SELECTED ABSTRACTS

ORAL PRESENTATIONS

IN ORDER OF PRESENTATION

61st Annual Spring Meeting
AMERICAN NEUROTOLOGY SOCIETY

April 24-26, 2026
Sheraton Phoenix Hotel
Phoenix Convention Center
Phoenix, AZ

ANS Oral presentations are on Saturday/Sunday
ANS Posters will be displayed on Friday/Saturday

Early Clinical Outcomes of a Fully Implantable Cochlear Implant:
A U.S. Multicenter Trial

Theodore R. McRackan MD, MSCR; Abraham Jacobs, MD; Jack Shohet, MD; Wanye Berryhill, MD
Sammy Gao, BS; Envoy Acclaim Clinical Trial Consortium, Colin L.W. Driscoll, MD

Objective: While cochlear implant (CI) effectiveness is well established, traditional CIs require external components that necessitate regular charging and are highly visible. Successful development of fully implantable CIs has been a long-standing goal for industry, clinicians and patients. The current study describes the preliminary outcomes of a US-based prospective clinical trial for a fully implantable CI.

Study design: Prospective United States-based multicenter FDA clinical trial of a newly developed fully implantable CI.

Setting: Tertiary CI centers

Patients: The initial phase included 10 adults with bilateral, post-lingual hearing loss with prior use of a hearing aid. Exclusion criteria included having a prior CI, retrocochlear pathology, and single-sided deafness.

Interventions: Cochlear implantation with a novel device

Results: At the time of the abstract deadline, trial participants in the initial cohort met 3-month FDA outcome criteria enabling full study expansion. Complete pre-CI to 6-month post-CI outcomes will be presented at the annual meeting, but reporting is currently locked by the FDA. Specific trial outcomes will include pre-CI to 6-month aided thresholds and CNC phoneme/word, AzBio Quiet and Noise (+10 SNR), CIQOL-35 Profile domain (and global), and SSQ subscale (and total) scores. There were no Serious Adverse Events or Unanticipated Adverse Device Effects reported.

Conclusion: The development of fully implantable CI technology represents an important and exciting moment in the history of cochlear implantation. However, safety, performance and real-world considerations (e.g., battery life) must reach an acceptable standard for these technologies to be broadly adopted. These positive early outcomes for the initial phase of this trial set the stage for full FDA trial expansion and future adoption and implementation of fully implantable CIs.

Note: These results will also be presented at the ACIA annual meeting, which occurs after the ANS Spring meeting. Dual submission to ACIA and ANS has been approved by the ANS president.*

Learning Objective: Attendees will understand the technology associated with a novel fully implantable cochlear implant as well as the 6-month results and complication profile.

Desired Result: Provide initial insight into the outcomes from a fully implantable cochlear implant.

Level of Evidence – Level III

Indicate IRB or IACUC: IRB #140843

Complication Rates and Efficiency of Robotic Assisted Versus Manual Insertion Cochlear Implantation

Dhruv K. Patel, BS; John J. Sykes, MD; Kenneth R. Feehs, MD; Eric M. Kraus, MD, MS
Pedrom C. Sioshansi, MD, MS; Michele M. Gandolfi, MD, MS

Objective: To compare postoperative complication rates and operative efficiency between robotic-assisted and manual insertion cochlear implantation (CI) and to identify predictive factors influencing ability to utilize robotic insertion systems.

Study Design: Retrospective cohort study.

Setting: Tertiary academic center.

Patients: Adult patients (≥18 years old) undergoing CI between December 2023 to September 2025. Patients undergoing reimplantation or concurrent otologic procedures were excluded.

Interventions: CI performed either manually or with robotic assistance using the IotaSOFT Insertion System.

Main Outcome Measures: 1) Postoperative complication rates. 2) Mean operative time. 3) Intraoperative robot-to-manual conversion or partial-manual completion rates.

Results: One hundred and fifty patients underwent CI, 57 robotic-assisted and 93 manual. Mean age at CI (65 ± 17.1 vs 64 ± 15.9 years, $p=0.5$), history of prior otologic surgery ($p=0.2$), and comorbid otologic pathology ($p=0.3$) were comparable. Manual cases included a higher proportion of male patients (67%, $p<0.001$) and former or current smokers (56%, $p=0.027$). Intraoperative robotic complications occurred in 22 (38.6%) cases, with 9 (15.8%) requiring robot-to-manual conversion and 13 (22.8%) requiring partial-manual insertion of the final 1-2mm of the electrode array. Among the converted cases, 5 (55.6%) had preoperative temporal bone CT findings of mastoid opacification and/or labyrinthitis ossificans. Anatomic restrictions (n=4) were the most common intraoperative cause for conversion. No statistically significant differences were observed in postoperative complication rates between robotic-assisted and manual cases ($p>0.05$ for all) during the <3 month or >3 month follow up period. The most frequently observed complications included dizziness (39% vs 31%, $p=0.4$) and tinnitus (30% vs 20%, $p=0.2$). Mean operative time was significantly longer for robotic-assisted cases compared to manual cases (191.8 vs 170.1 minutes, $p<0.001$). Among robot-assisted cases, mean operative times did not improve over time (>6 months vs 6-12 months vs >12 months, $p=0.22$).

Conclusions: Robotic-assisted CI demonstrated a comparable postoperative safety profile to manual insertion CI, with no significant differences in short- or long-term complication rates, despite longer operative times. Although intraoperative robotic insertion complications were uncommon, robot-to-manual conversion was associated with CT temporal bone findings of mastoid opacification or labyrinthitis ossificans and intraoperative anatomic restrictions, suggesting potential imaging and procedural predictors of robotic difficulty.

Learning Objective: To evaluate differences in postoperative complications between robotic-assisted and manual insertion CI and identify imaging and intraoperative predictors of robotic-assisted insertion difficulty.

Desired Result: To demonstrate that robotic-assisted insertion CI provides comparable complication rates to manual insertion CI, with potential for improved preoperative surgical selection based on image findings and anatomy.

Level of Evidence - Level IV.

Indicate IRB or IACUC: Wake Forest University School of Medicine, IRB00137017.

HERBERT SILVERSTEIN AWARD FOR RESEARCH EXCELLENCE IN OTOLOGY/NEUROTOLOGY

Apical Electrode Placement to Optimize Cochlear Implant Performance in Patients with an Ossified Cochlea and Incomplete Electrode Array Insertion

Justin Cottrell, MD; Emily R. Spitzer, Aud; David M. Landsberger, PhD; William Shapiro, AuD
Rebecca Piper, AuD; Sean McMenomey, MD; J. Thomas Roland Jr, MD

Objective: The placement of a standard electrode array with an additional electrode placed into the cochlear apex has previously been shown to facilitate current shifts towards the apex during standard cochlear implantation. Within patients with an ossified cochlea, a similar technique may also allow for current to be shifted through areas of ossification that can't be reached with an electrode. This study describes the surgical technique, outcomes, and programming parameters associated with apical ground electrode placement to steer current in patients with cochlear ossification and incomplete electrode array insertion.

Study Design: Retrospective case series.

Setting: Tertiary referral centers in the United States and Uganda.

Patients: Seven patients (ages 3–43 years) with partial or complete cochlear ossification who underwent cochlear implantation with incomplete standard electrode array insertion and placement of an apical electrode between 2020 and 2024.

Interventions: Standard cochlear implant electrode array insertion supplemented by an apical cochleostomy and placement of the ground electrode (ECE1) into the cochlear apex. Post-operative CI programming incorporated both standard and apical stimulation maps to evaluate perceptual benefit.

Main Outcome Measures: Intraoperative imaging and objective measures of intracochlear current spread, postoperative speech perception scores, patient-reported map preference, and surgical complications.

Results: Seven patients were included for study, with insertion depths of the standard array ranging from 11–18 electrodes. No intra- or postoperative complications occurred. TIM heatmaps demonstrated variable current shifts depending on apical electrode placement accuracy. Patients with demonstrable intracochlear current shifts showed greater subjective preference for apical-grounded programs. Speech outcomes varied with the degree of ossification.

Conclusions: Apical electrode placement can be safely performed in ossified cochleae and may expand intracochlear stimulation when standard insertions are incomplete. Although benefit is variable and technique-dependent, intraoperative confirmation tools such as TIM may optimize apical electrode positioning and associated incorporation the apical ground in programming maps.

Professional Practice Gap & Educational Need: Cochlear ossification presents a challenge to the implant surgeon. Performance in patients with complete ossification, or incomplete electrode insertion can be poor. Investigation into alternative means of completing surgery to improve post-operative performance is required..

