SELECTED ABSTRACTS

POSTER PRESENTATIONS

IN ORDER OF PRESENTATION

158th Annual Meeting
AMERICAN OTOLOGICAL SOCIETY

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

(Oral presentations are Sat/Sun May 17-18)

Evaluation of Spectral Ripple Testing as a Proxy for Speech Discrimination in Audiometric Testing

Heather D. Merkouris, MS; Arun M. Raghavan, MD; Ellise R. Minneker, BS; Gavriel D. Kohlberg MD

Objective: We investigated the hypothesis that spectral ripple discrimination predicts unaided word recognition scores (WRS).

Study Design: Prospective cohort study

Setting: Academic medical center

Patients: 34 English-speaking adult patients with sensorineural hearing loss

Interventions: N/A

Main Outcome Measures: Spectral ripple discrimination was measured in each ear and reported as ripples per octave (RPO).

Results: RPO scores were measured for 64 ears from 34 subjects. RPO scores ranged from 0.2 to 11.7. WRS ranged from 12% to 100%. Seven of eight ears with a WRS ≤60, and 14 of 56 ears with WRS >60 had an RPO of <3. At a cutoff of 3, RPO predicted WRS ≤60 with sensitivity of 87.5% and specificity of 75% (Chi-squared 12.4, DF = 1, $p < 0.001$).

Conclusions: Spectral ripple discrimination testing offers the potential for an efficient, language-independent CIE screening test for non-English-speaking patients. Further studies are warranted to evaluate how RPO thresholds predict aided word and sentence scores and cochlear implant candidacy for both English and non-English speaking patients.

Professional Practice Gap & Educational Need: Unaided WRS is a critical metric for determining if a patient should be referred for a cochlear implant evaluation (CIE). Non-English-speaking patients often do not have a WRS performed during routine audiometric testing, limiting the information available to assess the need for a CIE. Spectral ripple discrimination testing is a non-linguistic test that measures how well an individual can perceive changes in the spectral structure of sound. Evaluating whether a patient has an RPO below a particular cut-off can be performed rapidly.

Learning Objective: To evaluate if spectral ripple testing can reliably predict speech discrimination as defined by WRS.

Desired Result: To provide knowledge and contribute to the investigation of spectral ripple discrimination testing as a non-linguistic tool to screen patients for CIE.

Level of Evidence – Level III

Indicate IRB or IACUC: IRB is STUDY00018670. Approved 9/7/2023.

Contemporary Clinical Management of Otosyphilis: A Case Series for Practicing Otolaryngologist

Corinne A. Pittman, MD; Hudson Liu, BS; Erica Choe, MD; Sandeep Kowkuntla, BS
Michael Hoa, MD; Selena Briggs, MD, MBA, PhD; H. Jeffrey Kim, MD

Objective: Amid the COVID-19 pandemic, U.S. syphilis cases increased by 80% from 2018-2022, including a 17.3% rise in 2022 alone—the highest since 1950. This study describes clinical manifestations, treatments, and hearing outcomes in patients diagnosed with otosyphilis/neurosyphilis over the past 12 years at two tertiary care hospitals in a U.S. city with a 28.6% rise in syphilis since the pandemic.

Study Design: Retrospective case series

Setting: Tertiary care center

Patients: 16 patients diagnosed with otosyphilis or neurosyphilis

Intervention: This study involved reviewing patient charts, audiograms, and serological data to assess treatment outcomes in otosyphilis/neurosyphilis management

Main Outcome Measures: We conducted a retrospective case series from 2011 to 2023 of patients at two tertiary care hospital otolaryngology clinics, presenting with cochleovestibular symptoms and a confirmed diagnosis of otosyphilis or neurosyphilis via treponemal testing.

Results: Subjects included 16 patients (13 males, 3 females) with an average age of 52 years (range, 25 to 79) and 6 (67%) positive for HIV. Symptoms appeared on average 7.5 weeks before diagnosis and included unilateral or bilateral mixed or sensorineural hearing loss, tinnitus, and vertigo. Lumbar puncture diagnosed 7/18 (40%) with otosyphilis/neurosyphilis, with over half receiving 10-14 days of Penicillin G. Two patients were treated with doxycycline as an alternative antibiotic, and others were lost to follow-up. Six patients received at least 2 weeks of corticosteroids, 4 of whom experienced an 8 to 20dB pure tone average improvement in hearing. Following treatment, 62% displayed stable or improved hearing at short and long-term follow-ups, with 31% showing symptom resolution within 3 months.

Conclusions: With rising syphilis rates, early detection and intervention by otolaryngologists, in collaboration with infections disease specialists, are crucial to improve treatment outcomes and address this re-emerging health challenge effectively.

Professional Practice Gap & Educational Need: Despite the dramatic rise in syphilis cases during the COVID-19 pandemic and the increasing incidence of otosyphilis/neurosyphilis, many otolaryngologists may lack current knowledge on evolving clinical presentations, effective treatment options, and expected hearing outcomes. This educational gap necessitates targeted learning to ensure early and effective diagnosis and treatment strategies, which are critical for improving patient outcomes in this evolving health crisis.

Learning Objective: The incidence of syphilis has been steadily increasing through recent years and the COVID-19 pandemic. Otosyphilis is difficult to diagnose due to its wide range of symptoms, but early detection is crucial for treatment and reversal of hearing loss.

Desired Result: Enhance clinical knowledge and improve patient outcomes by providing otolaryngologists with updated insights into the diagnosis, treatment, and management of otosyphilis/neurosyphilis amid increasing infection rates.

Level of Evidence - IV

Indicate IRB or IACUC: MedStar Health/Georgetown University IRB #7531, approved on 6/17/24

RNA-Seq Analysis of Primary Vestibular Schwannoma Shows Focal Adhesion Pathway Involvement in Radiation Resistance

Aida Nourbakhsh, MD, PhD; Olena Bracho, BS; Yan Guo, PhD; Christine T. Dinh, MD

Hypothesis: Radiation-resistant VS upregulate key pathways regulated by merlin to evade cell death.

Background: Vestibular schwannomas (VS) are intracranial tumors caused by a deficiency in the merlin tumor suppressor protein, leading to uncontrolled cell growth through (1) impaired cell-matrix adhesion, (2) actin cytoskeleton destabilization, and (3) dysregulated receptor tyrosine kinase (RTK) signaling. Some VS are resistant to radiation; but the molecular basis for this resistance is unknown.

Methods: Primary VS cultures (n=10) were obtained from fresh tumors collected during VS surgery. Cultures were treated with 0 or 12 Gy of radiation and classified as "radiation-resistant" or "radiation-sensitive" based on 96-hour viability assays. RNA was extracted at 6 hours, and RNA-Seq was conducted using the Illumina TruSeq workflow. The Nextflow RNA-Seq pipeline identified differentially expressed genes and performed Gene Ontology (GO) and KEGG pathway analyses.

Results: Five of ten primary VS were radiation-resistant. Two VS from each radiation response group, matched by age, were selected for RNA-Seq. While samples did not cluster by radiation response, they clustered by radiation dose (0 and 12 Gy), suggesting that differential gene expression related more to radiation response than radiation dose. GO analysis showed enrichment in gene sets linked to cytoskeletal components, RTKs, and growth factor signaling in radiation-resistant VS. KEGG analysis demonstrated enriched pathways involving focal adhesion, actin cytoskeleton, and RTK signaling.

Conclusions: Focal adhesion pathway was found to be the most significantly enriched pathway in radiation resistant tumors. This pathway, similar to merlin signaling, regulates cellular interactions with extracellular matrix, stabilizes actin cytoskeleton, and regulates RTKs. Further investigations into the focal adhesion pathway will provide important insight on the molecular processes that can be targeted to overcome radiation resistance in VS.

Professional Practice Gap & Educational Need: The mechanisms of radiation resistance in VS are not well understood.

Learning Objective: Perform bioinformatic analysis of RNA Sequencing to determine differentially expressed genes

Desired Result: Knowledge of components that regulate merlin signaling pathway will lead to new therapeutics to help overcome radiation resistance in VS.

Level of Evidence – N/A

Indicate IRB or IACUC: University of Miami IRB #20150637.

Radiologic Assessment of the Round Window Anatomy in Pediatric Patients Relevant to Gene Therapy and Inner Ear Drug Delivery

Renata M. Knoll, MD; Soomin Myoung, BSE (presenter); Zachary A. Kons, MD
Katherine Reinshagen, MD; Judith S. Kempfle, MD

Objective: This study aims to radiologically determine the transcanal anatomic angles and variations of the round window (RW) in pediatric patients.

Study Design: Retrospective radiological review.

Setting: Tertiary care center.

Patients: Pediatric patients with normal high-resolution computed tomography scan of the temporal bone.

Interventions: Diagnostic.

Main Outcome Measures: The transcanal angle to the RW membrane, depth, volume and opening angle of the RW niche, and the transcanal RW location relative to the umbo were assessed. The patients were divided into two groups based on age: group 1 (< 24 months) and group 2 (>24 months).

Results: A total of 91 ears from 50 pediatric patients (58% male) were included. The mean age was 37.9±47 months, of which 60 ears (66%) were <24 months. The overall mean transcanal angle to the RW membrane, depth, opening angle, and volume of the RW niche were 98.3±9°, 1.83±0.19 mm, 67.1±5.5°, 3.29±0.79 mm^3, respectively. Depth, volume and opening angle of the RW niche were similar between groups. The transcanal angle to the RW tended to increase with age progression, and was significantly less obtuse for group 1 than group 2 (95.5±1° and 103.8±1.4°, respectively; $p < .0001$). The RW membrane was directed posteroinferiorly relative to the umbo tip, relatively superior compared to the adult RW location from prior literature but did not differ between pediatric subgroups.

Conclusions: Our findings suggest that the transcanal angle to access the RW membrane becomes more obtuse with increasing age while the RW depth and volume remain the same, which may be relevant for surgical planning and future design of novel devices for transcanal gene therapy approaches and inner ear drug delivery in pediatric patients.

Professional Practice Gap & Educational Need: The possibility of treating inner ear disorders through transcanal drug delivery and gene therapy has garnered increased interest. As the RW provides an ideal route for minimally invasive delivery through the external auditory canal (EAC), understanding its anatomy and variations is imperative. However, most studies on the RW anatomy either pertain to adult individuals or focus on features relevant for cochlear implantation through a facial recess approach. Furthermore, known disparities in temporal bone anatomy in children could result in different angles to access the RW, and possibly increased difficulty with transcanal delivery. Therefore, our study informs the morphological variations of the RW anatomy and how it develops with age progression, providing insight for medical therapy development to treat inner ear disorders in the pediatric population.

Learning Objective: To explore the radiological RW anatomic variability in relation the EAC in the pediatric population, relevant for transcanal delivery of novel medical therapies for the treatment of sensorineural hearing loss.

Desired Result: Clinicians will have a better understanding of the pediatric RW anatomical variability relative to the EAC, and allow for better surgical counseling, planning and choice of devices for minimally invasive transcanal delivery of novel medical therapies to restore hearing.

Level of Evidence – III.

Indicate IRB or IACUC: Exempt.

Regeneration of Cochlear Synapses following Intracochlear Delivery of Neurotrophin 3

Renata M. Knoll, MD; Sina Schwinn, BA; Andrea Zhang, MD; Andrew Jung, BS
Brooke Wang, BS; Judith S. Kempfle, MD; David H. Jung, MD, PhD

Hypothesis: Intracochlear injection (ICI) offers an alternative to effectively targeting the cochlea with lower concentration requirement as compared to other methods of delivery.

Background: Synaptic connections between sensory hair cells (HCs) and cochlear primary afferent neurons are vulnerable to noise-induced trauma. Neurotrophin-3 (NT3) has been reported to induce synaptic regeneration when delivered to the round window (RW) niche in mice. However, the drug bioavailability may be limited by multiple factors like membrane permeability and drug distribution within the inner ear. A direct, intracochlear route may overcome these issues by providing direct access to the cochlea and allowing for more precise control over drug delivery.

