard Medical School

NO AWARD GIVEN - 7/20-6/22

Lindsay Scott Moore, MD - 7/22-6/24
Stanford University

Adam Y. Xiao, MD, PhD - 7/24-6/26
University of California, Los Angeles

RECIPIENTS OF THE NOEL L. COHEN AWARD FOR SIGNIFICANT CONTRIBUTIONS TO OTOLOGY AND NEUROTOLOGY

Through a generous gift from our late colleague, ANS has established the Noel L. Cohen, M.D. Award for Significant Contributions to Otology and Neurotology. The establishment of the award is a fitting tribute to Dr. Cohen — a gifted physician, surgeon, academician, educator, administrator and leader. His contributions brought distinction to Otology & Neurotology, New York University, and our society.

The first recipient of this esteemed award, Dr. Thomas Balkany, was announced at the 55th Annual virtual Fall meeting on Sept 12, 2020.

Thomas J. Balkany, MD – 2020 – Miami, FL, University of Miami Miller School of Medicine

Robert K. Jackler, MD – 2021 – Palo Alto, CA, Stanford University

Bruce J. Gantz, MD – 2022 – Iowa City, IA, University of Iowa

Derald E. Brackmann, MD – 2023 – Los Angeles, CA, House Ear Clinic

Richard T. Miyamoto, MD, MS – 2024 – Indianapolis, IN, Indiana University

HOUSE/HITSELBERGER
LIFETIME ACHIEVEMENT AWARD

In honor of the 50th anniversary of the American Neurotology Society, 1965 - 2015, the House/Hitselberger Lifetime Achievement Award was established to honor the legacy of two giants in the field of neurotology, Dr. William F. House and Dr. William E. Hitselberger. The award recognized those individuals who have demonstrated superb surgical skills and patient care, a commitment toward education and cumulative scientific contributions that have profoundly impacted the field of neurotology.

These awards were presented to nine neurotologists from the USA and Europe at the 50th Annual Fall meeting in Dallas, TX on September 26, 2015.

Derald E. Brackmann, MD
House Ear Clinic - Los Angeles, CA

Prof. Ugo Fisch, MD
Fisch International Microsurgery Foundation
Zurich, Switzerland

Emilio García-Ibáñez, MD
Instituto De Otologia Garcia-Ibanez - Barcelona, Spain

Michael E. Glasscock, III, MD
The Otology Group, Nashville, TN
The Glasscock Hearing Center - Houston, TX

Malcolm D. Graham, MD
Emory University - Atlanta, GA

David A. Moffat, PhD, FRCS
Addenbrooks Hospital - Cambridge, UK

Joseph B. Nadol, Jr., MD
Massachusetts Eye & Ear Infirmary - Boston, MA

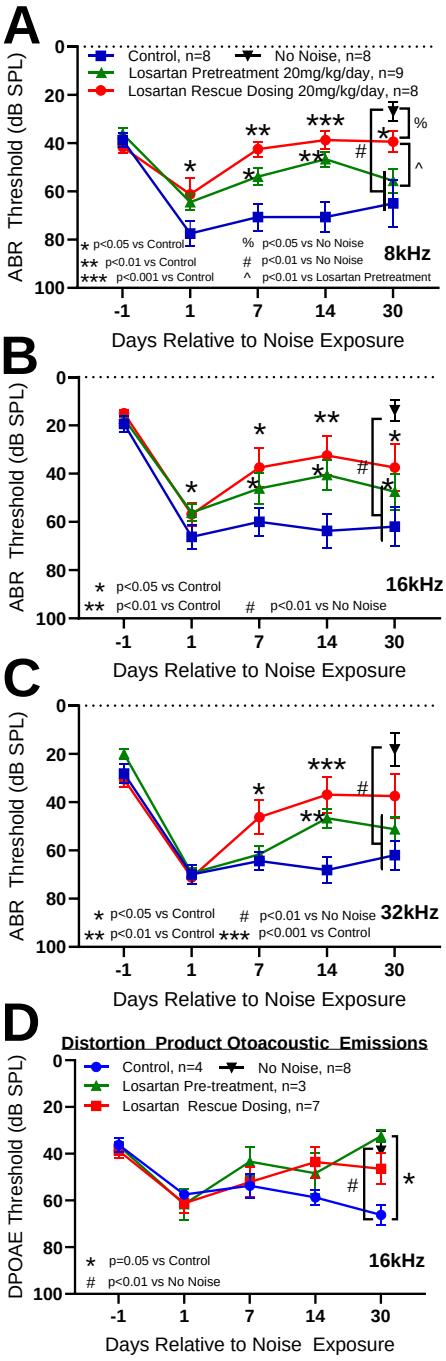
Prof. Mario Sanna, MD
Gruppo Otologico, Piacenza-Rome, Italy