Learning Objective: To understand how placement of an apical ground electrode, in addition to standard electrode insertion, may help improve post-operative CI performance in patients with cochlear ossification.

Desired Result: Surgeons add additional tools that can be used at their disposal to help patients with cochlear ossification.

Level of Evidence - Level IV

Indicate IRB or IACUC: IRB# i25-00378

Cochlear Implant Mapping Without a Target: Basal Deactivation and the Role of Electrophysiologic-Guided Alignment

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

Objective: To evaluate how basal electrode deactivation at cochlear implant (CI) activation affects speech performance and to quantify the impact of tonotopic electrophysiologic mismatch on outcomes.

Study Design: Retrospective cohort

Setting: Tertiary referral center

Patients: 147 postlingually deafened adults received perimodiolar arrays (CI632). In 69 (47%), the frequency allocation table (FAT) was modified at activation, most often deactivating the two most basal electrodes due to absent thresholds and reallocating the 188–7,938 Hz range across remaining electrodes. In other cases, FAT modifications maintained full frequency coverage. Intraoperative intracochlear electrocochleography (ECochG) estimated frequency–place maps (250–4,000 Hz), providing a physiologic tonotopic reference for FAT alignment. ECochG–FAT mismatch was defined as the log-frequency deviation between ECochG tonotopic peaks and assigned FAT center frequencies.

Main Outcome Measures: Speech-perception scores (CNC) at 3, 6, and 12 months.

Results: Mixed-effects modeling showed slower early and overall improvement among patients with basal deactivation. At 3 months, CNC improvement was 11.7 points lower in this group (β=–11.7; 95% CI:–21.4 to –2.0). Significant time effects at 6 months (β=4.4; 95% CI:0.4–8.6) and 12 months (β=9.2; 95% CI:4.5–14.0) indicated continued gains in both groups. The group × time interaction (β=–8.6; 95% CI:–14.9 to –2.3) confirmed slower improvement and persistently lower performance with basal deactivation. Greater ECochG–FAT mismatch correlated with poorer 12-month CNC (r=–0.41; 95% CI:–0.62 to –0.09).

Conclusions: Routine CI programming often lacks a patient-specific tonotopic reference. Without such a physiologic target, basal deactivation can distort place-frequency alignment and hinder speech outcomes. ECochG-guided mapping may provide a physiologic framework to standardize programming and improve performance by aligning stimulation with native cochlear tonotopy.

Learning Objective: Participants will recognize that current cochlear implant programming lacks a defined target and that commonly employed modifications, such as basal electrode deactivation, can substantially alter cochlear place–frequency alignment and delay optimal speech outcomes. A defined target, whether anatomic (e.g., Greenwood or Stakhovskaya) or electrophysiologic, provides a necessary framework for consistent, outcome-driven mapping.

Desired Result: Attendees will be able to apply the concept of ECochG-based tonotopic mapping as a physiologic target strategy to achieve individualized frequency–place alignment, improving programming consistency and patient speech-perception outcomes.

Level of Evidence - IV

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

Auto-Stopping Electrocochleography-Guided Cochlear Implant Insertion First-in-Human Feasibility Study

Maxwell Bergman, MD; Naina Miranda; Isaac Swink; Rachel Scheperle, AuD; Marlan R. Hansen, MD; Alexander Claussen, MD

Objective: To assess the feasibility and real-time performance of an auto-stopping, electrocochleography (ECochG)-guided cochlear implant insertion system in human surgery

Study Design: Prospective feasibility study

Setting: Tertiary academic medical center

Patients: Nine cochlear implant recipients undergoing hearing-preservation surgery

Interventions: Nine electrode array insertions were performed using the Advanced Bionics AIM ECochG module with the iotaMotion iotaSOFT Insertion System. A range of ECochG detection settings was evaluated, including drop thresholds of 2, 4, and 6 dB, with consistent frequency monitoring at 250, 500, 1,000, and 2,000 Hz.

Main Outcome Measures: Comparison of automated versus manual surgeon reaction times during ECochG "drop" events and verification of system responsiveness

Results: Nine implantations were performed: four cases used standard manual foot-pedal control; four used automated ECochG-triggered stops; one patient was excluded for technical issues during ECochG recording. Reaction-time comparisons were obtained in cases where both manual and automated stops occurred after verified ECochG amplitude decreases. Across eight analyzable cases and 25 total drop events, the automated system halted forward motion 321-883 ms faster than the surgeon, consistent with prior testing.

Conclusions: This study confirms that the robotic-assisted system achieved reliable, real-time ECochG-triggered auto-stops during human CI insertion. The findings reaffirm the system's faster reaction time compared with human performance, consistent with prior benchtop observations. By automating ECochG-guided stopping, this approach helps overcome human-factor limitations such as high mental workload during active ECochG monitoring, allowing the surgeon to focus on other critical aspects of the procedure. Future studies should further optimize "drop" thresholds and evaluate the impact of this technology on hearing preservation outcomes.

Learning Objective: To understand how auto-stopping ECochG-guided insertion can compares with manual surgeon reaction times to potentially reduce human-factor limitations during cochlear implantation

Desired Result: To highlight the clinical feasibility of automated ECochG-guided insertion systems and their potential to enhance hearing-preservation outcomes through improved reaction-time performance

Level of Evidence - Level IV (first-in-human feasibility study)

Indicate IRB or IACUC: IRB Approved – University of Iowa (IRB #202408621)

Off-the-Ear vs Behind-the-Ear Cochlear Implant Processors: Comparative Analysis of Skin Complications and Retention Outcomes in a Large Institutional Cohort

Maani M. Archang, MD, PhD; Karl R. Khandalavala, MD; Brian A. Neff, MD; Aniket A. Saoji, PhD
Matthew L. Carlson, MD, MBA; Colin L.W. Driscoll, MD; James R. Dornhoffer, MD

Objective: To evaluate whether off-the-ear cochlear (OTE) implant processors, increasingly used for cosmetic and comfort benefits, are associated with higher rates of skin complications or retention difficulties compared with traditional behind-the-ear (BTE) processors

Study Design: Retrospective single institution review

Setting: Tertiary academic medical center

Patients: CI recipients who were provided OTE processors as primary processor or as backup between 2017 and 2024

Interventions: Cochlear implantation

Main Outcome Measures: Skin complication (pain, erythema, ulceration, infection), device retention difficulty, OTE failure

Results: 393 implants (331 patients) including 331 off-the-ear (OTE) and 62 behind-the-ear (BTE) processors used by patients as their primary processor after implantation were included. OTE processors demonstrated significantly higher rates of skin complications than BTE (28.7% [95/331] vs 11.3% [7/62]; p = 0.004). Minor skin issues were more frequent in OTE (25.4% [84/331] vs 9.7% [6/62]; p = 0.006), while major complications were rare (3.3% [11/331] vs 0% [0/62]; p = 0.225). Most skin complications were resolved by decreasing magnet strength, padding, and break from device with magnet reduction. Eleven OTE implants (3.3%) required switching to a BTE processor due to skin complications and two were explanted due to severity of skin complications resulting in device exposure. Retention issues were more frequent among OTE vs BTE (14.5% [48/331] vs 8.1% [5/62]; p = 0.173). All retention difficulties of BTE processors were resolved by increasing magnet strength or using retention devices. Of OTE processors with retention difficulties, 10.4% (5/48) switched to a BTE device.

Conclusions: OTE processors were associated with higher rates of skin and retention complications compared with BTE designs, though most issues were resolved with conservative measures, and severe complications such as ulceration, skin breakdown, and CI exposure were rare. These findings highlight the need to for counseling patients on balancing comfort and cosmetic advantages of OTE processors against their higher risk of complications.

Learning Objective: To understand the relative rates and management of skin and retention complications between off-the-ear and behind-the-ear cochlear implant processors, enabling clinicians to better counsel patients on device selection and long-term care.

Desired Result: Participants will be able to incorporate complication risk profiles into patient counseling and device selection, and adjust follow-up strategies to optimize long-term comfort, retention, and skin health.

Level of Evidence - IV

Indicate IRB or IACUC: 22-000183

Vestibular Schwannoma Growth Patterns in Patients Aged 70 and Older

Kathy Le, MD; Akshay Prabhakar, BSA; Justina R. Varghese, BA; Jeffrey Vrabec, MD

Objective: To characterize the growth behavior of vestibular schwannomas (VS) in adults aged 70 years and older and to evaluate factors impacting tumor growth rate.

Study Design: Retrospective cohort study

Setting: Tertiary-care academic medical center

Patients: Adults with a diagnosis of VS (ICD-10 D33.3) who were age ≥ 70 years at any point during surveillance between 01/01/2021 to 10/16/2025 with ≥ 2 MRI scans at our institution with reported VS size. Patients with prior microsurgery or stereotactic radiosurgery were excluded.