Methods: We exposed 7-week CBA/CaJ mice to octave-band noise (8-16 kHz) for 2 hours at 98 dB SPL to induce synaptopathy. After 24 hours, mice underwent a single ICI through the RW of 100nL of either artificial perilymph (AP), 5.31 ng/uL or 10.57 ng/uL NT3 at a rate of 200 nL/min. Auditory brainstem responses (ABRs) were recorded 2 weeks after the injection. We evaluated HCs and synaptic ribbons in immunolabeled cochlear whole mount (WM) samples and compared them to those of non-noise-exposed mice (controls).

Results: ABR wave 1 amplitudes were in the normal range after NT3 injection, indicating synaptic regeneration. HCs populations were intact. The mean synaptic counts in both NT3 dose subgroups (5.31 ng/uL or 10.57 ng/uL) were similar to controls ($p=.5824$ and $p=.3909$, respectively), and significantly higher than in the AP only group ($p=.0017$ and $p=.0035$, respectively). Additionally, the mean synaptic counts between dose subgroups were similar ($p>.9999$).

Conclusions: Our findings suggest that low concentration ICI delivery of NT3 efficiently promotes synaptic regeneration in noise-exposed mice.

Professional Practice Gap & Educational Need: Trophic factors, such as NT3, have been reported to induce synaptic regeneration when delivered exogenously, and a variety of methods have been studied to directly introduce them into the cochlea. While delivery of trophic factors at the RW niche has been reported, the drug bioavailability remains a challenge through this method.

Learning Objective: To understand whether ICI is an effective method for enhancing drug delivery efficiency, requiring smaller doses to achieve the desired therapeutic effect.

Desired Result: ICI is a reliable method for delivery to reverse cochlear synapthopathy, and a promising route to study emerging therapeutic compounds for the treatment of inner ear diseases.

Level of Evidence – NA; Basic Science

Indicate IRB or IACUC: Protocol #2021N000079

The Longitudinal Impact of Radiotherapy on Osseointegrated Hearing Aid Outcomes and Complications

Benjamin D. Lovin, MD; Mike Hernandez, MS; Paul W. Gidley, MD; Karine Al Feghali, MD
Jack Phan, MD, PhD; Catherine Wang, MD; Dianna Roberts, PhD; Marc-Elie Nader, MD

Objective: To evaluate the impact of radiotherapy on osseointegrated hearing aids (OIHA) outcomes and complications.

Study Design: Retrospective cohort

Setting: Tertiary referral academic practice

Patients: All percutaneous OIHA performed from 2006 to 2021

Interventions: Evaluation of implant and abutment-related OIHA outcomes and complications stratified by receipt of radiation and dosage. Radiation dosages were calculated at both bone and soft tissue level.

Main Outcome Measures: Abutment, implant, and major complications assessed using the modified Holgers and IPS grading scales.

Results: Total of 190 OIHA were included of which 124 (65%) were placed in irradiated temporal bones. Radiation cohort was older (p=0.002) and more often prior/current smokers (p=0.003). Total of 84 (44%) OIHA experienced at least one complication at mean follow-up of 43.3 months. Radiation cohort had greater rates of having any complication (p=0.032), major complication (p=0.014), implant complication (p=0.007), and abutment complication (p=0.032). When comparing scales, IPS score distribution was significantly different between groups (p=0.011); a similar trend, yet not significant, was found with Holgers classification (p=0.075). Logistic regression identified radiation (p=0.029) and abutment size (p=0.048) as significantly associated with any complication. Notably, every 1mm increase in abutment size decreased the risk of any complication by 11%. There was a trend towards more implant and abutment complications with higher radiation doses (p=0.208 and 0.186, respectively). Cumulative incidence plots demonstrate a greater discrepancy in complication rates between groups as time increases.

Conclusions: Radiation significantly increases the risk of both abutment and implant-related OIHA complications, particularly in the long-term. The IPS grading scale may be more sensitive to detecting differences in complication rates. Increasing the abutment size and decreasing radiation dosages may decrease the risk of complication.

Professional Practice Gap & Educational Need: There is a paucity of literature on long-term evaluation of OIHA complications, particularly after radiation. This data may prove helpful in patient counseling before percutaneous OIHA or when considering alternatives, such as non-operative bone conduction technology or transcutaneous devices. There has also not been prior comparison of OIHA complication grading scales.

Learning Objective: The rate of OIHA complications is significant in long-term follow up and appears potentiated by radiation. IPS grading scale may be more helpful in identifying these complications. Using a longer abutment or decreasing radiation dosage may reduce risk of complications.

Desired Result: Thoughtful implantation and follow up of patients with OIHA and a history of temporal bone irradiation.

Level of Evidence – III

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

Intraoperative Continuous Electrocochleography in Cochlear Implant Surgery Using Slim Perimodiolar Electrodes

Allen Khudaverdyan, BA; Justin Cottrell, MD; Emily Kay-Rivest, MD; David Friedmann, MD
Daniel Jethanamest, MD; Sean McMenomey, MD; J. Thomas Roland Jr., MD

Objective: To explore the use of electrocochleography (ECochG) during cochlear implant (CI) surgery utilizing a slim perimodiolar electrode.

Study Design: Retrospective chart review

Setting: Single institution academic hospital

Patients: Patients who underwent cochlear implantation (CI) and intraoperative ECochG.

Interventions: Continuous ECochG recording at 250Hz stimulation frequency using Cochlear Research Platform 1.2.1

Main Outcome Measures: Final insertion cochlear microphonic (CM) and 3-month post-operative CNC word score. Hearing preservation rates were also evaluated for patients with pre-operative residual hearing.

Results: Fourteen patients (6 male, 8 female, mean age 55.8) had mean pre and 3-month postoperative CNC word scores of 14.4% (SD = 23%) and 57.7% (SD = 23%), respectively (p=0.0004*). The mean change in CNC word scores at 3 months was 43.46% (SD = 25). Thirteen patients had idiopathic hearing loss, with four undergoing unilateral implantation for single-sided deafness. The mean peak and final insertion CM were 24.25 μV and 16.8 μV respectively. Area under the curve (AUC) of the root mean square of CM was 1225 Volt-sec. The AUC of F0 Fast Fourier transform of CM curve was 1167 Volt-sec. Hearing preservation and 3-month postoperative CNC word scores are reported in conjunction with final CM measurements.

Conclusions: ECochG utilizing perimodiolar electrodes has been reported upon less than straight electrodes. Our results reinforce the feasibility of ECochG in the setting of perimodiolar insertion, although how this data might inform a real time change in surgical technique remains uncertain.

Professional Practice Gap & Educational Need: Understanding the clinical utility of ECochG utilizing perimodiolar electrodes.

Learning Objective: Evaluate the use of electrocochleography tracing features to predict hearing preservation and CNC outcomes following perimodiolar electrode insertion.

Desired Result: To add to the growing literature of perimodiolar electrode ECochG use to reinforce feasibility and clinical utility.

Level of Evidence – V

IRB: s24-00530, NYU Langone Health

Musical Perception and Enjoyment in Cochlear Implant Users

Richa S. Nathan, BS; Christopher R. Cai, BA; Julie Hanson, AuD; Nathan C. Tu, MD

Objective: To examine the effects of cochlear implantation on musical perception and enjoyment at least 9 months postoperatively, focusing on user experiences.

Study Design: Descriptive survey study

Setting: Outpatient Audiology Clinic at a tertiary Medical Center

Patients: Adult cochlear implant (CI) users (ages 18 and older) at least 9 months postoperatively. Exclusion criteria include significant cognitive impairment, psychiatric disorders, less than 9 months of CI use, and non-English speakers.

Interventions: Qualtrics survey administration via survey link or QR code

Main Outcome Measures: Qualitative survey data

Results: Current survey responses (n=23) reflect a population of 43% male and 57% female participants, with 39% having bilateral CIs, 39% in the right ear only, and 22% in the left ear only. Time since implantation ranges from 9 months to 40 years. Most participants (57%) listen to music daily, but 61% report no formal musical training while 10% have professional musical backgrounds. Notably, 58% reported diminished musical enjoyment compared to pre-implantation, while 38% noted an improvement. 78% reported equal or improved enjoyment compared to initial experiences post-implantation, though still below pre-implantation levels. Participants found lyrics to be the most challenging aspect of musical perception, followed by timbre, pitch, harmony, melody, and rhythm. Pop/rock was the most enjoyable genre, while classical music was rated least enjoyable. Regarding sound quality, pop/rock was also rated most pleasant, with classical music deemed the most unpleasant. 48% described their music perception as “somewhat unnatural” compared to what would be expected with normal hearing and 53% found streaming music equally or more enjoyable than pre-implantation. Participants expressed a desire for clearer lyrics, better high-pitch clarity, improved note recognition, and accurate pitch perception.

Conclusions: CIs significantly impact musical perception and enjoyment of users, with many reporting challenges in specific musical elements such as lyrics and pitch. While most participants experienced some improvement in their enjoyment of music compared to their initial post-implantation experience, it often did not reach pre-implantation levels. The findings highlight the need for enhanced auditory training and technological advancements to support music listening for cochlear implant users.

Professional Practice Gap & Educational Need: Despite the widespread use of CIs, there is limited understanding of how they affect musical perception and enjoyment. Audiologists and otolaryngologists must be aware of the specific challenges faced by users to better inform and guide their patients post-operatively.

Learning Objective: To understand the effects of CIs on musical perception and enjoyment, and to identify areas where patients may require additional support to improve their music listening experience and quality of life.

Desired Result: To foster greater awareness among healthcare professionals about the unique challenges faced by CI users and to promote the development of targeted interventions and technological advancements to enhance musical enjoyment and perception.

Level of Evidence - V

Indicate IRB or IACUC: Exempt

Repair of Partial Ossicular Discontinuity Restores High Frequency Middle Ear Function: A Basic Science and Clinical Correlation

Keelin A. Fallon, BA; Jeffrey T. Cheng, PhD; Aaron K. Remenschneider MD, MPH

Hypothesis: We expect repair of partial ossicular discontinuity in cadaveric temporal bones (TB) with bone cement to restore stapes velocity to baseline levels. Clinically, we expect to see improvement in high frequency conductive hearing loss (HFCHL) after surgical repair of partial ossicular discontinuity.

Background: In cadaveric TB, partial ossicular discontinuity results in a decrease in stapes velocity, primarily at HFs (>4 kHz). Clinically, this manifests as a HFCHL. The impact of joint reestablishment on HF hearing has not been widely studied.

Methods: Five, fresh, previously frozen human TBs from donors with no known history of ear disease were used to study the mechanical effects of partial ossicular discontinuity before and after repair, using dual laser Doppler vibrometry to measure stapes and umbo velocities. Results were correlated with audiometric outcomes of two patients who underwent endoscopic repair of surgically confirmed partial ossicular joint disarticulation with bone cement.

Results: Experimentally, partial joint disarticulation produced a decrease in stapes velocity by an order of magnitude beginning between 2-3kHz and primarily recorded between 4-20kHz. Repair with bone cement restored stapes velocity to baseline levels across frequencies. Clinically, both patients presented with a 4kHz air bone gap (ABG) ≥25dB, and evidence of a hypercompliant middle ear on tympanometry. Postoperatively the 4kHz ABG closed by ≥25dB, completely closing the ABG for one patient. Air conduction thresholds improved between 6-8kHz, and tympanometry normalized.

Conclusions: Partial ossicular discontinuity repair with bone cement can restore HF ossicular function and audiometric outcomes, suggesting some HF hearing losses are surgically correctable.