Prof. Jean-Marc Sterkers, MD
Paris, France

American Neurotology Society Research Grant, Brief Progress Report

Date: 2/10/2025
Principal Investigator: Douglas M. Bennion, MD, PhD
Mentor: Marlan R. Hansen, MD
Institution: University of Iowa, Department of Otolaryngology, Head & Neck Surgery
Project Title: Characterizing the Translational Treatment Potential of Losartan After Acoustic Trauma

Background: Two of three older adults globally suffer from hearing loss. Though hearing loss is often attributed to age, the variable effect of age on hearing is partially a function of an individual's accumulated noise exposure. In considering the time between acoustic trauma and the manifestation of permanent hearing loss, our lab has been investigating interventions to protect against noise-induced synaptopathy of the hair cells and spiral ganglion neuron (SGN) and improve hearing. To this end, drugs targeting the renin angiotensin system represent promising candidates. In multiple acute and chronic conditions including renal, cardiovascular, oncologic, and neural diseases, angiotensin II signaling is known to promote overactivation of inflammatory signaling, oxidation, fibrosis, and end-organ dysfunction. In our preliminary studies, we have demonstrated that in young adult CBA mice subjected to a moderately noxious noise exposure, blockade of the angiotensin II signaling using losartan, an angiotensin II type 1 receptor (AT1R) specific antagonist, results in prevention of noise-induced shifts in ABR thresholds and normalization of wave 1 growth function. This is accompanied by preservation of synapse counts between the inner hair cells and the spiral ganglion neurons, cells essential for the normal transduction of sound along the auditory pathway. With the support of this award, we are now working to assess the *general hypothesis that AT1R blockade with losartan during a critical window of time after noise exposure will prevent ABR threshold shifts and synaptopathy in a dose-dependent manner* via the following specific aims:



<u>Specific Aim 1</u>: Determine the treatment window for losartan's otoprotective effects in a preclinical model of noise induced trauma.

Hypothesis *– We anticipate that initiation of treatment with losartan after noise exposure will induce hearing protection, including attenuating permanent ABR threshold shifts by rescuing synaptic function. Treatment of groups young adult CBA mice (age 8-10 weeks, n=8-9 per group) with control chow versus losartan-infused chow (20mg/kg/day) beginning either 2 days before or immediately after exposure to 2 hours of 8-16kHz octave noise at 105dB (males) or 107.5dB (females).*