Interventions: Serial diagnostic MRI surveillance. Tumor growth rate was calculated as the difference between final and initial tumor size divided by total follow-up duration (mm/year). Tumor size change was categorized as regression (< -2 mm/year), growth (> +2 mm/year), or stable (-2 to +2 mm/year).

Main Outcome Measures: Tumor characteristics; tumor growth rate and behavior; associations between growth rate and tumor and patient variables

Results: Among the 44 patients who met criteria, 43% were male and 57% were female. Median age at diagnosis was 72 (range 58–87). Median initial tumor diameter was 7 mm (range 1.6–20) and median follow-up time was 1.9 years (IQR 0.8–4.5). During surveillance, 4/44 tumors (9%) spontaneously regressed, 8/44 (18%) grew, and 32/44 (73%) were stable. Tumor growth rate declined significantly with greater age at diagnosis (Spearman $\rho = -0.35$, $p = 0.018$). Tumor size at diagnosis was not correlated with growth rate (Spearman $\rho = -0.02$, $p=0.89$).

Conclusions: In patients aged ≥70 years, VS were predominantly stable; spontaneous regression was observed as well during surveillance. Growth rates declined significantly with age. These findings support conservative, imaging-based observation particularly in older patients and support prospective studies to refine age-informed surveillance intervals and identify biologic drivers of age-related growth attenuation.

Learning Objective: Identify tumor behavior patterns (regression, stability, growth) of vestibular schwannomas in patients ≥ 70 years under MRI surveillance and understand the association of age on tumor growth rate to inform management.

Desired Result: For clinicians to apply age-informed, conservative surveillance strategies for older adults with vestibular schwannoma.

Level of Evidence - Level IV

Indicate IRB or IACUC: IRB #41019 Houston Methodist Research Institute, 8/15/2025

Rate of Hearing Preservation After Stereotactic Radiosurgery for Treatment of Vestibular Schwannoma: Analysis of Patients with 100% Word Recognition Scores

Karl R. Khandalavala, MD; Hernan Vargas; John P. Marinelli, MD; Christine M. Lohse, MS
Michael J. Link, MD; Matthew L. Carlson, MD, MBA

Objective: To evaluate hearing outcomes after treatment with stereotactic radiosurgery (SRS) for sporadic vestibular schwannoma (VS) among patients with baseline 100% word recognition scores (WRS).

Study Design: Historical cohort.

Setting: Tertiary academic medical center.

Patients: Patients with 100% WRS on audiometric testing at initial treatment with SRS.

Interventions: Gamma Knife SRS.

Main Outcome Measures: Rate of maintaining serviceable hearing (SH), defined as American Academy of Otolaryngology-Head and Neck Surgery hearing class A or B.

Results: In total, 125 patients had 100% WRS at SRS for sporadic VS. Median age at SRS was 56 years (IQR 51-62), 75 (60%) of patients were women, and median pure tone average (PTA) at SRS was 20 dB HL (IQR 13-31). Sixty-eight patients progressed to non-SH at a median of 3.4 years after SRS (IQR 1.0-8.6). Rates of maintaining SH (95% CI, number still at risk) at 1, 3, 5, 7, and 10 years after SRS were 88% (82-94, 101), 75% (68-84, 81), 61% (53-71, 55), 58% (49-68, 43), and 44% (35-56, 26), respectively. Each 10-dB HL increase in PTA at SRS was associated with a 52% increased risk of progression to non-SH (hazard ratio 1.52, 95% CI 1.24-1.87, $p<0.001$).

Conclusions: Despite having 100% pre-treatment WRS, most patients with sporadic VS treated with SRS experienced clinically significant hearing decline over time. Even among this cohort of patients with excellent baseline hearing, at 10 years after treatment, only 44% of patients maintained SH.

Learning Objective: To describe the rate of hearing preservation among patients with perfect baseline hearing who undergo radiosurgical treatment for sporadic vestibular schwannoma.

Desired Result: The audience will understand the rates of hearing deterioration following radiosurgery for sporadic vestibular schwannoma, particularly in the context of published rates of hearing preservation among patients undergoing continued observation with a wait-and-scan approach.

Level of Evidence – Level IV

Indicate IRB or IACUC: IRB approved 9/22/2016 (IRB ID: 23-001641)

ANS TRAINEE AWARD

A National Cross-Sectional Assessment of the Mayo Clinic Vestibular Schwannoma Quality of Life (VSQOL) Index by Tumor Management Strategy

Madison V. Epperson, MD; Christine M. Lohse, MS; Michael J. Link, MD; Matthew L. Carlson, MD, MBA

Objective: To evaluate differences in disease-specific quality of life (QOL) among patients with sporadic vestibular schwannoma (VS) by tumor management strategy using recently validated Mayo Clinic Vestibular Schwannoma Quality of Life (VSQOL) Index relative to established minimal important difference (MID) thresholds.

Study Design: Cross-sectional cohort

Setting: Acoustic Neuroma Association and tertiary care center.

Patients: Adults who completed the VSQOL Index between February 2023-August 2025.

Interventions: Microsurgery, radiation, or observation.

Main Outcome Measures: VSQOL Index scores for the Hearing Problems; Dizziness and Imbalance; Pain, Discomfort, and Tinnitus; Problems with Face or Eyes; Impact on Physical, Emotional, and Social Well-being; Difficulty with Thinking and Memory; Global QOL; and Satisfaction or Regret domains were compared by tumor management strategy adjusting for age, sex, and tumor size at diagnosis. Scores range from 0-100; higher scores indicate better QOL.

Results: 652 patients were included: 333 (51%) treated with microsurgery, 175 (27%) treated with radiation, and 144 (22%) managed with observation. Mean (SD) time of survey was 6.2 (2.7) years from treatment. Global QOL adjusted mean scores (95% CI) differed significantly ($p<0.001$) by group: 70 (67-72) for microsurgery, 73 (70-77) for radiation, and 79 (75-83) for observation. Domain scores differed significantly for Hearing Problems ($p<0.001$), Dizziness and Imbalance ($p<0.001$), Problems with Face or Eyes ($p<0.001$), and Difficulty with Thinking and Memory ($p=0.03$). Pairwise comparisons that exceeded at least the lower bound of published MIDs included Global QOL scores (between microsurgery and observation) and Hearing Problems (between microsurgery and observation).

Conclusions: At a mean follow-up of 6.2 years following treatment, several notable statistically and clinically significant differences in QOL were identified among management groups using the recently developed VSQOL Index. These important findings may be used to guide patient counseling regarding management options.

Learning Objective: Understand how application of the VSQOL Index and established MID thresholds enables interpretation of meaningful differences in QOL among VS management approaches.

Desired Result: Empower the clinician to apply disease-specific, patient-reported QOL outcomes to better inform an individualized patient-centric VS management strategy.

Level of Evidence: III

Indicate IRB or IACUC: Approved by the Institutional Review Board (14-009331)

Emerging Non-Conventional Imaging Modalities Characterizing Vestibular Schwannoma Prognosis: A Scoping Review

Nader G. Zalaquett, MD; John P. Marinelli, MD; Karl R. Khandalavala, MD
Christine M. Lohse, MS; Matthew L. Carlson, MD, MBA

Objective: To explore the existing evidence on novel imaging modalities that may aid in prognostication of vestibular schwannoma (VS) across various treatment approaches.

Study Design: Scoping review

Setting: Not applicable

Patients: VS patients

Interventions: Novel imaging techniques

Main Outcome Measures: VS tumor growth and response to treatment

Results: A total of 16 articles were included in this review. Of these, 7 focused on pre-treatment prognosis, 6 evaluated radiosurgery outcomes, 2 examined microsurgery outcomes, and 1 assessed response to bevacizumab. The imaging modalities investigated included radiomics (n=10), positron emission tomography (PET) (n=3), dynamic contrast-enhanced MRI (DCE-MRI) (n=3), and magnetic resonance elastography (MRE) (n=1). Radiomics studies yielded encouraging results, with reported accuracy ranging from 0.52 to 0.88, sensitivity from 0.13 to 0.95, specificity from 0.50 to 0.94, and area under the curve values from 0.65 to 0.99. PET studies identified several promising ligands associated with tumor growth, suggesting a potential role in prognostication. DCE-MRI also demonstrated valuable associations with tumor growth, surgical outcomes, and treatment response to bevacizumab. Lastly, the study on MRE highlighted its ability to predict intraoperative tumor stiffness.