Professional Practice Gaps and Educational Needs: Our understanding of the impact of partial ossicular discontinuity repair on high frequency ossicular function and audiometric outcomes remains poor. There is a need to understand how joint reestablishment influences the mechanics of the middle ear and how this relates to clinical outcomes.

Learning Objectives: To study the mechanical effects of partial ossicular discontinuity and repair in cadaveric temporal bones, and correlate outcomes with clinical cases of surgically repaired partial ossicular discontinuity.

Desired Result: Repair of partial ossicular discontinuity experimentally and clinically with a hard drying substance will result in restoration of middle ear function and therefore audiometric outcomes, which may warrant further evaluation of high frequency conductive hearing loss in patients as it may be surgically correctable.

Level of Evidence: V

IRB: UMass Chan Medical School #H00020062

Acute Complicated Mastoiditis Risk Factors and Presentation in National Emergency Departments

Lisa Zhang, MD; Robert J. Macielak, MD; Oliver F. Adunka, MD; Yin Ren, MD, PhD

Objective: To determine patient and hospital risk factors for acute complicated mastoiditis

Study Design/Setting: Retrospective review of the National Emergency Department Sample (NEDS) database from 2020-2021

Patients: A total of 1,351 (86%) patients presented with a primary diagnosis of acute mastoiditis without complications (H70.00x) and 226 (14%) patients with acute complicated mastoiditis (H70.01x, H70.8x, H70.09x, H70.2x). Patient demographics and hospital characteristics were included.

Main Outcome Measures: Patient disposition and hospital characteristics for those diagnosed with acute mastoiditis with and without complications.

Results: Patients diagnosed with acute complicated mastoiditis were younger (31.0 [SD 26] vs 40.3 [SD 23.6] years, $p<0.0001$), with twice as many pediatric patients (40% vs 20%, $p<0.001$). These patients were significantly more likely to be admitted (70% vs 56%, $p<0.0001$) and had longer lengths of stay (7 vs 3.7 days, $p<0.001$). One patient diagnosed with complicated mastoiditis died during their inpatient stay (1% vs 0%, $p=0.04$). There were no differences in rates of discharge home following inpatient admission between the cohorts ($p>0.05$). Multivariable logistic regression with all patient demographics demonstrated age to still be significantly predictive of mastoiditis with complications (OR 0.98 [0.976-0.988]). Trauma and teaching hospitals had significantly higher rates of acute complicated mastoiditis (20% vs 9%, $p<0.001$; 15% vs 9%, $p=0.04$, respectively). Complicated mastoiditis patients had higher inpatient ($59,362 vs $25,968, $p<0.001$) and total hospitalization costs ($98,329 vs $43,666, $p<0.001$). The most common associated diagnoses with complicated mastoiditis included suspected coronavirus-19 (COVID-19) infection (20%), hypertension (18%), nicotine dependence (16%), and type 2 diabetes mellitus (12%).

Conclusions: Younger age is the most predictive patient factor for acute complicated mastoiditis. Higher rates of diagnosis at trauma and teaching hospitals may be due to a higher index of suspicion and access to resources.

Professional Practice Gap & Educational Need: To identify patient and hospital risk factors associated with acute complicated mastoiditis in emergency departments on the national level.

Learning Objective: Learners should be able to identify the most predictive risk factor for complications associated with acute mastoiditis.

Desired Result: We hope to improve awareness for increased risk of complications associated with acute mastoiditis in the younger population, especially in pediatric patients.

Level of Evidence - NA

Indicate IRB or IACUC: Exempt

Standardized Cognition Scores Predict Performance on an Auditory Working Memory Task

Nathan G. Sattah, BA; Sherri L. Smith, AuD, PhD; Erin Hernon, AuD
Hannah Martin, MD; Kristal M. Riska, AuD, PhD

Objective: Investigate the relation between cognitive function and performance on an auditory working memory task in older adults with hearing loss.

Study Design: Prospective cohort study.

Setting: Single-institutional, academic center.

Patients: Patients aged 60 or older diagnosed with sensorineural hearing loss (ICD-10 codes H90.3, H90.5, H91.1).

Interventions: National Institute of Health Toolbox Cognition Battery (NIHTCB), abbreviated Word Auditory Recognition and Recall Measure (aWARRM).

Main Outcome Measures: NIHTCB age-adjusted standard scores, aWARRM recall score.

Results: 66 participants were included (43 (65.2%) females, mean age of 71.2 ± 5.9 years, mean pure tone average of 27.9 ± 6.4 dB HL). The mean NIHTCB age-adjusted standard score was 106.4 ± 13.1 and the mean aWARRM recall score as 63.6% ± 13.6%.

Higher aWARRM recall scores were significantly correlated with higher picture vocabulary ($r = 0.30$, $p < 0.05$), oral reading recognition ($r = 0.28$, $p < 0.05$), list sorting working memory ($r = 0.42$, $p < 0.01$), picture sequence memory ($r = 0.29$, $p < 0.05$), and total composite scores ($r = 0.43$, $p < 0.01$). Linear regression adjusting for sex, race, and hearing level demonstrated that higher performance on list sorting working memory ($F = 2.502$, $p < 0.05$) and higher total composite scores ($F = 3.122$, $p = 0.01$) were independently associated with higher aWARRM recall scores.

Conclusions: Auditory working memory is positively correlated with standardized measures of receptive and expressive language, as well as episodic and working memory. Performance on a visual-and-auditory list sorting working memory task and on the NIHTCB overall predicted performance on an auditory-only working memory task in older adults with hearing loss. These results may provide additional construct validity to the use of the aWARRM as a measure of auditory working memory.

Professional Practice Gap & Educational Need: The aWARRM is a useful tool for evaluating auditory working memory in older adults with hearing loss, but research is needed to compare performance on this task with other measures of cognition in order to assess its potential for clinical use.

Learning Objective: Understand the association and impact of cognition on an auditory working memory task, specifically in adults with hearing loss.

Desired Result: Demonstrate that scores on a validated cognition battery are correlated with and predictive of scores on an auditory working memory task.

Level of Evidence – Level III.

Indicate IRB or IACUC: Approved. Duke Health IRB, Pro00113750.

Seasonal Variation in Autoimmune Inner Ear Disease: A Preliminary Study

Sriprachodaya Gaddam, BS; Adam Gardi, BS; Philip Maxwell, MD; Robert T. Sataloff, MD, DMA

Objective: To determine whether there is seasonal variation in the audiogram data of patients with autoimmune inner ear disease (AIED).

Study design: Retrospective chart review.

Setting: Academic.

Patients: 141 adult patients with a diagnosis of AIED from January 2010 to June 2023 were included.

Intervention: Audiometry.

Main outcome measures: For patients' better- and worse- hearing ears, as defined by audiogram metrics, pure tone average (PTA), high-frequency PTA (HFPTA), low-frequency PTA (LFPTA), and average word discrimination score (WDS) were calculated for each season.

Results: For better-hearing ears, PTA was worse in the summer compared to the winter ($p = 0.04$), HFPTA in the spring and summer was worse than in the winter ($p = 0.047$ and $p = 0.03$, respectively) and LFPTA in spring ($p = 0.04$) and summer (0.04) was worse than in the winter. For worse-hearing ears, only LFPTA was worse in the spring ($p = 0.01$), summer ($p = 0.0003$), and autumn ($p = 0.005$) than the winter. WDS showed no significant differences across seasons. However, more patients were found to have "flares," sudden decreases in hearing or increases in subjective symptoms, as indicated by patient complaints and prednisone prescriptions, in the winter compared with other seasons. Control patients showed no seasonal variation. Paired t-tests, repeated measures ANOVA, and Bonferroni post-hoc tests were used.

Conclusion: AIED audiogram changes and flares may be influenced by complex interactions between environmental factors. The implications of seasonal factors as a consideration in the symptoms and treatment of AIED warrant further study.

Professional Practice Gap & Educational Need: The pathogenesis of AIED is currently unclear. However, its characterization as an autoimmune disease suggests that environmental factors could influence clinical status as previous studies have shown seasonality in other autoimmune conditions (multiple sclerosis, systemic lupus erythematosus, rheumatoid arthritis). Hearing fluctuations in AIED may be influenced by seasonality. Evidence of a seasonal association may lead to better understanding of AIED flares and subsequent advancements in evaluation and treatment.

Learning Objective: To determine whether there is seasonal variation in the onset, progression, severity, and treatment response of AIED.

Desired Result: Enhance our understanding of the seasonality of AIED.

Level of Evidence – Level IV

Indicate IRB or IACUC: Exempt, Protocol Number 2303009771, Drexel University College of Medicine (Exemption Granted 3/22/2023)

Patient-Reported Outcomes after Cochlear Implantation in U.S. Military Veterans

Douglas J. Totten, MD, MBA; Hunter L. Elms, MD; Abdul Saltagi, MD; Karen Libich, AuD
David B. Pisoni, PhD; Evan C. Cumpston, MD; Rick F. Nelson, MD, PhD

Objective: To assess patient-reported hearing outcomes in United States Military Veterans after cochlear implantation

Study Design: Retrospective review

Setting: Tertiary VA Medical Center

Patients: U.S. Military Veterans receiving cochlear implantation from May 2019 through March 2024

Interventions: Cochlear implantation, audiologic rehabilitation

Main Outcome Measures: Measures included pre-operative and six month post-operative 12 item Speech, Spatial, and Qualities of Hearing Scale (SSQ12) responses, 12 month post-operative International Outcome Inventory for Hearing Aids modified for Cochlear Implantation (IOI-CI) responses, and 12 month CI usage. Change in scores were assessed with Student's T-test. CI usage was also assessed. SSQ12 and IOI-CI responses were also compared to AzBio sentence and CNC word scores.

Results: 75 U.S. Military Veterans (89 ears) were implanted from May 2019 through March 2024. All patients were male, average age at implantation was 74 (standard deviation 9) years, and 73 (97%) patients were white. Average pre-operative SSQ12 score was 3.5 (2.0) while SSQ12 average was 6.1 (1.9) six months postoperatively. Mean IOI-CI score 12 months postoperatively was 29 (4) out of a maximum of 35. Patients used CIs at an average of 12 (4) hours daily 12 months after implantation. There was little correlation between 6 month SSQ12 and AzBio sentence scores (R-squared=0.10) or CNC word scores (R^2=0.06) or between 12 month IOI-CI scores and AzBio sentence scores (R^2=0.004) or CNC word scores (R^2=0.006).

Conclusions: U.S. Military Veterans report subjective CI benefit in addition to previously-documented improvement in objective scores. SSQ12 scores increase as expected six months after cochlear implantation. Both SSQ12 and IOI-CI scores indicate good subjective outcomes in these patients. Subjective outcomes do not necessarily correlate with objective audiometric testing in this population.

Professional Practice Gap & Educational Need: U.S. Military Veterans historically have had limited access to cochlear implantation. Furthermore, few studies have examined CI outcomes in this population. Even fewer have examined subjective patient outcomes. This study shows that U.S. Military Veterans derive substantial subjective benefit from CI and that this benefit is not necessarily correlated with objective outcomes.

Learning Objective: U.S. Military Veterans report subjective benefit after cochlear implantation

Desired Result: U.S. Military Veterans have improvement in subjective hearing outcomes after cochlear implantation

Level of Evidence – Level IV

Indicate IRB or IACUC: Richard L. Roudebush VA Medical Center IRB # 13588 (Approved 11/30/2021)

Temporal Trends, Regionalization, and Total Cost Analysis of Meniere's Disease Management in the United States

Ayush G. Iyer, BS; Rance J. T. Fujiwara, MD, MBA; Walter Kutz, MD

Objective: This study aims to describe patient demographics and to analyze how regionalization of care to academic centers, total admissions costs, and procedural trends in the inpatient management of Meniere's disease (MD) changed from 2002-2021.