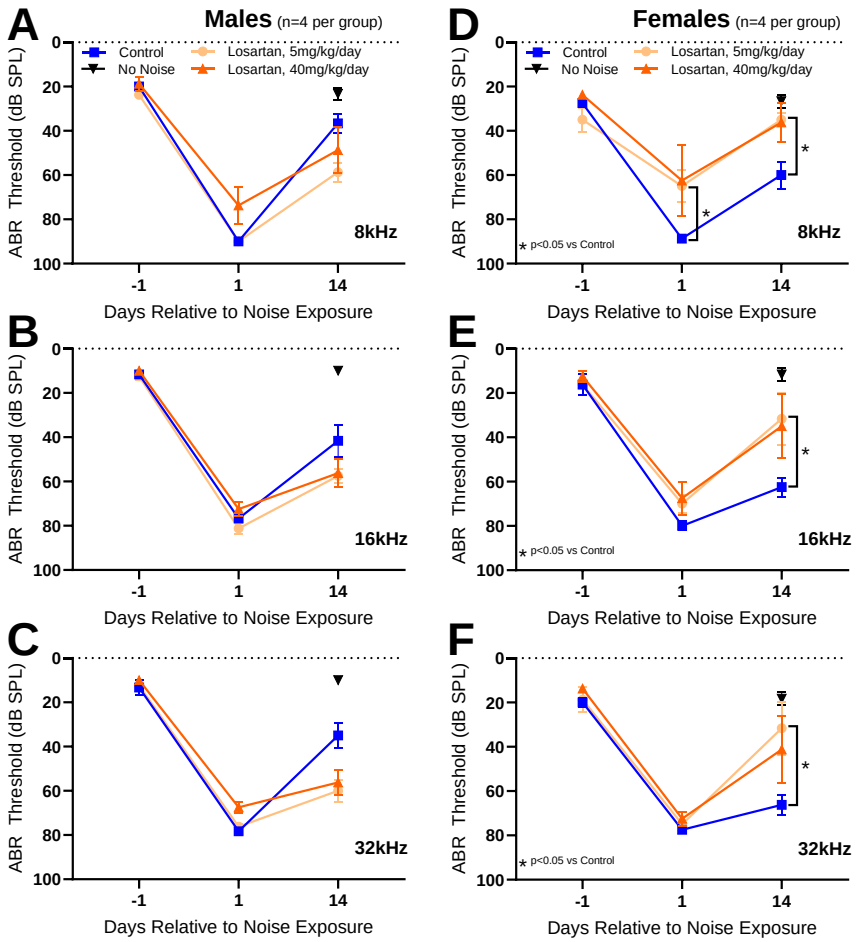
Progress – We have completed an initial experiment comparing the ABR and DPOAE threshold shifts among mixed male and female groups after noise exposure, with results shown in Figure 1. Two hours of moderate acoustic trauma resulted in permanent ABR threshold shifts (PTS) that persisted to 30 days (Figure 1). In recapitulation of our preliminary data, pretreatment with losartan (Figure 1, green up triangles) significantly blunted ABR shifts recorded at 1, 7, 14, and 30 days after noise exposure compared to control group (blue squares), with the most significant protection seen in this group at 14 days in response to stimuli at 8 kHz (46.66 dB vs 70.62 dB SPL, $p<0.01$) (Figure 1A), 16 kHz (40.55 dB vs 63.7 dB SPL, $p<0.05$) (Figure 1B), and 32 kHz (46.66 dB vs 68.12 dB SPL, $p<0.01$) (Figure 1C). Distortion product otoacoustic emission (DPOAE) thresholds at 30 days after noise exposure were also found to be significantly lower in lorsartan treated mice compared to control chow treated mice (Figure 1D). Though some protection persisted at 30 days,

hearing thresholds among mice receiving losartan pretreatment remained significantly impaired at 30 days as compared to non-noise exposed age matched controls (black down triangles) (Figure 1A-C). In the cohort with losartan treatment starting 1 hour after noise exposure in a rescue strategy (red circles), there was similarly a significant protection against ABR thresholds shifts at 7, 14, and 30 days, with the highest levels of protection seen at 14 days in response to stimuli at 8 kHz (38.75 dB vs 70.62 dB SPL, $p<0.01$) (Figure 1A), 16 kHz (32.5 vs 63.7 dB SPL, $p<0.01$) (Figure 1B), and 32 kHz (36.87 dB vs 68.12 dB SPL, $p<0.001$) (Figure 1C), effects that persisted to 30 days. Importantly, in these rescue-treated mice, there was no significant difference in 30 day ABR thresholds at 16 kHz and 32 kHz stimuli compared to thresholds from age-matched non-noise exposed controls (black down triangles) (Figure 1B-C), suggesting a robust protective effect. Given the known sex specific differences in hearing, further subgroup analyses of ABRs were completed. Losartan rescue treatment was shown to exert protective effects against any one frequency among both sexes, specifically at 8 kHz (35 dB vs 82.5 dB SPL, $p=0.014$) in males and at 32 kHz (32.5 dB vs 67.5 dB SPL, $p=0.021$). Comparisons were made by Mann-Whitney test. We are now assessing later treatment time points, including starting at 1 day and 3 days after noise exposure. Cochlear tissues will be analyzed using immunohistochemical techniques to determine the effect of losartan on hair cell and hair cell-SGN synapse counts.