Conclusions: Several emerging imaging modalities hold potential for improving prognostication in VS. Techniques such as radiomics, PET, and DCE-MRI have shown promising results; however, the supporting evidence is still limited and heterogeneous. Further research is necessary to validate these approaches and enhance their clinical utility.

Learning Objective: To understand the potential of novel imaging modalities in predicting VS tumor growth and treatment response across different therapeutic approaches.

Desired Result: Not applicable

Level of Evidence – Level V

Indicate IRB or IACUC: Not applicable

Response of NF2-Related Schwannomatosis (NF2) Associated Vestibular Schwannomas to Losartan: A Case Series

Sophie Jabban, BA; Spencer Frome, MA; Maya Hatley, BA; Kaleb Yohay, MD
J. Thomas Roland Jr, MD; Devorah Segal, MD, PhD

Objective: Given preclinical evidence suggesting the potential efficacy of losartan in modulating vestibular schwannoma (VS) growth and hearing loss, the objective of this study is to identify whether a cohort of NF2 patients with VSs respond to treatment with losartan.

Study Design: Single-institution retrospective case series

Setting: Tertiary referral center

Patients: Seven Patients with NF2

Interventions: Losartan

Main Outcome Measures: Change in VS size greater than 20%, in accordance with the Response Evaluation in Neurofibromatosis and Schwannomatosis (REiNS) criteria for evaluating tumor response to medical intervention. Additionally, change in hearing measures according to the 95% critical difference table for WRS score derived from Thornton and Raffin.

Results: This study included 7 patients, with 12 VSs, treated at our institution from 2014-2024. All included patients had been treated with at least one antineoplastic agent prior to initiation of losartan. Prior lines of therapy ranged from 1 to 4 (average: 1.85, SD: 1.07). Treatment duration among patients ranged from 0.67 to 7.00 years (average: 2.74, SD 2.33). Patients were categorized by the indication for losartan treatment, including primary hypertension (n=2), hypertension secondary to antineoplastic therapy (n=3), or hearing loss prevention (n=3). 4 patients were concurrently managed with antineoplastic therapy (bevacizumab, n=3; brigatinib, n=1). 3 of 12 tumors from 2 patients regressed in size over the treatment course. Both patients with responsive tumors were treated concurrently with bevacizumab. 5 of 7 (71.4%) patients exhibited worsened hearing over the treatment course, 2 of 7 (28.6%) exhibited stable hearing, and no patient experienced hearing improvement with losartan.

Conclusions: This case series suggests that losartan may influence tumor size, particularly when used in combination with bevacizumab. This finding warrants further study of losartan as a potential adjunctive treatment of NF2-related vestibular schwannomas. The study is limited by small sample size.

Learning Objective: Understand the role of losartan in treatment of NF2-related vestibular schwannomas and hearing loss.

Desired Result: Assist physicians in selecting optimal targeted therapies for patients with NF2.

Level of Evidence – V

Indicate IRB or IACUC: NYU Grossman School of Medicine: #i23-00840.

Long COVID is Associated with Increased Odds of Neurotologic Manifestations: A National Database Study

Anvitha R. Metpally, BS; Taral K. Jella, BS; Tara Menon, BS; Eric Oliver, MD

Objective: To evaluate whether long COVID-19, compared to acute COVID-19, is associated with increased odds of developing new-onset neurotologic effects, particularly sensorineural hearing loss (SNHL), vertigo, and tinnitus.

Study Design: Retrospective cohort study using a large multi-institutional electronic health record network.

Setting: National database (TriNetX) sourced from 84 HCOs in the USA.

Patients: Adults (≥18 years) with confirmed SARS-CoV-2 infection between January 2019 and January 2023 were included. Cohort 1 comprised long COVID-19 (ICD-10 code U09) patients, and Cohort 2 comprised acute COVID-19 patients. Patients with pre-existing otitis media and presbycusis were excluded. Propensity score matching (1:1) for age, sex, and race/ethnicity yielded 98,359 patients per cohort.

Interventions: Analyses were based on diagnostic and clinical records. SNHL was defined by ICD-10 codes H90.3, H90.4, H90.5, and 398.1; vertigo by ICD-10 code H81.4, and tinnitus by ICD-10 code H93.1.

Main Outcome Measures: Incidence of new-onset SNHL, vertigo, or tinnitus within three years after long or acute COVID-19 diagnosis.

Results: After matching, SNHL developed in 3,082 long COVID-19 patients (3.40%) versus 1,591 acute COVID-19 patients (1.67%); vertigo in 121 (0.12%) versus 51 (0.05%); tinnitus in 1,995 (2.15%) versus 931 (0.97%). Long COVID-19 patients had higher odds of SNHL (OR = 2.07; 95% CI 1.95–2.20; $p < 0.0001$), vertigo (OR = 2.38; 95% CI 1.72–3.30; $p < 0.0001$), and tinnitus (OR = 2.26; 95% CI 2.09–2.44; $p < 0.0001$).

Conclusions: Long COVID-19 is associated with significantly increased risk of SNHL, vertigo, and tinnitus compared to matched acute COVID-19 controls.

Learning Objective: Recognize increased neurotological risks in long COVID-19 patients and the need for vigilant monitoring.

Desired Result: Enhanced awareness of the association between long COVID-19 and neurotological effects to improve patient outcomes and reduce long-term disability.

Level of Evidence - Level IV

Indicate IRB or IACUC: Exempt

Hearing and Vestibular Deficits Following the Use of Teprotumumab: Preliminary Findings

Samuel Johnson, BS; Lydia Granados, BS; Claudia Prospero-Ponce, MD
Tamis Bright, MD; Amanda Chiao, AuD, PhD

Objective: To determine the oto-vestibulotoxic effects of Teprotumumab on hearing and the vestibular function in adults who were prescribed Teprotumumab and as compared to an age-sex matched control group

Study Design: A prospective cohort

Setting: Tertiary referral center

Patients: Adults 18-79 years of age who were prescribed Teprotumumab and age-sex matched adults with no history of Teprotumumab participated. Participants previously diagnosed with hearing or vestibular loss, otologic surgery, and/or neurodegenerative disorders were excluded.

Interventions: Participants in the study group completed a baseline assessment and repeat testing following each Teprotumumab infusion (~ 8 total). The control group received the same battery twice for test-retest reliability.

Main Outcome Measures: An otologic questionnaire was administered per visit to document symptom changes. We hypothesized that the study group would report more otologic symptoms with cumulative infusions. Auditory testing included standard-and-extended high frequency (EHF) audiometry, DPOAEs, and speech perception in noise. We hypothesized that the study group would show reduced: a) standard and EHF-pure-tone average thresholds (PTAs), b) DPOAE amplitudes, and c) speech-in-noise from baseline to the final testing timepoint. Vestibular testing included the video Head Impulse Test (vHIT), dynamic visual acuity (DVA), and standing balance. We hypothesized that vestibular testing would reveal: a) lower vHIT gain, b) increased DVA loss, and c) greater imbalance from baseline to the final testing timepoint. We anticipated that at the conclusion of their treatment, the study group would have greater otologic deficits compared with controls.

Results: Non-parametric repeated measures analyses for the study group (n = 5; mean age = 50.4 years, 3 males) showed an increase in EHF PTAs with cumulative infusions ($p = 0.032$). There was also no significant change to the standard frequencies, DPOAE amplitudes, or speech perception over time (p-values > 0.05). The study group had no significant change to vHIT gains, DVA, or standing balance from baseline to the end of their treatment (p-values > 0.05). Subjectively, a new onset of tinnitus (n= 4/5) or aural fullness (n= 3/5) was most commonly reported following an infusion, and for all who reported otologic symptoms, they had been exposed to at least 3 infusions. Between group analysis indicated that our study group's final EHF PTAs ($U = 0$, $p = 0.012$) and EHF DPOAEs ($U = 1.3$, $p = 0.028$) were significantly poorer than controls (n = 6; mean age = 46.2 years, 4 males), with no other group differences on other audiometric or vestibular measures (all p-values > 0.05).

Conclusions: Preliminary, Teprotumumab likely has ototoxic effects on EHF-thresholds and EHF-DPOAEs, but physiological changes may not be significant enough to impact the traditional speech frequencies. Temporary otologic symptoms are common with cumulative infusions. Teprotumumab does not appear to negatively impact vestibular function. Continued data collection is underway.

Learning Objective: Learners are expected to identify the negative physiological and behavioral implications of Teprotumumab on hearing and vestibular function in adults.

Desired Result: To improve physician knowledge about anticipated ototoxicity for patients taking Teprotumumab and risks.