Study Design: Cross-sectional analysis

Setting: National Inpatient Sample, 2002-2021

Patients: 30,838 inpatient admissions with a primary diagnosis of Meniere's disease

Interventions: Rates of admission and total inflation-adjusted admission cost trends stratified by academic vs. nonacademic regionalization, rates of patients undergoing endolymphatic sac decompression (ESD) vs. other inner ear procedure (labyrinthectomies, vestibular nerve sections, etc.)

Main Outcome Measures: Patient- and hospital-level characteristics of inpatient MD admissions were first described and subsequently used as covariates to perform a multivariate regression analysis, gauging their association with total adjusted admission cost and length of stay. Adjusted total admissions costs and rates of procedures additionally plotted temporally.

Results: The majority of patients were white (61.6% [SE = 1.4%]), female (66.9% [SE = 0.7%]), above the age of 65 (55.0% [SE = 1.0%]), and had an Elixhauser comorbidity index of 0-1 (49.3% [SE = 0.7%]). There was a significant decrease in the weighted number of admissions for Meniere's disease from 2503 (SE = 378.3) in 2002 to 640 (SE = 64.9) in 2021. Starting in 2012, there was a noticeable decline in admission to non-academic centers, with 72.8% (SE 4.6%) of admissions to academic centers in 2021. Adjusted admissions cost appeared to increase independent of the teaching status of the hospital (b = 35.35 USD [30.91, 39.58], $p < 0.001$ for academic and b = 67.84 USD [64.17, 71.51], $p < 0.001$ for nonacademic). While the proportions of patients receiving an ESD stayed relatively the same throughout the study period, there was a decrease in all other inner ear procedures from 17.38% (SE = 10.1%) in 2002 to 6.25% (SE = 2.3%) in 2021. It was found that patients between 40 and 65 (b = 6610.75 USD [487.00, 12734.51], p = 0.03), admission to hospitals in the southern United States (b = 2360.17 USD [692.71, 4027.64], p = 0.01, and other inner ear procedures (b = 5491.10 USD [714.22, 10267.99], p = 0.02) were significantly associated with higher admission costs. Patients who received ESDs were predicted to have shorter admissions (b = -0.782 days [-1.197, -0.367], $p < 0.001$).

Conclusions: There was a significant decrease in total Meniere's disease admissions. In conjunction, there was an overall increase in regionalization to academic hospitals. When these trends are taken in the context of an observed increase in inflation-adjusted admissions cost over time, it is vital that future endeavors be focused on analyzing resource allocation and overall cost-drivers in the management of Meniere's disease.

Professional Practice Gap & Educational Need: There is a paucity of epidemiological data in regard to MD management patterns over a prolonged period of time. This study aims to shed light on how national practice patterns have changed over time to better inform MD management guidelines.

Learning Objective: Determine regionalization, total admissions cost, and procedural trends in the inpatient management of MD

Desired Result: Attendees should understand that MD care is becoming increasingly specialized and that this may be associated with the general shift away from more destructive surgical management methods and rising admissions costs.

Level of Evidence: Level V

Indicate IRB or IACUC: Exempt

Utility of Intrathecal Fluorescein in Transmastoid Repair of Temporal Encephaloceles

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

Objective: To evaluate preoperative fluorescein utility for transmastoid repair of lateral skull base encephaloceles and identify predictors for fluorescein identification intraoperatively.

Study Design: Retrospective case-control study of patients before and after implementing routine intrathecal fluorescein administration for transmastoid encephalocele repairs.

Setting: Single academic medical center

Patients: Consecutive patients with temporal lobe encephaloceles repaired via transmastoid approach from October 2012 to October 2024.

Interventions: Electronic medical records of qualifying patients were searched for relevant demographics, diagnostic workup, disease characteristics (defect number, size, and location), and intraoperative and postoperative outcomes. Analysis incorporated the independent t-test, Mann-Whitney U test, and Fischer's exact test.

Main Outcome Measures: Intraoperative fluorescein identification; fluorescein complications; encephalocele recurrence rates.

Results: 38 patients met inclusion criteria. Mean age was 59.8 years old (SD 11.9 years), and 23 (60.5%) patients were female. Mean BMI was 35.8 kg/m^2 (SD 8.7 kg/m^2). Fluorescein was administered in 12 cases (31.6%) and intraoperatively detected in 6 (50%). Tegmen defects were identified in all cases. The most common fluorescein dose was 10 mg. No intraoperative or immediate postoperative complications were associated with fluorescein administration. There was no significant difference in recurrence rates between patients who received and did not receive intrathecal fluorescein (0% vs 11.5%, p=0.54). There were no significant differences in gender, BMI, or defect location, size, or number on the likelihood of fluorescein identification intraoperatively.

Conclusions: Routine preoperative intrathecal fluorescein administration does not appear to improve recurrence rates for transmastoid repair of lateral encephaloceles, but given its relatively safe risk profile, it can supplement the identification of the leak source in many cases. Higher-powered studies are warranted to explore its utility in specific circumstances, such as multiple defects or revision surgeries.

Professional Practice Gap & Educational Need: Given the potentially serious complications and quality of life concerns related to unrepaired encephaloceles, continued empiric review of the safety and efficacy of adjunctive surgical techniques, such as fluorescein administration, is critical to improving patient safety, surgical outcomes, and quality of care.

Learning Objective: 1) Assess the safety and efficacy of fluorescein administration during transmastoid repair of temporal lobe encephaloceles and 2) recognize patients who may benefit from intraoperative fluorescein administration.

Desired Result: Refinement of the transmastoid approach to temporal lobe encephalocele repair with regards to the potential incorporation of fluorescein based on patient and disease characteristics.

Level of Evidence: IV – Retrospective case-control study

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

Increased Risk of Cerebrovascular Accident After Sudden Sensorineural Hearing Loss

Mihai Bentan, BS; Daniel Long, MD; Lawrance Lee, MD; Brendon K. Warner, MD
Arman Saeedi, MPH; Nauman F. Manzoor, MD

Objective: To analyze increased risk of subsequent cerebrovascular accident (CVA) after sudden sensorineural hearing loss (SNHL) event.

Study Design: Cohort analysis using aggregate data from TriNetX Research Network.

Setting: TriNetX Research Network

Patients: Patients diagnosed with either ICD-10 code H91.2 (sudden idiopathic hearing loss) or ICD-10 code H83.0 (labyrinthitis) with subsequent development of ICD-10 codes: I60-I63 (CVA) compared to development of CVA in cohorts without diagnosis of hearing loss and cohorts with diagnosis of non-sudden SNHL (ICD-10 codes H90.3, H90.4, H90.5).

Main Outcome Measures: Absolute risk (AR) and relative risk (RR) of experiencing a CVA (defined by ICD-10 codes I60-I63).

Results: After propensity score matching, a total of 183,178 patients were analyzed to compare the impact of sudden SNHL on the risk of CVA compared to a cohort with no hearing loss. The sudden SNHL cohort demonstrated a significantly higher risk of CVA (3.65%) compared to the control (2.63%, AR: 1.02, 95% Confidence Interval [CI] 0.86-1.18, $p<0.05$) with RR of 1.39 (95% CI 1.32-1.46, $p<0.05$). Similarly, after propensity score matching, a total of 264,974 patients were analyzed to compare the impact of sudden SNHL on the risk of CVA against patients with non-sudden SNHL. The sudden SNHL cohort demonstrated a significantly higher risk of CVA (4.87%) compared to the non-sudden SNHL cohort (2.80%, AR: 2.06, 95% CI 1.92-2.21, $p<0.05$) with RR of 1.74 (95% CI 1.67-1.81, $p<0.05$).

Conclusion: Sudden SNHL confers a higher risk of subsequent CVA compared to patients with non-sudden SNHL as well as patients without diagnosis of hearing loss. Further prospective studies are needed to delineate this finding as a risk factor for CVA.

Professional Practice Gap & Educational Need: Professionals need to identify a higher likelihood of subsequent CVA in patients with SSNHL. This has implications for risk stratification and referrals for optimal preventative strategies.

Learning Objective: Understand higher risk of subsequent CVA after a SSNHL event.

Desired Result: Highlight need for identification and further investigation of SSNHL as a risk factor for CVA

Level of Evidence: Level III

Indicate IRB or IACUC: Exempt

Comparing Cochlear Implant Quality of Life Outcomes in Patients Who Qualify in Quiet vs Noise

Amy L. Ho, BA; Donald Tan, MD; Rance J.T. Fujiwara, MD, MBA
J. Walter Kutz, MD; Jacob B. Hunter, MD

Objective: To assess differences in improvements in Cochlear Implant Quality of Life-35 Profile scores for patients who qualify in quiet versus in noise only.

Study Design: Retrospective cohort study

Setting: Tertiary academic institution

Patients: 91 cochlear implant patients with peri-operative CIQOL-35 surveys

Interventions: Cochlear implantation

Main Outcome Measures: Pre-operative and post-operative CIQOL surveys were administered to patients at the time of their initial CI evaluation, as well as subsequent follow-up appointments. Patients with preoperative AzBio <60% only in multitalker babble comprised the noise-qualifying group and were compared to those with AzBio in Quiet <60%.

Results: Of 91 patients undergoing cochlear implantation, 57 patients completed pre- and post-operative surveys. 74 qualified in quiet, while 17 qualified in noise only. The mean age of the quiet- and noise-qualifying groups was 64.8 years (SD 15.8) and 69.0 years (SD 10.1), respectively. No statistically significant differences in mean CIQOL-10 global scores or the six CIQOL domains were appreciated between the quiet- and noise-qualifying groups, either preoperatively or postoperatively. Baseline preoperative CIQOL-10 global scores in the quiet- and noise-qualifying groups were 38.2 (SD 10.3) and 39.0 (SD 6.4). Post-operative mean CIQOL-10 global score was lower in patients who only qualified in noise, 43.6 (SD 5.6) versus 47.3 (SD 10.6) but did not meet statistical significance (p=0.19). Amongst patients with pre- and post-operative data (n=57), there was a significant increase in correlated samples CIQOL with a mean difference of 8.5 (p <.0001). There were no statistically significant predictors of change in CIQOL after CI on multivariate analysis. Relative to the noise-qualifying group (n=7), patients in the quiet-qualifying group (n=50) experienced greater increases in emotional (b=9.3 [95% CI -8.4 to 27.1]), environmental (b=8.8 [95% CI -12.8 to 30.4]), and social (b=12.7 [95% CI -5.7 to 31.2]) domains, though these differences were not statistically significant. Patients in the noise-qualifying group experienced a greater though nonsignificant increase in listening effort (b=10.9 [95% CI -6.2 to 28.0], p=0.2).

Conclusions: Decision to proceed with CI was associated with increased CI specific quality of life, and the benefit was not different in patients who qualified in quiet versus those who only qualified in noise.

Professional Practice Gap & Educational Need: This study assessed whether patients qualifying in quiet vs. noise-only conditions for cochlear implantation had differences in their improvements in patient-reported qualify of life measures.

Learning Objective: To investigate the patient reported quality of life outcomes for cochlear implant candidates who do not qualify in the quiet setting.

Desired Result: To improve patient counseling on expected outcomes with CI.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Evaluating Optimal Bone-Anchored Hearing Aid Placement Using 3D-Modeling Software

Jason K. Adams, MD; Maura K. Cosetti, MD; George Wanna, MD, MHCM
Zachary G. Schwam, MD; Enrique Perez, MD

Objective: There has been limited evaluation of the utility of 3D-modeling software in determining optimal bone-anchored hearing aid (BAHA) implant placement, especially in BAHA implants that employ a floating-mass transducer. This study sought to assess surgeon preferred BAHA implant location using 3D-modeling software in patients that have previously undergone BAHA implant surgery.