<u>Specific Aim 2</u>: Establish the dose response relationship for the otoprotective effects of losartan against noise induced trauma.

Hypothesis *– We hypothesize that treatment of young adult CBA mice with control chow versus losartan-infused chow at one of four doses (n=4/group, 5, 20, and 40mg/kg/day) will reveal a minimum effective dose and a maximum treatment effect dose for losartan's protection against noise-induced ABR threshold shifts and cochlear synaptopathy.*

Progress – We have recently completed noise-induced hearing loss protocol for the following cohorts that were treated with control chow or losartan-infused chow beginning immediately after noise exposure (n=6/group, equally divided between males and females): control, 5, and 40mg/kg/day. We measured ABR thresholds (**Figure 2**) at baseline, 1 day, and 14 days after noise-induced hearing loss (two hours of 8-16kHz octave band noise, 105dB for males, 107.5dB for females). Among female cohorts, our preliminary analysis suggests that 10mg/kg/day dosing results in significant protection against noise exposure, with a return toward baseline thresholds by 14 days. Due to a change in availability of equipment, these experiments were performed using a new noise chamber. This in combination with other technical factors, may have contributed to the unexpectedly transience of the shift in ABR thresholds after noise at 14 days, which was apparent in the male control cohort. For these reasons, we plan to repeat these cohorts and will add additional doses (0.5 and 20 mg/kg/day) to round out the dose response curve. Cochlear tissues will be analyzed for inner and outer hair cell counts and hair cell-SGN synapse analysis.



ANS 2024-2025 Research Grant
Progress Report
PI: Alexander Chern, MD (Johns Hopkins)
Project Title: Psychometric Validation an Item Bank and Development of a Profile Instrument Assessing Music Enjoyment in Individuals with Hearing Loss
Progress Report Date: 2/10/2025

Project Summary: Experiencing and engaging with music is associated with improved quality of life (QOL), increased sociability, and overall well-being. However, individuals with hearing loss (HL) report decreased music enjoyment compared to those with normal hearing, even with the use of hearing aids (HAs) or cochlear implants (CIs). Despite technological advancements in hearing devices, there is a lack of standardized patient-reported outcome measures (PROMs) that assess music enjoyment in individuals with HL. This gap limits our understanding of how HL and its rehabilitation impact music listening and its effects on emotional and social well-being.

The objective of this research is to develop and validate a PROM for music enjoyment in individuals with HL, addressing this critical gap in HL outcome measures. By using a mixed-methods approach, including primary stakeholder engagement (e.g., focus group interviews with individuals with HL), we aim to establish key domains of music engagement, create an initial item bank, and apply rigorous psychometric methods to develop a validated PROM.

Specific Aim 1: Determine the psychometric properties of the initial Music Enjoyment-Hearing Loss (MUSE-HL) item pool.
Progress: An online questionnaire consisting of participant demographics, hearing and hearing device history, musical experience/training has been created. We are also concurrently completing key informant interviews and performing thematic analysis to generate domains of music enjoyment from which an initial music enjoyment item pool will be recruited. Recruitment of potential participants across a wide spectrum of hearing loss and hearing device usage who will complete the questionnaire including the participant demographics, hearing and hearing device history, musical experience/training, as well as the initial item pool is well-underway, with an estimated 200 potential participants recruited by the end of this month. We have also engaged with the psychometric team at our institution to come up with a plan for determine the psychometric properties of the initial item pool. Rigorous psychometric analysis will include confirmatory analysis and item response theory analysis.