Level of Evidence – Level IV

Indicate IRB or IACUC: This study is approved by the author's Institutional Review Board (E24130, approval date July 25, 2024).

Increased Risk of Inner Ear Disease in Patients with Inflammatory Bowel Disease
A National Database Study

Aaron Tucker, BA; Yashnoor Sandhu, BS; Aashish Batheja, MPH; Daniel H. Coelho, MD

Objective: Inflammatory bowel disease (IBD) is a systemic rheumatologic condition, previously reported to affect the inner ear, although there is a lack of large-scale research to support this. This study aims (1) to determine the risk of inner ear disease in IBD and its subtypes and (2) to determine whether use of IBD medication modifies the observed effect.

Study Design: Retrospective Cohort Cross-Sectional Analysis.

Setting: Cosmos, an Epic electronic health record database, contains records of >300 million patients from 1,762 hospitals in the US, Canada, Lebanon, and Saudi Arabia.

Patients: 1,616,041 patients at least 15 years of age searched 1/1/15 to 7/31/25. Patients were grouped according to the presence or absence of IBD, and were further categorized as either Crohn's Disease (ICD-10 code K50) or Ulcerative Colitis (K51).

Interventions: Use of a common IBD medication (sulfasalazine, mesalamine, mycophenolate mofetil, azathioprine, methotrexate, ciprofloxacin).

Main Outcome Measures: Risk ratios with 95% confidence intervals (RR, 95% CI) for sensorineural hearing loss (SNHL) (H90.3-90.5), tinnitus (H93.1), peripheral vertigo (H81.1, H81.3), and Ménière's disease (H81.0).

Results: 21,063 IBD patients were compared to 1,594,978 patients without IBD. IBD patients were older (57 ± 0.26 vs 51 ± 0.03), similar in sex (56.9% vs 55.4%), and more often white (82.7% vs 70.8%). IBD diagnosis was associated with a higher risk of the neurotologic diagnoses studied (10.2% vs 5.9%, RR 3.11, 2.99-3.24). SNHL (5.4% vs 2.8%, RR 3.47, 3.28-3.68), tinnitus (4.4% vs 2.7%, RR 2.93, 2.75-3.13), peripheral vertigo (3.0% vs 1.7%, RR 3.18, 2.94-3.43), and Ménière's disease (0.4% vs 0.21%, RR 1.86, 1.34-2.58) were all significantly associated (all $p<0.0001$). Use of IBD medication mitigated the risk of each diagnosis except SNHL, which remained slightly higher (RR 1.10, 1.03-1.18, $p=.0074$). Unmedicated IBD patients showed consistently higher risks. Similar patterns were observed in Crohn's and Ulcerative Colitis cohorts.

Conclusions: IBD diagnosis was associated with increased risk of neurotologic disease, suggesting a shared autoimmune pathophysiology. Use of IBD medication was a negative effect modifier, though unmedicated IBD patients remained at increased risk. This supports the claim that IBD independently contributes to the development of neurotologic disease.

Learning Objective: Understand the potential systemic autoimmune effect of IBD on the inner ear.

Desired Result: Motivate future research into subpopulations at risk, and promote the early referral of all IBD patients to hearing specialists.

Level of Evidence - Level III

Indicate IRB or IACUC: Exempt

NICHOLAS TOROK VESTIBULAR AWARD

Increased Adrenergic Receptor Expression in Meniere's Disease

Adam Y. Xiao, MD, PhD; Achilles Kanaris, BS; Masanori Ishii, MD
Ivan A. Lopez, PhD; Gail Ishiyama, MD; Akira Ishiyama, MD

Hypothesis: There is increased expression of adrenergic receptors in the vestibular end organs of Meniere's disease.

Background: Meniere's disease (MD) is an inner ear condition characterized by episodic vertigo, hearing loss, tinnitus, and aural fullness. It is believed to be due to an imbalance in inner ear fluid often leading to hydrops; however, the exact mechanism is unclear. Pupillometry data have suggested a role for autonomic dysfunction, specifically sympathetic hyperactivity, but no studies have investigated the molecular pathways involved in this.

Methods: Vestibular end organs from patients undergoing labyrinthectomy for MD (n = 6) as well as control specimens from patients with vestibular schwannoma undergoing translabyrinthine resection were collected and processed for FFPE. RNA in situ hybridization was performed using RNAscope™ Multiplex Fluorescent V2 Assay using probes for β_1-, β_2-, and α_{1a}-adrenergic receptors (AR). Positive and negative control experiments were also performed for quality control. Immunohistochemistry (IHC) was used to characterize protein expression and identify sensory epithelium (Myosin 7a).

Results: There is increased expression of α_{1a}-AR transcripts in MD compared to control. This appears to be concentrated in the sensory epithelium confirmed with Myo7a positivity although expression can be seen in the stroma as well. This was further confirmed with IHC demonstrating robust expression in MD. There is also transcriptional expression of β_2-AR with no difference between the two groups.

Conclusions: There are limited molecular studies investigating the pathogenesis of MD, especially those utilizing surgical tissue. This is the first study to demonstrate increased expression of α_{1a}-AR both at the transcriptional as well as protein level in MD compared to control specimens. These results may explain the mechanism behind sympathetic hyperactivity and guide future therapies.

Learning Objective: To understand the expression pattern of adrenergic receptors in Meniere's disease.

Desired Result: Participants should better appreciate the potential role of autonomic dysfunction and adrenergic receptors in Meniere's disease.

Level of Evidence – Not applicable

Indicate IRB or IACUC: UCLA IRB # 22-001587

VeDA VESTIBULAR RESEARCH AWARD

Visual Vertigo in Vestibular Migraine

Alexandra T. Bourdillon MD; Jason W. Allen MD PhD; Jeffrey D. Sharon MD

Objective: To quantitatively assess visual provocations in vestibular migraine (VM).

Study Design: Cohort Study

Setting: Single-institution

Patients: Prospective cohort of vestibular migraine patients and healthy controls.

Interventions: Visual vertigo (VV) was assessed by having subjects with either VM or healthy controls watch 20 30-second video clips with varying degrees of visual motion stimulation. After each video, subjects selected whether they experienced headache, dizziness, nausea, fogginess, or no symptoms using a 5-button hand-held controller. A second response was captured, reflecting the severity of the symptom (0, 2, 4, 6, or 8).

Main Outcome Measures: The main outcome was a composite score reflecting symptom severity for all 20 videos, comparing individuals with VM to healthy controls. VV symptoms were also correlated to patient-reported outcome measures (PROMs) such as Dizziness Handicap Inventory (DHI), VM-Patient Assessment Tool and Handicap Inventory (VM-PATHI), Headache Impact Test-6 (HIT-6), Visual Vertigo Analogue Scale (VVAS), Cognitive Failures Questionnaire (CFQ), Modified Pain Catastrophizing Score (MPCS), Generalized Anxiety Disorder-7 (GAD-7), and Patient Health Questionnaire-8 (PHQ-8).

Results: The study enrolled 36 participants, including 17 with VM and 19 healthy controls. There was a female majority in both the VM (n=15/17, 88.2%) and control (n=15/19, 78.9%). The VM arm was older compared to the controls (mean age 51±14.5 for VM vs. 39.6±12.9 for controls). VM-PATHI scores were significantly higher in those with VM compared to healthy controls (mean 43.3 ± 15.1 versus 3.4 ± 6.6; U-statistic: 323.0, $p < 0.001$). The rate of VV was significantly higher in the VM arm (71.9% in VM vs. 13.7% in controls, $X^2(4, 705)= 245.6$, $p<0.001$). Composite symptom scores were significantly higher in the VM arm (43.9±13.9 vs. 23.6±6.3 in controls, U=304.0, $p<0.001$). Composite scores were significantly correlated with all PROMs: DHI, VM-PATHI, HIT-6, VVAS, CFQ, MPCS, GAD-7, and PHQ-8 ($p<0.001$ for each). VVAS was the only measure to be significantly associated with composite scores across both arms ($p<0.001$ for VM and $p=0.011$ for controls). Video analysis demonstrated that while some stimuli commonly provoked symptoms in both arms, several video clips were differentially triggering in the VM cohort. Notably, "Sky dive Mont Blanc" provoked symptoms in 93.8% of VM subjects versus 16.7% of controls, and "Mountain biking in the woods" provoked symptoms in 88.2% of VM patients versus 10.5% of controls.

Conclusions: Visual vertigo occurred more frequently in individuals with VM than in healthy controls. Composite symptom severity ratings correlated with other established PROMs (VM-PATHI, DHI, etc.), demonstrating alignment between visual stimulus responses and broader measures of dizziness, headache, and cognitive function.