Study Design: Retrospective cohort study

Setting: Tertiary, specialty clinic

Patients: Adults or children with prior transcutaneous bone-anchored hearing aid (BAHA) implantation with floating mass transducer and pre-operative computed tomography scan

Interventions: Three-dimensional modeling with placement of BAHA

Main Outcome Measures: Preferred and possible BAHA locations

Results: 29 patients (mean age 44, range 8-74, n=17 female, n=12 left side, n=11 prior ipsilateral mastoid surgery) underwent BAHA implant with 19 (65.5%) in the mastoid, 10 (34.4%) in the retrosigmoid space, and none overlying the middle cranial fossa. Using 3D-modeling software, three independent reviewers' preferred location matched to surgical placement in 72.6% of cases. When asked to identify possible appropriate locations these reviewers matched to surgical placement in 95.2% of cases. Inter-rater reliability (IRR) amongst reviewers for preferred location was minimal (Kappa (κ) = 0.286, $p<0.0001$) whereas possible placement location was substantial ($\kappa=0.795$, $p<0.0001$). Notably, 37% of actual cases used lifts, 31% had sigmoid exposure, and 34% had dural exposure. In reviewer preferred placement, rates of lift use, sigmoid exposure, and dural exposure were 8%, 5%, and 6% respectively.

Conclusions: IRR for possible BAHA location agreement was substantial with a percent correct rate of 95.2%. 3D-modeling software is useful in identifying preferred BAHA implant locations that minimize use of lifts, or exposure of the sigmoid or dura. Further research is needed to prospectively study whether 3D-modeling software can be used preoperatively to accurately determine optimal implant location.

Professional Practice Gap & Educational Need: The role of 3D-modeling software prior to BAHA has not been well established within the field of otology.

Learning Objective: Learners will recognize the utility of evaluating BAHA implant location using 3D-modeling software.

Desired Result: Improve understanding of the role of 3D-modeling software in evaluation of patients undergoing BAHA implant surgery.

Level of Evidence – Level IV

Indicate IRB or IACUC: Icahn School of Medicine at Mount Sinai IRB, 23-01194

Real-World Analysis of Meniere Disease: Treatment Patterns, Surgical Trends, and Associated Comorbidities Using TriNetX Data

Huseyin Isildak, MD

Objective: This study addresses four key questions about Meniere disease (MD) utilizing TriNetX data:

1. What are the most used medications for patients with MD?
2. Which otologic surgeries are most frequently performed?
3. Are there demographic differences between surgical and non-surgical patients?
4. What are the common comorbidities associated with MD?

Study Design: Retrospective analysis using TriNetX, a global network of healthcare organizations.

Setting: Academic and non-academic.

Patients: Patients with MD (ICD-10 CM, H81.0-9).

Interventions: N/A

Main Outcome Measures: This retrospective analysis of Meniere patients highlights key medical treatments, surgeries, demographic differences, and associated comorbidities.

Results: A total of 117,059 patients were identified (F: 60.91%, M: 34.97%). The most common medications used for Meniere disease included steroids (64%), benzodiazepines (55%), diuretics (52%), and antacids (49%). Surgical interventions comprised cochlear implantation (1,314 pts, 1%), endolymphatic sac operation (1,219 pts, 1%), labyrinthectomy (407 pts, 0.3%), and vestibular nerve section (138 pts, 0.1%). Demographically, 34.62% of non-surgical patients were male compared to 44.29% of surgical patients, and 8.29% of non-surgical patients were Asian, while only 1.55% of surgical patients were Asian. Common comorbidities included musculoskeletal disorders (69%), metabolic disorders (56%), hypertension (50%), anxiety/depression (48%), GER (35%), sleep disorders (28%), thyroid disorders (25%), vasomotor/allergic rhinitis (22%), DM (20%), migraine (19%), asthma (15%), and melanoma (6%).
Conclusions: Corticosteroids, benzodiazepines, and diuretics were the most prescribed in patients with MD. Nearly half of the patients also used antacids or gastric medications. Cochlear implantation and endolymphatic sac surgery were the most frequent surgical interventions. Surgical patients had a higher percentage of males and a lower percentage of Asians compared to non-surgical patients. Comorbidities noted as musculoskeletal, metabolic, mental health, and hypertensive. Additionally, GER, sleep disorders, and thyroid disorders were prevalent.

Professional Practice Gap & Educational Need: Even though there are recent practice guidelines for Meniere's disease, there is no standardized treatment for the condition. Additionally, there is a need to recognize the associated comorbidities in Meniere patients. Some of these comorbidities, or the medications used for them, may shed light on better understanding the disease through a cause-and-effect relationship.

Learning Objective: To identify the most common medical treatments and surgical procedures for Meniere disease, and to explore demographic differences between surgical and non-surgical patients. This study also aims to examine the comorbidities frequently associated with Meniere disease.

Desired Result: By recognizing the demographic patterns in surgical and non-surgical patients and understanding the common comorbidities associated with Meniere's disease, we may gain valuable insights into the disease through a cause-and-effect relationship.

Level of Evidence - Level IV

Indicate IRB or IACUC: Exempt.

Predictive Factors for Facial Nerve Palsy in Malignant Otitis Externa Using TriNetX Data

Huseyin Isildak, MD

Objective: This study aims to determine whether gender, ethnicity, biochemical markers, and comorbidities are predictive factors for facial nerve palsy (FNP) in patients with malignant otitis externa (MOE).

Study Design: Retrospective analysis using TriNetX.

Setting: Academic and non-academic.

Patients: A total of 12,751 patients with MOE (F:48.91%, M:46.88%; 68.8% not Hispanic or Latino (H/L), 13.02% H/L) and 719 patients with MOE and FNP (F:35.05%, M:62.86%; 67.74% Not H/L, 17.66% H/L).

Interventions: N/A

Main Outcome Measures: This study examines the predictive factors for FNP, including demographics, biochemical markers and comorbidities.

Results: Statistical analyses revealed a significant association between male and FNP ($p \approx 4.65e\text{-}15$). 13.02% of the MOE-only group were H/L, compared to 17.66% in the MOE and FNP group, indicating a significant association (z-score = 3.19, $p = 0.0014$. Additionally, biochemical markers such as calcium, creatinine, glucose, urea nitrogen, albumin, aPTT, iron, ESR, and lactate were identified as statistically significant, with albumin and urea nitrogen emerging as the most notable ($p < 10^{-32}$). Hypertension (odds ratio [OR] = 3.72, $p = 6.95 \times 10^{-55}$) and chronic kidney disease (OR = 3.12, $p = 1.44 \times 10^{-49}$) were more prevalent in patients with FNP. Electrolyte imbalances (OR = 2.59, $p = 4.29 \times 10^{-36}$), malnutrition (OR = 3.44, $p = 1.61 \times 10^{-35}$), and altered mental status (OR = 2.34, $p = 7.34 \times 10^{-15}$) were significant comorbidities. While dizziness was also significant (OR = 1.58, $p = 3.99 \times 10^{-8}$), migraine and headaches did not show statistically significant differences.

Conclusions: FNP was noted in 6% of MOEs. Male and H/L is a predictive factor. Monitoring blood glucose, albumin levels, and ESR may aid in predicting FNP in MOE patients. Comorbidities such as hypertension and kidney disease may be associated with higher risk for FNP.

Professional Practice Gap & Educational Need: Understanding predictive factors for facial nerve palsy in MOE can enhance clinical assessments and guide management strategies, particularly in patients with comorbidities.

Learning Objective: To identify key predictive factors for facial nerve palsy in patients with MOE and to explore the associated comorbidities that may inform clinical outcome.

Desired Result: By recognizing the predictive factors and associated comorbidities in patients with MOE, healthcare providers can develop targeted strategies for monitoring and intervention, potentially reducing the incidence of facial nerve palsy.

Level of Evidence: Level IV

Indicate IRB or IACUC: Exempt.

Music Perception in Children with Cochlear Implants: A Systematic Review and Meta-Analysis

Lauren R. McCray, BS; Erin E. Briggs, BS; Shaun A. Nguyen, MD
Robert F. Labadie, MD, PhD; Clarice S. Clemmens, MD; David R. White, MD

Objective: Our goal is to assess quantitative measures of music perception in the pediatric cochlear implant (CI) population compared to children with normal hearing.

Data sources: CINAHL, Cochrane Library, PubMed, and SCOPUS were searched for English-language studies published from inception through September 11th, 2024, with the following keywords: cochlear implant, hearing aid, and music.

Study selection: Cohort and cross-sectional studies related to music perception in pediatric CI patients under 18 years old were included. Studies involving hearing aids, adult patients, or qualitative data only were excluded.

Data extraction: Two authors extracted and reviewed data, and disagreements were resolved with a third party if needed. The risk of bias was assessed according to the Risk of Bias in Non-randomized Studies - of Exposure for cohort studies and the Joanna Briggs Institute critical appraisal checklist for cross-sectional studies.

Data synthesis: Primary outcome measures included continuous measures (mean) and proportions (%) with 95% confidence intervals (CI).

Conclusions: Twenty-two studies (n = 758) pertaining to music perception in the pediatric CI population were included. The mean age was 9.3 for the CI group and 8.9 for the control group. The average age of implantation was 3.2 years, with an average of 5.9 years' experience. There were significant differences in accuracy with identifying music emotion (72.9% vs. 77.3%; $p = 0.04$) and melody recognition (62.3% vs. 88.8%; $p < 0.0001$) in CI users compared to controls. Average accuracy for timbre recognition (37.3% vs. 64.6%) and rhythm recognition (55.4% vs. 94.8%) were also reported for children with CIs and the control population, respectively; however, there was only one study that measured these outcomes for the control group. Thus, we recommend further research on this topic and patient counseling regarding these findings.

Professional Practice Gap & Educational Need: It is important to counsel patients and their families regarding music perception with a CI.

Learning Objective: To describe the differences in music perception in pediatric CI users compared to children with normal hearing.

Desired Result: Our aim is to improve quality of life in the pediatric CI population by increasing awareness of music perception among otolaryngologists and audiologists interacting with these patients.

Level of Evidence: Level III

Indicate IRB or IACUC: Exempt

Exploring Otological Comorbidities of Tinnitus in the U.S. Population

Sunil Shenoy, BA; Cynthia Tsang, BS; Romina Mirshahi, MD; Saharnaz Nedjat, MD, PhD
Mehdi Abouzari, MD, PhD; Hamid R. Djalilian, MD

Objective: To document presence and extent of otological comorbidities in patients with tinnitus.

Methods: Retrospective analysis of demographic, otological symptoms, and audiometric data from the National Health and Nutrition Examination Survey (NHANES) Database between 1999 and 2004.

Results: A total of n=6,509 patients were included with a mean age of 53.9 and 50.2% female. Among demographic measurements, participants who reported having tinnitus were significantly older than healthy individuals (OR=1.26, 95% CI: 1.12-1.42, $p<0.001$), and men were more likely than women to suffer from tinnitus (OR=1.18, 95% CI: 1.04-1.33, $p=0.007$). No significant difference in BMI was evident ($p=0.069$). Major hearing loss (OR=4.0, 95% CI: 3.08-5.23, $p<0.001$) and dizziness (OR=3.06, 95% CI: 2.66-3.53, $p<0.001$) had the strongest associations with tinnitus among the otological symptoms assessed. Neck pain (OR=1.93, 95% CI: 1.69-2.22, $p<0.001$) and migraine (OR=1.45, 95% CI: 1.25-1.68, $p<0.001$) demonstrated a comparatively milder increased likelihood of tinnitus presence. Among a subpopulation of the cohort (n=3,022), those with tinnitus were more likely to endorse a recent sinus problem ($p<0.001$) and recent otalgia ($p<0.001$) compared to non-tinnitus patients. Otoscopy exam data among this subset also identified collapsing ear canal ($p=0.031$) as a significant factor in tinnitus presence, while cerumen impaction ($p=0.796$) was not significant.