Specific Aim 2: Develop a profile instrument measuring domain-specific music enjoyment in individuals with HL.
Progress: Once the psychometric properties of the initial item pool are assessed, we will use item response theory analysis to establish model fit, item difficulty, and discrimination to select optimal items for the profile instrument. Five items from each domain of music enjoyment with the highest discrimination parameters and a range of difficulties will be included in a profile instrument. By necessity of this type of research, we still need to establish the psychometric properties of the item pool before this Aim

can be completed. We hypothesize this profile instrument derived from the initial item bank will have the ability to measure the full range of music enjoyment in our target population.

Impact: The successful completion of this project will result in a psychometrically validated item bank and profile instrument to assess music enjoyment in individuals with HL. This new PROM will serve as a critical tool for evaluating the impact of hearing interventions on music enjoyment and quality of life. It will also provide the foundation for future research, including the development of short-form versions, computerized adaptive testing, and further validation of the instrument for clinical and research purposes.

American Neurotology Society Research Grant
Progress Report Date: February 10, 2025
Project Title: Developing a Validated Adult Cochlear Implant Referral Guideline Using Machine Learning
Principal Investigator: **Ankita Patro, MD MS**
Institution: Vanderbilt University Medical Center, Nashville, TN

Background:

Hearing loss affects half a billion people worldwide and has been linked to social isolation, reduced quality of life, and dementia.[1-4] For people with moderate-to-profound sensorineural hearing loss who get limited benefit from hearing aids, cochlear implants (CIs) have become the standard of care, providing improvements in speech perception, quality of life, and cognition.[5-8] The widespread success of CIs has led to further expansion in candidacy criteria to include patients with residual low-frequency hearing, single-sided deafness (SSD), and asymmetric hearing loss (AHL).[9-14] Yet, less than 2% of eligible adults are receiving CIs under traditional and expanded candidacy criteria.[15-17] A resultant 7 million individuals in the United States who could benefit from CIs are estimated to be untreated,[17] highlighting **significant gaps in health care delivery**.

The goals of this multidisciplinary project are to externally validate and to prototype a user interface for our recently developed machine learning-based referral guideline for adult CI evaluations. The central hypothesis is that, in comparison to the "60/60 guideline," which has the best performance among the major screening tools,[31] a machine learning-based CICE referral algorithm has higher sensitivity, specificity, and accuracy in identifying CI candidates across centers in the United States. The newly generated knowledge from this project can help inform a standardized referral guideline, which is instrumental in increasing timely access to CIs for millions of patients who would qualify under traditional and expanded criteria.

Specific Aim 1: To validate a machine learning-based referral guideline for adult CI evaluations across centers in the United States through a large population cross-sectional study.
Progress: We have attained complete data from 2,300 patients who were tested for CI candidacy at other centers across the United States. These centers have varying protocols, such as the use of noise for candidacy testing and specific variables collected. With this larger sample size, we better represent geographic and demographic distributions in the United States, which is a key goal of Specific Aim 1. In addition, this data has been re-organized to reflect whether a single ear qualifies especially as CI candidacy has evolved in recent years to consider the individual ear. One of the weaknesses of our pilot study is the large number of patients who qualified for a CI (96%). As such, assessing the single ear provides a larger number of cases where patients did not qualify for a CI, helping drive the accuracy of the machine learning-based methodology.
We are currently refining our machine learning-based referral guideline by using 30% of the external data to further train our algorithm. The remaining 70% is being used to test the model against the "60/60 guideline" based on ability to identify CI candidates. We have also started drafting our manuscript for this specific aim.

Specific Aim 2: To prototype a user interface for the machine learning-based CI referral guideline using implementation science and input from key stakeholders.
Progress: Working closely with our collaborators at the Vanderbilt Qualitative Research Core and Implementation Science Core, we have developed a pool of questions for our interviews with our key stakeholders. The interview guide is being finalized with our Implementation Science collaborators, and the Qualitative Research Core will provide direct support for conducting the interviews with 10 CI audiologists and 10 referring providers in the next month. After a discussion with the research team including our collaborators, we have elected to not include CI surgeons as they would not be referring potential CI candidates. Once the interviews are complete, we will be working with our collaborators to complete coding and analysis.

Progress Report Date: 01/15/2024
Principal Investigators: Jonathan D. Neukam, AuD; Terrin N. Tamati, PhD (Vanderbilt University Medical Center)
Project Title: Assessing Barriers to Cochlear Implantation in Underserved Populations.