Professional Practice Gap & Educational Need: While visual vertigo is a known feature of VM, standardized and quantifiable assessments have not been established. Here, we provide a quantitative analysis demonstrating a greater burden of visual vertigo in VM compared to healthy controls.

Learning Objective: Motion-simulating video clips can reliably provoke visual vertigo in individuals with VM and correlate with other measures of disease burden.

Desired Result: Gain understanding about visual vertigo in VM.

Level of Evidence – Level III

Indicate IRB or IACUC: 21 - 35910.

NEUROTOLOGY FELLOW AWARD
MICHAEL E. GLASSCOCK SCIENTIFIC MERIT AWARD

The Glasscock Award is given to the highest scoring blinded abstract.

Neoadjuvant Immune Checkpoint Inhibitor Therapy in Temporal Bone Squamous Cell Carcinoma

Kaitlyn A. Brooks, MD; Nathan R. Lindquist, MD; Meera Patel, MD MHS; Neil D. Gross, MD
Marc-Elie Nader, MD; Neal S. Akhave, MD; Paul W. Gidley, MD

Objective: To present immune checkpoint inhibitor immunotherapy (IO) outcomes for patients with temporal bone-involving squamous cell carcinoma and guide neurotologic decision making.

Study Design: Retrospective cohort.

Setting: Multi-institutional tertiary-care referral centers.

Patients: Twenty-one patients (42 to 86 years) with biopsy-proven temporal bone squamous cell carcinoma (SCC) from 2018 - 2024.

Interventions: Neoadjuvant IO and imaging for response.

Main Outcome Measures: Response Evaluation Criteria in Solid Tumors (RECIST) 1.1 outcomes, surgery de-escalation, overall survival.

Results: Eighteen (85.7%) patients received cemiplimab, 2 (9.5%) patients received pembrolizumab, and 1 (4.8%) patient received atezolizumab. By RECIST 1.1 criteria for final tumor response, 6 (28.6%, 95% CI 11% to 52%) patients had a complete response (CR), 3 (14.3%, 95% CI 3% to 26%) patients had a partial response (PR), 3 (14.3%, 95% CI 3% to 36%) patients had stable disease (SD), and 9 (42.8%, 95% CI 22% to 66%) patients had progressive disease (PD). Two (9.5%) patients were de-escalated to non-surgical management, and 2 (9.5%) patients were de-escalated from lateral temporal bone resection (LTBR) to mastoidectomy. All three patients with CR who underwent resection had complete pathologic response at the primary site; 1 patient with SD had complete pathologic response. Three (14.3%) patients from the PD group had died at study end. Overall, 3-year survival for patients with CR, PR, or SD after ICI was 100% as opposed to 78% for patients with disease progression (p=0.034, HR 12.2, 95% CI 1.2 to 123).

Conclusions: Immunotherapy is an option for early-stage and advanced temporal bone SCC; 40 to 50% of patients exhibit some response. Ideally, imaging should be performed after 2 cycles to assess response and restage for surgical planning.

Professional Practice Gap & Educational Need: Outcomes of immunotherapy for temporal bone SCC to guide surgical decision making.

Learning Objective: Surgical management of temporal bone SCC for patients receiving or who have received immunotherapy for their lesion.

Desired Result: The desired result of this abstract is to improve clinical practice and surgical management of temporal bone SCC with the growing applicability of IO in this disease process.

Level of Evidence: Level IV

Indicate IRB or IACUC: MD Anderson Cancer Center IRB # PA19-0106, approved 3/6/2019; Baylor College of Medicine IRB# H-56798, approved 2/6/2025

Intratympanic Embolization for Management of Glomus Tumors: A Case Series

Benjamin T. Ostrander, MD, MSE; Catherine L. Kennedy, MD; Monika Manchanda, MD
Ramachandra Tummala, MD; Tina Huang, MD

Objective: To evaluate the feasibility of a novel preoperative intratympanic embolization technique for management of tympanic and jugular paragangliomas

Study design: Retrospective case series

Setting: Tertiary referral center

Patients: Five patients with tympanic or jugular paragangliomas

Interventions: Intratympanic intratumoral direct embolization using Obsidio or n-butyl cyanoacrylate embolic agent followed by microscopic resection

Main Outcome Measures: Post-embolization cerebral angiogram, tumor resection status, mean estimated blood loss (EBL), adjuvant radiotherapy

Results: Five patients (mean age 69 years, 60% female) underwent preoperative intratympanic intratumoral direct embolization of glomus tumor. Preoperative audiogram revealed mean pure tone average of 58 dB and word discrimination score of 79%. Immediate post-embolization cerebral angiography confirmed reduction of the angiographic tumor blush. Microsurgical resection was then completed, with 3 total and 2 sub-total resections. Mean operative blood loss was 28 mL. Postoperatively, no patients had cranial neuropathies, hemorrhage, stroke, or sensorineural hearing loss. Of the 2 patients with glomus jugulare, 1 patient underwent adjuvant radiotherapy. The embolic agent was partly extratumoral and within the middle ear in two cases, with subsequent inflammatory reaction that gradually subsided over months. Postoperative otomicroscopic examination revealed pigmented tympanic membrane staining, an important and potentially permanent change after intratympanic Obsidio embolization. While this technique worked well for glomus tympanicum, injection of embolic agent into more inferior, larger glomus jugulare was challenging, resulting in more extra-tumoral embolic agent and subtotal resection requiring adjuvant radiotherapy.

Conclusions: Immediate preoperative intratympanic intratumoral direct embolization of glomus tumors is a novel and viable technique for management, with reduced bleeding during microscopic resection and potentially lower risk of complications compared to traditional intravascular embolization.

Learning Objective: To describe a novel intratympanic intratumoral direct embolization technique for the management of glomus tumors

Desired Result: To demonstrate the advantages and disadvantages of intratympanic embolization for glomus tumors such that surgeons may consider employing this management technique in their practice

Level of Evidence - Level V

Indicate IRB or IACUC: Exempt

Short- and Long-Term Outcomes of Sigmoid Sinus Wall Resurfacing versus Compression Surgery for Venous Pulsatile Tinnitus: A 313-Case Cohort

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

Objective: To characterize the variability in pulsatile tinnitus (PT) resolution following surgery for sigmoid sinus wall anomalies (SSWA) and to analyze the nuances of complications associated with sigmoid sinus wall resurfacing surgery before complete cessation of PT.

Study Design: Case series with retrospective data analysis.

Setting: Multi-institutional tertiary university medical centers.

Patients: A total of 313 surgical patients with venous pulsatile tinnitus attributable to SSWA.

Interventions: Sigmoid sinus wall reconstruction surgery and sigmoid sinus compression surgery.

Main Outcome Measures: Cross-sectional imaging (CT/MRI), Doppler ultrasound hemodynamics, and tinnitus handicap inventory (THI).

Results: PT resolved in 89.1% of patients. The mean follow-up duration was 48.4 ± 41.5 months. The incidence of postoperative complications was significantly higher in the compression surgery group compared to the resurfacing group ($p < 0.05$). No statistically significant difference was observed in effectiveness or THI score improvement between the two surgical approaches. The mean preoperative THI score was 57.5 ± 24.1, which decreased to 10.5 ± 5.4 postoperatively ($p < 0.05$). Short-term follow-up revealed immediate resolution of PT in 27% of patients, while 73% achieved complete silence of PT within an average of 1.3 weeks. Aural fullness was positively correlated with the duration required for PT to subside ($R = 0.71$, $p < 0.05$).

Conclusions: Both resurfacing and compression surgeries are effective long-term treatments; however, resurfacing surgery is associated with fewer complications. In the short term, PT typically resolves gradually within two weeks as middle ear fluid retention decreases.

Learning Objective: By the end of this session the participant will be able to: Compare the two surgical strategies for SSWA—sigmoid-sinus resurfacing versus sigmoid-sinus compression—with respect to operative risk, complication profile, and long-term PT resolution rates. Predict short-term PT behaviour after surgery, including the typical 1–2-week subsidence interval and the positive correlation between post-operative aural fullness and time-to-silence. Select the safer, equally effective resurfacing technique over compression when planning elective surgical correction of SSWA-related PT.

Desired Result: Participants will leave the module able to recognise sigmoid-sinus-wall anomalies as a curable cause of pulsatile tinnitus, choose the safer resurfacing approach, and counsel patients that their pulsatile tinnitus and handicap scores typically resolve within weeks, thereby embedding a standardised, low-risk, patient-centred care pathway that each centre will audit and continuously refine.