Conclusion: Several otological symptoms including major hearing loss, dizziness, neck pain, and migraine are significant comorbidities in tinnitus patients. These findings provide a basis of potential etiologies of tinnitus and therapeutic targets for patients.

Define Professional Practice Gap & Educational Need: The pathophysiology and etiologies of tinnitus are not fully understood, with most cases being subjective. Identifying comorbidities allows for a better understanding of risk factors and potential causes of tinnitus. Further, these associations can help clinicians provide broader, comprehensive treatment strategies for patients' symptoms.

Learning Objective: To identify demographic factors and otological symptoms that impact presence of tinnitus in the United States population.

Desired Result: Informing otologists of tinnitus comorbidities to improve symptom management and identify patient populations at risk of tinnitus development.

Level of Evidence – III

Indicate IRB or IACUC: Exempt

Differences in Audiologic Healthcare Utilization by Race

Roy W. Qu, MD; Helen Xu, MD; Baishakhi Choudhury, MD

Objective: To identify patterns of audiologic healthcare utilization by race and subsequently identify barriers for patient populations with poor utilization in the United States.

Study Design: Cross-sectional study of the National Health and Nutrition Examination Survey (NHANES) from 2011 – 2012, 2015 – 2016, and 2017 – 2020.

Setting: Community-based setting in the United States.

Patients: Adults in the United States aged 20 years and older.

Main Outcome Measures: Hearing loss, time to last hearing test by a hearing specialist

Results: 11,120 participants aged 20 years and older, of which 9,206 had audiograms, were included for analysis. The cohort was 48.2% male, 15.4% Hispanic, 11.8% Black, 5.8% Asian, and 67.0% White and had an average age of 47.43 years. Whites were more likely to have hearing loss (22.0%, $p < 0.001$) compared to racial minorities: 13.4% in Hispanics, 12.7% in Blacks, and 14.5% in Asians. However, only blacks had lower odds of hearing loss (OR 0.44, $p = 0.035$) compared to whites after controlling for age, gender, health insurance, education, income-to-poverty ratio, access to routine healthcare, and length of time in the United States.

We assessed how recently participants had their hearing tested by a specialist. Hispanics (OR 2.06, $p < 0.001$) and Asians (OR 3.06, $p < 0.001$) had longer intervals since their last hearing test compared to whites. Blacks were more likely to have a recent hearing test compared to whites (OR 0.780, $p = 0.003$). On multivariate ordinal regression, less severe hearing loss ($p = 0.003$), better self-perceived hearing ($p < 0.001$), and shorter time in the United States ($p < 0.001$) were associated with a longer interval since their last hearing test. However, despite correcting for multiple confounders, Asians had a longer time since their last hearing tested compared to whites (OR = 1.64, $p = 0.004$). Next, we identified factors associated with time since last hearing test within each race. In multivariate analysis, better self-perceived hearing was associated with a longer time since the last hearing test in Blacks ($p = 0.015$) and Hispanics ($p = 0.006$), but hearing loss severity was not (Black, $p = 0.433$; Hispanic, $p = 0.790$). Lower hearing loss severity ($p = 0.021$), better self-perceived hearing ($p < 0.001$) and speaking a non-English language for most of the time in the household (OR 1.372, $p = 0.007$) were independently associated with a longer time to last hearing test for Asians. Speaking mostly Spanish at home was not associated with time to last hearing test for Hispanics (OR 1.315, $p = 0.115$).

Conclusions: Despite adjustments for hearing loss and other confounders, the time since last hearing test still differed by race, namely for Asian Americans. Addressing factors associated with seeing a hearing specialist, such as discordance between objective and self-perceived hearing loss and language barriers, may improve hearing health for racial minorities.

Professional Practice Gap & Educational Need: Data on audiologic healthcare utilization in racial minorities is underreported. Further knowledge on behaviors associated with differences in utilization may inform interventions to improve the rate of audiologic testing within each racial minority group.

Learning Objective: To identify factors associated with hearing testing in racial minorities.

Desired Result: Provide knowledge on differential audiologic healthcare utilization in racial minorities. Healthcare providers will be more aware of characteristics that affect rates of audiologic testing within each racial minority group. This will also encourage future research to explain the forces driving these differences.

Level of Evidence – Level IV

Indicate IRB or IACUC: Exempt

Factors Influencing Emergency Department Revisits in Patients with Otologic Diagnoses

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Eric J. Formeister, MD, MS

Objective: To investigate factors leading to revisits in patients presenting to the emergency department (ED) with otologic diagnoses.

Study Design: Retrospective cohort study.

Setting: Level I academic trauma center.

Patients: Patients who presented to the ED with otologic diagnoses (ICD 10 codes H60-H67, H70-H75) excluding dizziness or vertigo between January 2015 and June 2024. Patients were only included if the otolaryngology service was consulted during ED visit or admission.

Main Outcome Measures: Revisit to the emergency department within 30 days of initial presentation.

Results: In total, 971 patients were included with 523 (53.9%) males, a mean age (± S.D.) of 34.4±26.6 years at diagnosis, and 853 (87.8%) English-speakers. Overall, 394 (40.6%) patients presented with suppurative or nonspecific otitis media, 271 (27.9%) with otitis externa, and 163 (16.8%) with mastoiditis or mastoiditis with complication. One-hundred fifty-three (5.8%) patients revisited the ED within 30 days. Bivariate analysis revealed that race, need for admission, total length of stay at index presentation, Elixhauser comorbidity burden, and smoking status correlated with ED revisit (all $p<0.05$). Patients with a higher comorbidity burden (OR=1.06, 95% CI=1.01-1.12, p=0.014) and current smokers (OR=2.20, 95% CI=1.32-3.66, p=0.002) were more likely to revisit. Of note, longer initial admission was associated with a lower risk of revisit (OR=0.95, 95% CI=0.90-0.98, p=0.018).

Conclusions: Patients who smoke and patients with a higher comorbidity burden were more likely to revisit the ED for otologic conditions, while longer stays following their initial presentation reduced revisits. Otologists consulting in the ED should be especially vigilant when treating smokers with complex medical histories, as these patients are at higher risk for complications and revisits.

Professional Practice Gap & Educational Need: Current smokers and patients with a high comorbidity index are not only more susceptible to otologic conditions but also require more complex follow-up and continued care. Studies are needed that investigate clinical and patient factors contributing to poorer outcomes in patients with otologic diagnoses.

Learning Objective: The audience will learn to risk stratify patients presenting to the ED with otologic conditions and to identify those at risk for ED revisit following otolaryngology evaluation.

Desired Result: Readers will gain insight into patient factors necessitating closer follow-up and more intensive interventions for otologic diagnoses.

Level of Evidence – Level III.

Indicate IRB or IACUC: Duke Health IRB, Determined Exempt Pro00116404.

Postoperative Complications Related to Bone Conduction Hearing Devices: A Comprehensive Evaluation at a Single Institution

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Objective: 1) To comprehensively report our experience with postoperative complications from bone conduction hearing devices (BCHDs), and 2) to identify preoperative patient-related factors that differ among BCHDs.

Study Design: Retrospective cohort.

Setting: Tertiary academic practice.

Patients: 187 patients (114 adults, 73 children) who met criteria for BCHD.

Intervention(s): Implantation with BAHA Attract (n=40), BAHA Connect (n=40), Osia (n=64), Ponto (n=17), or Bonebridge (n=26) between January 2018 and April 2024.

Main Outcome Measures: Postoperative complications, operative time, demographics, preoperative pure-tone average.

Results: Median age at implantation was lower for the Ponto (9y, IQR 7—67) and Osia (18y, IQR 12—47) compared to the Attract (33y, IQR 8—52), Connect (47y, IQR 15—60), and Bonebridge (49y, IQR 26—60). Gender, type of hearing loss, and preoperative air- and bone-conduction thresholds were equivalent among the devices ($p>0.05$). Postoperative infections were highest for the Connect (68%), followed by the Attract (45%), Osia (33%), Ponto (29%), and Bonebridge (8%) ($p<0.001$). Skin overgrowth was most prevalent with the Connect (25%) ($p=0.002$). Difficulties with magnet retention were more likely with the Bonebdrige (12%) and Osia (8%) than the Attract (0%) ($p=0.012$). Patient complaints of pain, bleeding, and decreased hearing were similar among the BCHDs ($p>0.05$). Of 10 BCHDs that were revised, 6 converted from Connect or Attract to Bonebridge or Osia; 1 converted from Osia to Bonebridge; and 3 were replaced with the same device. Median operative time was similar between the Osia and Bonebridge ($p>0.05$).

Conclusions: Despite issues with poor magnetization, active transcutaneous BCHDs had relatively lower rates of infection. Patients that underwent revision surgery were more likely to convert from a percutaneous to transcutaneous device.

Professional Practice Gap & Educational Need: While studies have compared postoperative complications with two BCHDs, a comprehensive assessment of all implants has not been reported. Moreover, we sought to assess if there were demographic differences that could steer patients and physicians to use of one device over another.

Learning Objective: To identify differences in preoperative characteristics and postoperative complications among BCHD.

Desired Result: Providers will have knowledge of the potential postoperative complications among multiple BCHDs which can help with patient counseling and identification of which BCHD may be the best fit for them.

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

Indicate IRB or IACUC: IRB Approved (230221, Vanderbilt University, approved on 2/2/2023)

The Evaluation of Cochlear Implantation Usage, Complications, and Speech Perception Outcomes in a Rural, Elderly Population

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Objective: Cochlear implantation (CI) is generally well tolerated in elderly populations. However, studies have shown that elderly patients may not experience speech perception improvements as dramatically as younger populations. Additionally, elderly patients may be at an increased risk of postoperative complications. Few studies have researched these topics in patients older than 80 years of age, and studies that have investigated this population have provided inconsistent results. The goal of this study is to investigate the audiologic outcomes, comorbidities, and usage of CI in patients aged 80 years and older, particularly in rural patient populations.

Study Design: Retrospective chart review.

Setting: Tertiary referral center that serves a large, rural population.

Patients: There were 127 participants in this study, which included all cochlear implant recipients aged 70 years or older who underwent CI at a tertiary referral center between 2/21/2014 and 4/3/2024.

Interventions: Data reflecting preoperative and postoperative speech perception scores, comorbidities, body mass index, postoperative complications, usage of cochlear implants, and years of life after surgery were extracted from the charts of participants. Data was analyzed as a whole, and data was compared between the age groups of 70 – 79 and over 80 years.

Main Outcome Measures: Improvements in CNC and AzBio scores, years of life after surgery, postoperative complications, rates of emergency department (ED) visits within 1 month of surgery, rates of explantation, and usage of cochlear implants at last follow-up visit.

Results: Patients aged 80 years or older had a lower increase in AzBio scores at 3 months after surgery ($p < 0.01$) but had similar improvements in speech perception scores 6 to 12 months after surgery when compared to those aged 70 to 79 years. Patients over the age of 80 years had a 1-year mortality of 7.7%, while patients aged 70 to 79 had a 1-year mortality of 1.25%, although this difference was insignificant. Rates of non-users at the last postoperative appointment and rates of complications were not different between the age groups. Patients aged 80 years or older were less likely to follow up after 1 year when compared to those aged 70 to 79 years ($p < 0.01$). Those over the age of 80 were also more likely to undergo explantation ($p = 0.057$) and to visit the ED after surgery ($p = 0.070$), but these results only approached significance. In all patients over the age of 70, those with a history of cardiovascular disease were more likely to visit the ED or need explantation ($p < 0.05$). Additionally, some comorbidities, such as cardiovascular disease, lung disease, and kidney disease predisposed patients of both age groups to smaller speech perception score improvements.