Project Summary: Cochlear implants (CIs) are a highly effective neuroprosthetic used to treat moderate to profound levels of hearing loss across the lifespan. Despite their effectiveness, utilization remains between 2% and 13% for adults who are eligible. Further, ethnic and racial minorities are being implanted at a disproportionately lower rate than Caucasians. This finding extends to those with lower socioeconomic status and, subsequently, populations with lower levels of education. Several studies examining barriers to cochlear implantation have focused on the populations that are primarily being implanted, i.e., Caucasians with high socioeconomic status. As a result, a **significant gap in knowledge** exists in the understanding of factors that contribute to inequities in cochlear implantation.

Guided by a framework of social determinants of health we propose that social factors at the individual personal and interpersonal level play a critical role in CI access, uptake, and outcomes. Therefore, the **objectives of the proposed research** are to characterize and explain how individual personal and interpersonal social factors influence CI pursuance in racial/ethnic minority and low SES groups. The **central hypothesis** is that barriers and facilitators to CI pursuance in adults with HL differ across racial, ethnic, and rural/low SES groups, and reflect individual social characteristics and the broader interpersonal context of the social network.

Aim 1: Determine barriers and facilitators to CI pursuance that are unique to CI users with diverse racial/ethnic and SES backgrounds.

Aim 2: Determine the social network factors that impact CI pursuance among adult CI users with diverse backgrounds.

Progress: IRB approval was received on 11/07/2024. A list of eligible patients has been generated, and eligible patients have been contacted. All questionnaires and informed consent have been uploaded into RedCap. Eleven participants have been consented, and four participants have a complete dataset (i.e., completion of online questionnaires and a completed qualitative interview). Transcription of interviews is currently in progress. Coding and analysis of qualitative interviews will be conducted after the full dataset is complete.

The main challenge to study progress has been the delay in IRB approval. Additional challenges include the relatively small number of African American cochlear implant recipients at our clinic. Recruitment/enrollment is ongoing for both proposed participant groups (African American and Rural/Low SES). A study flyer is currently under review by the IRB for expanded recruitment materials through other clinics and social media.

AMERICAN NEUROTOLOGY SOCIETY PAST PRESIDENTS

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2021-22 Craig A. Buchman, MD
2022-23 Fred F. Telischi, MD
2023-24 Elizabeth H. Toh, MD, MBA

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1974-76 Jack Pulec, MD

1976-79 Michael Glasscock III, MD

1979-85 Robert Keim, MD

1985-88 Shokri Radpour, MD

1988-92 Charles M. Luetje II, MD

1992-95 Jack M. Kartush, MD

1995-98 Richard J. Wiet, MD

1998-01 Newton J. Coker, MD

2001-04 Debara L. Tucci, MD

2004-07 Karen J. Doyle, MD, PhD

2007-10 Jeffrey T. Vrabec, MD

2010-13 Anil K. Lalwani, MD

2013-16 Moisés A. Arriaga, MD, MBA

2016-19 Bradley W. Kesser, MD

2019-22 Elizabeth H. Toh, MD, MBA

2022-25 David S. Haynes, MD, MMHC

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in alphabetical order

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Richmond, VA
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Emeritus

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in Memoriam

The ANS Administrative office was notified of the following members passing since the last Spring meeting.

Please take a moment of silence to remember these outstanding colleagues & friends.

Dr. Michael M. Paparella
Inducted to ANS in 1976
Passed: November 20, 2024

Dr. Bloyce Hill Britton
Inducted to ANS in 1973
Passed: November 2, 2024

Dr. Brenda L. Lonsbury-Martin
Inducted to ANS in 1997
Passed: September 2, 2024

Dr. Jose Antonio Rivas
Inducted to ANS in 1977
Passed: August 17, 2024

Dr. Joseph Di Bartolomeo
Inducted to ANS in 1983
Passed: July 27, 2024

Dr. Robert L. Baldwin Sr
Inducted to ANS in 1990
Passed: June 22, 2022
(notification 08/2024)