Level of Evidence - IV

Indicate IRB or IACUC: The present study was approved by the ethics committee of the Eye, Ear, Nose, and Throat Hospital of Fudan University (No. 2021102-1) on Feb 202, and all participants signed informed consent forms.

Thread-guided Eustachian Tube Obturation for Patulous Symptoms

Peter G. Volsky, MD; Benjamin VanTasel, DO; Aaron Snow, MD

Objective: To describe a novel surgical technique of eustachian tube (ET) obturation with using readily available materials.

Study Design: Case series.

Setting: Tertiary academic otology/neurotology practice.

Patients: Three adult patients (4 ears) with patulous Eustachian tube (PET) were treated with the described technique after exhibiting autophony, aural fullness, tympanic membrane excursion on respiration, and failure of conservative management.

Interventions: Under sedation with local anesthesia, a suture thread was advanced through a myringotomy into the ET, to the nasopharynx, and out through the nose. On the opposite end, outside the ear, an obturator (an 18G angiocatheter) and a trailing suture (to facilitate reversal) were attached with a knot. Under traction from the nasal end, the obturator was guided through the myringotomy and positioned into the ET, secured by tactile feedback. Excess suture was trimmed and the myringotomy patched.

Main Outcome Measures: Technical feasibility, Symptom response (Patulous Handicap Index, PHI-10), and tympanic membrane integrity

Results: All 4 procedures resulted in successful obturation of the ET and a healed tympanic membrane. Patients reported improvement and PHI-10 scores were lower post-procedure. One ear developed seromucinous otitis media and was treated with tympanostomy. No other complications occurred.

Conclusions: Thread-guided ET obturation can be successfully performed with common supplies under local anesthesia. A small myringotomy permits passage of the obturator. No grafts, fillers, or tissue removal is necessary. Traction applied on either end should allow removal from the nose or ear, though the need has not yet arisen. Removability from the nose is a distinctive feature of this design, compared to other described techniques. This is a practical method of managing symptomatic, refractory PET dysfunction.

Learning Objective: At the conclusion of this presentation, learners will be familiar with the procedural steps, instrumentation, and anatomic considerations of a trans-tympanic ET obturation technique using nylon thread and an angiocatheter as an obturator. Still images and video demonstrate the operative technique, in which the obturator is positioned by passing a thread through the ET from the ear to the nose.

Desired Result: To familiarize otologists and neurotologists with a novel technique for ET obturation that can be readily performed using standard materials.

Level of Evidence: Level IV (case series).

IRB / IACUC: IRB # 25-09-NH-0219 “Not Research” designation; Macon & Joan Brock Virginia Health Sciences at Old Dominion University

Cochlear Implantation in Asymmetric Hearing Loss: A Scoping Review of Functional and Quality-of-Life Gains

Warren L. Luo, BS; Emily Clementi, BA; Ruth K. Mizu, MD; J. Dixon Johns, MD
Alexandra Arambula, MD; Sarah Mowry, MD; Michael Hoa, MD

Objective: Perform a scoping review on cochlear implantation (CI) in adults with asymmetric hearing loss (AHL), focusing on audiometric and quality-of-life (QoL) outcomes.

Data Sources: Five databases (Ovid MEDLINE, Embase, CENTRAL, CINAHL, Web of Science) from inception to November 13, 2023. English language publications only.

Study Selection: Peer-reviewed articles involving adults (>18 years) with AHL undergoing CI reporting pre- and post-operative audiometric or QoL data. Excluded: reviews, case reports, basic science studies, pediatric populations, non-English publications. Two independent reviewers screened per PRISMA-ScR guidelines with third-reviewer conflict resolution.

Data Extraction: Study characteristics, demographics, pre-operative pure-tone averages, and pre- and post-operative audiometric results (monosyllabic/disyllabic word recognition, sentences in quiet/noise) and validated QoL questionnaires. Sample sizes, means, and standard deviations extracted when available.

Data Synthesis: Given heterogeneity across 23 audiometric tests and 21 QoL instruments, narrative synthesis was performed without quantitative pooling. Results analyzed at 6- and 12-month timepoints.

Results: Twenty-five studies from 9 countries met criteria. CNC word recognition in the implanted ear improved from 3.6-18.3% preoperatively to 49.3-66.2% at 12 months. AzBio sentence recognition in quiet increased from 13-25% to 84% bimodally. In noise (+5 dB SNR), bimodal scores improved from 27-30% to 49-68% at 6 months. Speech, Spatial and Qualities of Hearing Scale showed significant improvements in 92% of studies (12/13); Nijmegen Cochlear Implant Questionnaire in 100% (6/6).

Conclusions: CI provides substantial auditory and QoL benefits for AHL adults comparable to traditional bilateral CI candidates, supporting reconsideration of FDA and Medicare candidacy criteria.

Learning Objective: Learners will be able to describe audiometric and QoL outcomes following CI in AHL patients and identify appropriate candidates who may benefit from expanded candidacy criteria.

Desired Result: Increased physician knowledge of CI benefits in AHL and improved identification of appropriate candidates for implantation beyond current restrictive criteria.

Level of Evidence: V

Indicate IRB or IACUC: Exempt

ANS TRAINEE AWARD

Beta-2 Transferrin May Not Be Specific for Presence of Cerebrospinal Fluid in Middle Ear Fluid

Anthony Thai, MD; Sasha Vasilijic, PhD; Lindsay S. Moore, MD; Peter J. Kullar, MD; Alan G. Cheng, MD
Iram N. Ahmad, MD; Douglas R. Sidell, MD; Karthik Balakrishnan, MD, MPH; Kay W. Chang, MD
Jennifer Y. Lee, MD; Konstantina M. Stankovic, MD, PhD; Jennifer C. Alyono, MD, MS

Objective: Quantify the rate of beta-2 transferrin (B2T)-positivity in middle ear fluid of patients undergoing pressure equalization tube (PET) placement for recurrent acute otitis media (RAOM) or chronic otitis media with effusion (COME)

Study Design: Prospective study

Setting: Tertiary referral center

Patients: 81 ears from 60 adult and pediatric patients undergoing PET placement. Mean age was 12.1 years. 60.6% of ears were male. 33.8% and 66.2% had RAOM and COME, respectively. The mean effusion duration was 6.2 months.

Interventions: PET placement. B2T levels were quantified in middle ear aspirates in duplicate using quantitative ELISA. 10 ears were excluded due to coefficients of variation >20% between duplicate wells, likely from sample viscosity.

Main Outcome Measures: B2T positivity

Results: Of 71 ears, 55 (77.5%) were B2T-positive. Compared to B2T-negative ears, B2T-positive ears were more likely to be younger (6.1 vs 32.9 years, p=0.004) and have mucoid effusion (70.9% vs 20.0%, p=0.001). 91.8% of ears aged 18 years or less were B2T-positive, compared to only 20% aged greater than 18 years. B2T-positivity was not associated with gender, effusion duration, or indication for PET placement. No patients had chronic otorrhea after PET placement.

Conclusions: Although B2T is considered the gold standard to detect cerebrospinal fluid (CSF), our study shows high B2T positivity rates in the middle ear fluid of patients undergoing PET placement for RAOM or COME, with no specific concern for CSF leak. B2T may not be specific for presence of CSF in the middle ear.

Learning Objective: B2T may not be specific for presence of CSF in middle ear fluid.

Desired Result: Clinicians should exercise caution when interpreting B2T in middle ear fluid, as B2T may not be specific for CSF.

Level of Evidence - III

Indicate IRB or IACUC: Stanford School of Medicine IRB, protocol #72440. Approved 11/10/2023

Assessment of MRI-Derived Synthetic CT for Otologic Surgical Planning

Sammy Y. Gao, BS; Yubo Fan, PhD; Kaiwen Chen, BS; Benoit M. Dawant, PhD
Robert F. Labadie, MD, PhD; Jack H. Noble, PhD

Objective: Synthetic CT (sCT) techniques aim to generate CT-equivalent images from MRI to support surgical planning while reducing radiation exposure. Prior studies have shown strong agreement between real CT (rCT) and sCT with DICE coefficients > 0.8. However, the clinical utility in otologic surgery has not yet been explored.

Study Design: Cross-sectional study

Setting: Academic tertiary medical center

Patients (Participants): Division of otology faculty

Interventions: Participants were blinded and randomly reviewed 60 scans (30 rCT, 30 sCT) and were asked to classify each as real or synthetic. Participants subsequently reviewed the 30 paired sets side-by-side and were asked to identify rCT versus sCT. Finally, once scans were revealed as sCT or rCT, they were asked to assess clinically-relevant anatomical visualization.