Conclusions: Many outcomes of CI were similar between age groups. However, special considerations must be made for patients over the age of 80, as results showed significantly decreased 1-year follow-up rates and near significant increases in 1-year mortality, explantation, and ED visits. Although CI enhances speech perception and provide patients with improved quality of life, elderly patients may require more comprehensive preoperative CI evaluation and counseling.

Professional Practice Gap & Educational Need: As the cochlear implant candidate population ages, more research is needed to identify risk factors and outcomes that are unique to elderly populations considering CI.

Learning Objective: Identify considerations for CI in rural, elderly populations that could influence preoperative evaluations and counseling.

Desired Result: Improved provider to patient communication about specific considerations for CI in the elderly population. Identify areas of potential improvement in CI outcomes in the elderly.

Level of Evidence – Level IV
Indicate IRB or IACUC: IRB 024-333 approved by Baylor Scott & White Research Institute.

Changes in Patient-Reported Dizziness after Simultaneous Endolymphatic Sac Decompression and Cochlear Implantation in Patients with Meniere's Disease

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Christine M. Lohse, MS; Brian A. Neff, MD; James R. Dornhoffer, MD

Objective: To evaluate the impact of simultaneous cochlear implantation and endolymphatic sac decompression (ELSD) on dizziness in patients with advanced Meniere's disease.

Study Design: Historical cohort.

Setting: Tertiary academic medical center.

Patients: Patients with a preoperative diagnosis of Meniere's disease who underwent cochlear implantation from 2000 to 2024.

Interventions: Cochlear implantation, ELSD.

Main Outcome Measures: Patient-reported changes in dizziness severity and frequency compared between those who did and did not undergo simultaneous ELSD.

Results: 125 patients with preoperative dizziness secondary to Meniere's disease were eligible for study, including 19 (15%) who underwent simultaneous ELSD. In total, 17 (89%) and 2 (11%) of the 19 patients with simultaneous ELSD reported improvement and stability in dizziness severity, respectively; in comparison, 29 (27%), 57 (54%), and 20 (19%) of the 106 patients without any dizziness intervention reported improvement, stability, and worsening in dizziness severity, respectively ($p<0.001$). Likewise, 17 (89%) and 2 (11%) of the patients with simultaneous ELSD reported improvement and stability in dizziness frequency, respectively, whereas 25 (24%), 60 (57%), and 21 (20%) of patients without any intervention reported improvement, stability, and worsening in dizziness frequency, respectively ($p<0.001$).

Conclusions: In patients with Meniere's disease who experience ongoing dizziness but meet criteria for cochlear implantation, consideration of simultaneous ELSD may allow for improvements in dizziness severity and frequency.

Professional Practice Gap & Educational Need: Given the historical controversy surrounding the utility of ELSD in medically refractory Meniere's disease, and its more recent widespread adoption due to studies showing high rates of vertigo control, there is a need to better understand its impact on dizziness severity and frequency when performed concurrently with cochlear implantation.

Learning Objective: To describe dizziness-related outcomes after simultaneous cochlear implantation and ELSD in patients with Meniere's disease.

Desired Result: To provide guidance on patient counseling regarding the utility of simultaneous ELSD and cochlear implantation in the setting of advanced Meniere's disease.

Level of Evidence: III

Indicate IRB: Mayo Clinic IRB #22-000183

Audiometric Predictability of Photon-Counting Computed Tomography Findings in Otosclerosis

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Objective: To examine correlation between baseline audiometric data and surgical outcome with extent of otosclerotic plaque using preoperative high-resolution photon-counting computed tomography (PCCT).

Study Design: Retrospective cohort.

Setting: Large academic center.

Patients: Patients with otosclerosis who completed preoperative PCCT imaging.

Interventions: Observation, surgery.

Main Outcome Measures: Radiologic disease extent, pre- and postoperative audiometric data.

Results: 53 ears met inclusion criteria and were included in the analysis. The mean age at PCCT was 51 years (SD 14). The radial degrees of oval window involvement was not significantly associated with air-bone gap (p=0.3) or magnitude of the Carhart notch (p=0.8). Likewise, oval window plaque depth was not significantly associated with air-bone gap (p=0.2) or magnitude of the Carhart notch (p=0.6). Following CT, 22 ears underwent surgery. In this subset, extent of oval window involvement measured in angular degrees and plaque depth was not significantly associated with the postoperative change in air-bone gap or high-frequency thresholds.

Conclusions: Despite enhanced visualization of subtle abnormalities with PCCT imaging, extent of oval window otosclerotic plaque, measured in angular degrees and thickness, does not predict preoperative hearing or postoperative audiologic changes in patients with otosclerosis.

Professional Practice Gap & Educational Need: With the advent of high-resolution PCCT imaging, we need to better understand the potential audiometric impact of the degree of radiologically visualized disease.

Learning Objective: To describe the association of otosclerosis findings on high-resolution PCCT imaging with audiometry.

Desired Result: To provide guidance on the predictability of pre- and postoperative audiometrics based on high-resolution radiologic otosclerotic disease extent.

Level of Evidence: III

Indicate IRB: Mayo Clinic IRB #23-012204 (exempt from formal review)

Advances in Retrieval Augmented Generation and Large Language Models for Diagnosing Vestibular Disorders

Alexandra T. Bourdillon, MD; Soraya Fereydooni, BS; Song Cheng, MD

Objective: Large language models (LLMs) such as ChatGPT can integrate vast amounts of data, and Retrieval Augmented Generation (RAG) is a method to customize LLMs to harness domain-specific knowledge to improve responses. Our aim is to design, implement and characterize the diagnostic utility of advanced RAG-based LLMs in assessing vestibular clinical vignettes.

Study Design: Qualitative Study

Setting: Tertiary referral center

Patients: Published case reports of patients with common vestibular disorders.

Interventions: Our institutional secure instance of ChatGPT-4 (called Versa) was compared to a scripted otology-specific RAG LLM supplied with Bárány society consensus documents of vestibular and other otologic conditions. Both models were prompted with clinical vignettes drawn from case reports capturing various conditions: superior semicircular canal dehiscence (SSCD), otosclerosis, Meniere's disease, benign paroxysmal positional vertigo (BPPV), vestibular migraine, and vestibular neuritis. Each model was asked to build a differential diagnosis and grade the likelihood of each diagnosis using a 10-point grading rubric.

Main Outcome Measures: Model performance (ChatGPT-4 versus RAG LLM) was assessed by the accuracy of the differential diagnosis and concordance between the two models in their grading of the diagnoses.

Results: Both models accurately diagnosed each of the 6 clinical vignettes. The RAG generated a more complete differential diagnosis that spanned more varied conditions beyond typical vestibular disorders. Furthermore, the standard model demonstrated more skew by assigning more confidence (higher scores) to the most likely diagnosis and less confidences (fewer points) to the remaining diagnoses. Generally, there was high concordance in grading schemes between the two LLMs in their ordering of the diagnoses.

Conclusions: RAG LLMs have improved differential diagnosis building and can weigh the nuances of various vestibular conditions with more complexity. Assessing the confidence of LLM responses using a scoring rubric is a valuable way to characterize the quality of these tools for counselling patients or augmenting clinical workflows.

Professional Practice Gap & Educational Need: Assessments of generative large language models are needed as they advance in quality and popularity.

Learning Objective: Understanding critical concepts for designing and evaluating the performance of LLMs

Desired Result: Examining the diagnostic capacity of LLMs using a paradigm of a scoring rubric

Level of Evidence - NA

Indicate IRB or IACUC: Exempt.

Piezoelectric Device for Canal Wall Reconstruction Tympanomastoidectomy: A Cadaveric Study

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Seiji B. Shibata, MD, PhD

Objective: Evaluate whether piezoelectric devices are safe and effective for canal wall reconstruction (CWR) tympanomastoidectomy.

Study Design: Cadaveric study

Setting: Temporal bone lab

Patients: 5 donor formalin-fixed temporal bones

Interventions: Piezoelectric devices that utilize bone-specific ultrasonic frequencies to achieve tissue-selective cutting were used to perform posterior canal wall (PCW) osteotomies in CWR tympanomastoidectomy.

Main Outcome Measures: Time required to complete the PCW osteotomies by piezoelectric devices. Selectivity for bone-cutting over soft tissue by examining the surrounding soft tissue integrity.

Results: Following complete mastoidectomy and extended facial recess, a piezoelectric device was used for en-block removal of the PCW to optimize middle ear visualization, particularly sinus tympani exposure, as would typically be performed in a CWR tympanomastoidectomy. A neurotology fellow and attending performed the PCW osteotomies. The mean osteotomy time was 9.67 minutes (range=[5-14]), with repetition decreasing total osteotomy time by as much as 50%. The resultant PCW bone grafts remained intact with seamless fit back into the canal. Surrounding soft tissue also remained intact with osteotomies performed with straight (0.4mm-thickness) and curved (0.35mm-thickness) inserts. Contact of the piezoelectric saw with soft tissue produced different tactile feedback compared to that of bone. Brief contact of the device with crucial structures, including the facial nerve and tegmen dura, did not cause any notable damage, although continued targeted device application did eventually lacerate these structures.

Conclusions: Piezoelectric devices can efficiently and effectively perform PCW osteotomies for a CWR tympanomastoidectomy. Osteotomy time decreased from 14 minutes to 5 minutes with repetition and familiarity of the device. There is also versatility of angles and cuts with various inserts in the piezoelectric device, overall proposing a potentially safer, more attractive tool for these osteotomies compared with the microsagittal oscillating saw.

Professional Practice Gap & Educational Need: Piezoelectric devices use ultrasonic frequencies to provide bone-selective cutting over soft tissue structures. It has been widely used in specialties such as facial plastics and craniofacial surgery, but is not routinely used for otologic surgery. Due to the small space and important structures such as the facial nerve and tegmen dura in close proximity to the PCW, using a microsagittal saw when performing the osteotomies for CWR tympanomastoidectomy can be formidable. Therefore, using the piezoelectric device instead of microsagittal oscillating saw can provide some level of protection when performing this procedure.

Learning Objective: Piezoelectric device is an efficient, effective, and safe alternative to microsagital oscillating saw in performing PCW osteotomies for CWR. While the microsagittal saw requires less time to perform the osteotomy cuts, familiarity with the piezoelectric device led to shorter osteotomy time.

Desired Result: CWR tympanomastoidectomy provides elements of canal wall down and canal wall up procedures to optimize surgical exposure and effectively treat chronic ear disease. Since PCW osteotomies require regular use of the microsagittal oscillating saw, some surgeons may be reluctant to perform CWR tympanomastoidectomy. Surgeons can consider using piezoelectric devices, an equally effective and potentially safer alternative due to relative soft tissue protection, for performing this procedure.

Level of Evidence - Level V
Indicate IRB or IACUC : Exempt

Effects of the Concentration of Intratympanic Dexamethasone in the Treatment of Idiopathic Sudden Sensorineural Hearing Loss

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Arun K. Gadre, MD; W. James Azeredo, MD

Objective: Compare the efficacy of the two concentrations of intratympanic dexamethasone referenced by The American Academy of Otolaryngology - Head and Neck Surgery (AAO-HNS) for the treatment of Idiopathic Sudden Sensorineural Hearing loss (ISSNHL).

Study Design: Retrospective cohort study

Setting: Academic otolaryngology clinic over a 10-year period

Patients: Age eighteen and over who presented with ISSNHL and underwent intratympanic dexamethasone injections.

Interventions: Intratympanic dexamethasone injections with 10 mg/mL or 24 mg/mL concentrations.

Main Outcome Measures: We compare changes in pre- and post-treatment subjective and audiometric data between 10 mg/mL and 24 mg/mL cohorts- namely, pure-tone average (PTAs), speech reception threshold (SRT), word recognition score (WRS), and subjective improvement in hearing.