Main Outcome Measures: Accuracy distinguishing sCT from rCT; confidence in utilizing the sCT for anatomic evaluation and surgical planning

Results: Across participants (N=6), the ability to distinguish sCT from rCT did not exceed chance. Overall, mean ± SD accuracy was 57.2±7.1%. Sensitivity and specificity, representing correct identification of sCT and rCT, were 55.0±13.0% and 59.4±11.4%. Area under the receiver operating characteristic curve (AUC) was 0.597±0.11, indicating limited discriminability. Participants rated 95.0±4.3% of sCT acceptable for cochlear implantation planning and 86.7±9.4% acceptable for middle ear surgery planning. In paired and blinded sCT–rCT review, overall accuracy improved to 74.2±18.9%. In unblinded paired review, 18.9±12.9% of sCT were deemed unsuitable for surgical planning due to misrepresented ossicles, air cells, or soft tissue pathology.

Conclusions: Overall, experts had difficulty distinguishing rCT from sCT with image quality of sCT generally acceptable for surgical planning. Ongoing work aims to identify features from source MRI which predict distortion of sCT.

Learning Objective: To understand the current performance, limitations, and clinical applicability of synthetic CT generation algorithms for otologic surgical planning.

Desired Result: Increased awareness of the potential of synthetic CTs to reduce radiation exposure while recognizing the need for continued algorithm refinement to prevent anatomic misrepresentation and improve clinical reliability.

Level of Evidence - V

Indicate IRB or IACUC: Exempt

The Impact of Obstructive Sleep Apnea Diagnosis and Treatment on Spontaneous CSF Leaks: A Multi-Institutional Database Study

Adam S. Vesole, MD; Michael J. Ruckenstein, MD; Tiffany P. Hwa, MD

Objective: To evaluate the impact of obstructive sleep apnea (OSA) and its treatments on the incidence of spontaneous CSF (sCSF) leaks, encephaloceles and anterior or lateral skull base CSF leak repairs.

Study Design: Retrospective cohort database study with propensity score matching.

Setting: A multi-institutional collaborative database (TriNetX) extracting population level data from >160 healthcare organizations.

Patients: Adults (≥18 years old) diagnosed with OSA.

Interventions: Initiation of continuous positive airway pressure (CPAP), use of GLP-1 receptor agonists, or bariatric surgery.

Main Outcome Measures: Incidence of sCSF leak, encephalocele, and repair of anterior or lateral CSF leak. Secondary outcome measure: change in BMI following OSA treatment.

Results: Patients with OSA (n=2.6 million) were approximately 2 times more likely to develop sCSF leak/encephalocele and 1.6 times more likely to undergo a CSF leak repair than those without OSA (n=2.6 million) when controlling for BMI and idiopathic intracranial hypertension (IIH). Further, IIH patients with OSA were 1.2 times more likely to develop sCSF leak/encephalocele than IIH patients alone at a similar BMI.

Both CPAP initiation and GLP-1 receptor agonist use in OSA were independently associated with a significantly lower incidence of sCSF leak, encephalocele, and repair compared to those not on CPAP or a GLP-1, respectively (OR 0.6-0.7 with CPAP; OR 0.5-0.8 with GLP-1). The GLP-1 cohort reduced BMI by 5.6% versus 4.0% in the non-GLP-1 cohort over a maximum 3 year period. The impact of bariatric surgery was unable to be assessed due to limited sample size.

Conclusions: OSA is independently associated with the development of sCSF leak/encephalocele and subsequent skull base repair. Treatment of OSA with CPAP or weight loss via GLP-1 receptor agonists may significantly reduce CSF leak risk, especially in populations with concomitant IIH and obesity.

Learning Objective: 1) To assess the relationship between OSA and the incidence of sCSF leaks/encephaloceles and anterior or lateral skull base CSF leak repairs. 2) To evaluate if OSA treatment (CPAP, GLP-1 receptor agonists and bariatric surgery) reduces the risk of sCSF leak/encephalocele or CSF leak repair.

Desired Result: Attendees will appreciate the impact of OSA in the development of sCSF leaks and encephaloceles and how OSA treatments may significantly reduce their incidence.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt.

Hearing Loss is Associated with Longitudinal Accumulation of Regional Brain Amyloid in the NOMEM Cohort

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Objective: Investigate the longitudinal association of hearing loss (HL), measured by pure tone average (PTA) and word recognition score (WRS), with a marker of Alzheimer's disease pathophysiology, measured using amyloid positron emission tomography (PET).

Study Design: Prospective cohort, longitudinal analysis

Setting: Northern Manhattan community

Participants: Healthy adult volunteers from NOMEM (Northern Manhattan Study of Metabolism and Mind)

Main Outcome Measures: Amyloid standardized uptake value ratio (SUVR) in cortical regions. Rate of amyloid accumulation is the difference in SUVR per 5.2 months (1 unit SD of time). Linear regression was performed, adjusted for age, sex, education level, and cardiovascular disease.

Results: 223 participants were included, 65.3% women, with a mean (SD) age at latest PET scan of 68.3 years (3.49), PTA of 21.9 dB (8.9), WRS of 97.7% (5.5), and time between scans of 22.8 months (5.2). Each SD increase in PTA was associated with greater whole brain SUVR at baseline (+0.03; p=0.026) and increased accumulation rate (+0.009; p=0.025). This relationship held in the left cingulate (baseline +0.030, p=0.029; rate +0.013, p=0.010), right cingulate (baseline +0.03, p=0.020; rate +0.018, p<0.001), left frontal (baseline +0.03, p=0.044; rate +0.009, p=0.031), and right frontal regions (baseline +0.02, p=0.060; rate +0.01, p=0.014). Baseline SUVR was greater in the left parietal (+0.03, p=0.037) and left temporal regions (+0.02, p=0.038); rate increase was non-significant in these regions. For each SD decrease in WRS, whole brain SUVR increased by 0.03 at baseline (p=0.002) and rate increased by 0.009 (p<0.001). This relationship held in all brain regions, though trended toward significance for left frontal region baseline (p=0.077) and left temporal region rate (p=0.055).

Conclusions: Worse hearing was associated with higher amyloid baseline and rate of accumulation in multiple brain regions. The reason for the association, including causality, requires further study.

Learning Objective: Participants will better understand the relationship between hearing loss and amyloid accumulation over time.

Desired Result: Increase physician knowledge of a hearing loss as a potential target for prevention of cognitive decline and dementia.

Level of Evidence - III

Indicate IRB or IACUC: Columbia IRB #AAAR5012.

Cardiovascular Effects of Transcutaneous Auricular Nerve Stimulation in Rats

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Hypothesis: We hypothesized that electrical stimulation of discrete auricular regions would elicit distinct hemodynamic responses reflecting differences in underlying neural innervation, and that these effects may persist independent of vagal efferent pathways.

Background: Transcutaneous auricular vagus nerve stimulation (taVNS) is a noninvasive method of modulating autonomic tone that works by stimulating the external ear and has demonstrated efficacy for inflammatory disorders, opioid disorders, and cardiovascular diseases. Auricular sensory innervation is complex with contributions from multiple cranial nerves, and the mechanisms by which taVNS alters cardiovascular parameters remain poorly understood. Improved understanding of mechanisms of cardiovascular responses mediated by aVNS would enhance translation of aVNS therapies for cardiovascular and autonomic disorders.

Methods: Adult rats underwent cutaneous electrical stimulation of three auricular or periauricular sites using a 30 Hz, 5mA, 10-second stimulation paradigm across five trials per location. Blood pressure and heart rate were continuously monitored via an implantable internal carotid artery catheter. Experiments were repeated following bilateral cervical vagotomy to assess the contribution of vagal pathways.

Results: Medial concha stimulation consistently produced transient decreases in mean arterial pressure (MAP) averaging 10 mm Hg ± 2 mm Hg, with earlier onset and higher response likelihood compared with other sites. These responses were augmented and became more consistent after bilateral vagotomy, whereas heart rate changes were inconsistent and not statistically significant.

Conclusions: Auricular stimulation evokes site-dependent hemodynamic responses that persist after vagal transection, suggesting that these responses are independent of vagal efferents. These findings highlight the importance of precise stimulation targeting and support further investigation into peripheral mechanisms underlying aVNS, with potential implications for optimizing noninvasive neuromodulation in clinical populations.

Learning Objective: To delineate differences in transcutaneous stimulation of distinct regions of the rat auricle with and without an intact vagal efferent pathway.

Desired Result: Identification of afferent-mediated pathway for transcutaneous auricular vagal nerve stimulation-elicited hypotension.

Level of Evidence – Not applicable

IACUC: IPROTO202100000175 to Patrick Ganzer and Vivek Kanumuri at University of Miami