Results: In our standardized groups, there are no differences in the degree of change between pre-treatment and post-treatment PTA (dB) (p-value: 0.735), SRT (dB) (p-value: 0.133), or WRS (%) (p-value: 0.355). There is no difference in the number of patients who experience a subjective improvement in hearing between treatment groups (p-value: 0.335). For both the 10mg/mL and the 24mg/mL treatment group, there is an approximately 10% improvement PTA after treatment (p-value: 0.004 and p-value: <0.001 respectively).

Conclusions: There does not appear to be a significant difference in the subjective and audiometric outcomes in patients treated with either 10 mg/mL or 24 mg/mL intratympanic dexamethasone injections in our patient population. There does appear to be objective improvement of PTAs in both cohorts.

Professional Practice Gap & Educational Need: Inconsistency in the treatment of ISSNHL. Need for resource allocation when compounding 24mg/mL dexamethasone solution.

Learning Objective: Discuss the treatment of ISSNHL and compare the treatment outcomes for the referenced concentrations of intratympanic dexamethasone.

Desired Result: Applicable comparison of the described doses of intratympanic dexamethasone for the treatment of ISSNHL.

Level of Evidence - IV

Indicate IRB or IACUC: IRB number: 2024-0786. IRB exemption: 9/26/2024.

Patient Selection and Outcomes for Eustachian Tube Dilation in Cholesteatoma Surgery

Ana Marija Sola, MD; Tiffany Husman, BS; Charles J. Limb, MD

Objective: To report patient selection and outcomes for eustachian tube dilation (ETD) in patients with primary acquired cholesteatoma and compare these factors in a subset of case-matched patients undergoing surgery with or without ETD.

Study Design: Retrospective cohort study; case-control sub-analysis.

Setting: Tertiary academic center.

Patients: Thirty-six patients >18 years with primary acquired cholesteatoma. Twelve cases undergoing primary canal-wall-up cholesteatoma resection were 1:1 control-matched for age, gender, extent/location of cholesteatoma, ossicular chain reconstruction (OCR), type of OCR, and degree of pre-operative hearing loss.

Interventions: Patients undergoing surgery for removal of cholesteatoma with contemporaneous ETD. For case-control sub-analysis, cases underwent cholesteatoma removal and ETD while controls underwent removal alone.

Main Outcome Measures: Main outcomes measures were postoperative change in conductive hearing loss (CHL), change from Type B or C to type A tympanogram, and cholesteatoma recurrence.

Results: All patients undergoing ETD had at least 2 characteristics of obstructive eustachian tube dysfunction (OETD): audiogram findings, symptoms, and physical exam findings. Mean follow up was 30.2 months (median: 31.2). Postoperative audiograms occurred on average 9 months post-operation. The rate of cholesteatoma recurrence in this cohort was 16.7% (6/36). Patients who underwent mastoidectomy in addition to cholesteatoma resection and ETD reported an average improvement in conductive hearing loss of 6.43 dB, compared to a worsening by 3.5 dB in patients who did not undergo mastoidectomy (p=0.04). On case-control sub-analysis, patients selected for ETD more frequently reported symptoms of OETD (odds ratio: 7.0, p=0.045) and had contralateral disease (odds ratio: 7.0, p=0.045). Average improvement of CHL was 4.3 dB (standard deviation (SD)=8.12) in the ETD group compared to 1.3 dB (SD=9.28) in the control group, although this did not reach statistical significance. In addition, the rate of conversion to Type A tympanogram post-surgery was higher in the ETD group (33%, 4/12 vs 8.3%, 1/12), although this analysis also did not reach statistical significance. There was no difference in rate of cholesteatoma recurrence between cases and controls (16.7%, 2/12 in both groups).

Conclusions: Patients undergoing ETD with cholesteatoma surgery have cholesteatoma recurrence rates within the average reported ranges and may show improved hearing outcomes with mastoidectomy. No adverse outcomes related to ETD were reported. The likelihood of patients with similar disease characteristics and pre-operative hearing being selected for ETD with cholesteatoma surgery is increased when there are symptoms of OETD and contralateral disease. Overall, ETD alongside cholesteatoma resection is safe and may confer a hearing and eustachian tube functional benefit—although a larger cohort may be required to further characterize this effect.

Professional Practice Gap & Educational Need: Obstructive eustachian tube dysfunction (OETD) can manifest as effusion, otitis media (OM), and/or cholesteatoma. While several studies have focused on the role of ETD in management of OM, there is limited research related to ETD in cholesteatoma surgery.

Learning Objective: To describe characteristics of patients undergoing ETD with cholesteatoma surgery and identify potential relationships between patient characteristics and outcomes.

Desired Result: To provide information on patient selection and outcomes related to ETD and cholesteatoma surgery.

Level of Evidence: IV

Indicate IRB or IACUC: UCSF:24-42636

Complete Insertion Rates and Insertion Depth with versus without Image Guided Cochlear Implant Electrode Selection Software

James C. Campbell, MD; Amanda Rago, AuD; Abhinav R. Ettyreddy, MD
Douglas A. Chen, MD; Todd A. Hillman, MD

Objective: Report rates of full insertion before and after standardized utilization of image guided cochlear implant electrode selection (IGCIES), tradename OTOPLAN, for patients electing to receive a MED-EL cochlear implant.

Study Design: Retrospective Cohort Study

Setting: Tertiary care neurotology practice.

Patients: Adult patients presenting between 7/2021-27/2024 found to be cochlear implant candidates that chose a MED-EL device.

Interventions: Standardized utilization of IGCIES in 3/2023

Main Outcome Measures: Full insertion rates, frequency of longer electrode use, and maintenance of low frequency hearing (either ≤65dB or ≤85dB at 125, 250, or 500 Hz).

Results: 61 adults (36 female, median age 66) underwent implantation without IGCIES and 56 adults with IGCIES (35 female, median age 64). Complete insertion was more likely with IGCIES (100% vs 93%, p=0.02), as was use of a 31mm vs 28mm electrode (50% 33mm use vs 26%, p=0.01). IGCIES did not alter low frequency hearing preservation ≤65dB (45% vs 34% preservation, p=0.46) or low frequency hearing preservation ≤85dB (55% vs 49%, p=0.58).

Conclusions: After standardized utilization of IGCIES, increases in complete insertions and longer electrodes were observed, with no change in low frequency hearing preservation rates.

Professional Practice Gap & Educational Need: Image guided electrode selection is a new tool available to cochlear implant surgeons. How might this affect the amount of longer electrodes and full insertions that a surgeon achieves?

Learning Objective: Review our practice's results since using image guided electrode selection for all patients electing to receive a MED-EL device, with a control cohort of patients receiving MED-EL electrodes prior to this new tool's availability for comparison.

Desired Result: Provide data for surgeons on where image guided electrode selection may or may not improve their practice.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

Characterizing Middle Ear Carcinoid Tumors: A Population-Based Study

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Objective: Describe clinical characteristics and survival outcomes of middle ear carcinoid tumors

Study Design: Retrospective cohort study

Setting: Surveillance, Epidemiology, and End Results Database of the National Cancer Institute

Patients: All cases of histopathologically confirmed carcinoid tumors of the middle ear as primary location.

Main Outcome Measures: Patient features, tumor characteristics, treatment patterns, and survival outcomes

Results: Twenty-seven patients with middle ear carcinoid tumors were identified. The median age was 39 years (range, 21-68). There was nearly equal distribution between males and females (48% and 52%, respectively) and the majority were white (69%). The median follow-up duration was 13 years (range, 0-21). The median tumor size was 9 mm (range, 2-11). Seventeen presented with local (94.4%) and one with regional disease (5.6%). No patient experienced distant disease. Nearly all patients underwent surgery (92.6%) with one also undergoing adjuvant radiation. Five and ten-year overall and five and ten-year disease-specific survivals were 100%.

Conclusions: Middle ear carcinoid tumors are extremely rare entities with low metastatic potential. The favored treatment modality appears to be surgical resection with infrequent adjuvant radiation. While located in a complex anatomic location, the tumor portends a much favorable prognosis overall.

Professional Practice Gap & Educational Need: Studies on patient and tumor characteristics of middle ear carcinoid tumors is limited in the current literature.

Learning Objective: To understand clinical characteristics and survival outcomes of patients with middle ear carcinoid tumors.

Desired Result: To be able to describe tumor characteristics and clinical outcomes of middle ear carcinoid tumors.

Level of Evidence – Level V

Indicate IRB or IACUC: Exempt

Early Outcomes of Round Window Drill-Out for Otosclerosis Causing Round Window Obliteration

Kaitlyn A. Brooks, MD; Jeffrey T. Vrabec, MD

Objective: To discuss the effect of round window drill-out on otosclerosis cases with radiographic evidence of round window obliteration.

Study Design: Retrospective case series.

Setting: Single institution tertiary care referral center.

Patients: Four adult patients (5 ears) were included with audiometric findings of mixed hearing loss and radiographic evidence of otosclerosis causing round window obliteration. Three (75%) patients were female and median age at time of surgery was 64 years old.

Interventions: Round window obliterative disease was addressed with a formal round window drill-out (RWD) by opening the lumen of the basal turn of the cochlea with a micro drill. The opening was then reconstructed with fascia to create a two-window system.

Main Outcome Measures: Number and percent of patients with decrease in air-bone gap pure-tone average thresholds (ABG-PTA) calculated using 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz pure-tone thresholds.

Results: Two ears (same patient) underwent stapedectomy with successful RWD achieving ABG-PTA improvements of 27.5 dB (left) and 47.5 dB (right). One ear underwent stapedectomy alone with a residual ABG-PTA of 15 dB. One ear with RWD alone and one ear with revision stapedectomy and unsuccessful RWD did not show significant benefit. No ear was worse.

Conclusions: For patients suffering from mixed hearing loss with substantial residual hearing due to round window involving otosclerosis, formal RWD may be beneficial for hearing outcomes by reestablishing a two-window system.

Professional Practice Gap & Educational Need: Otosclerosis with inner ear and round window involvement is particularly challenging, especially when that patient has significant residual hearing and does not feel ready or qualify for cochlear implantation. Discussion of alternative surgical strategies is needed.

Learning Objective: Present our patient selection, technique, and outcomes of round window drill-out in applicable otosclerosis cases.

Desired Result: To foster further discussion regarding surgical techniques and outcomes in otosclerosis cases with round window obliterative disease.

Level of Evidence – Level V

Indicate IRB or IACUC: Houston Methodist Hospital IRB #38485-1

The Current State of Temporal Bone Education in the United States

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Hypothesis: There is wide variability in how temporal bone lab education is delivered which may affect resident competency with otologic surgery.

Background: Otologic surgery is first learned by trainees in the temporal bone lab, which is a required component of ACGME-accredited residency programs. Despite this, no specific guidelines or standardization of education is provided. The purpose of this study is to evaluate the current state of temporal bone education across the United States through a survey of ACGME-accredited otolaryngology programs.

Methods: A cross-sectional evaluation of otolaryngology residency programs was conducted. An anonymous survey was distributed to program directors and coordinators and neurotology fellowship directors at each ACGME Accredited Otolaryngology Residency Program in the United States. Survey responses were compiled and analyzed using R Statistical Software (Vienna, Austria).

Results: A total of 37 responses were obtained from the 131 accredited otolaryngology programs in the United States (29.0%). Fifteen programs (39.5%) had accredited neurotology fellowship programs. Ten programs (26.3%) did not have a dedicated otology rotation for residents. Twenty-five programs had annual or biannual dissection courses, and 15 programs had monthly or weekly temporal bone dissection courses. Thirty programs (81.1%) used a dissection manual, the most common of which was the Ralph Nelson House Dissection Manual (n=28, 93.3%). Sixteen programs had labs dedicated to temporal bone education (43.2%) while 8 share the space with other surgical specialties. Only 5 programs had at least as many drilling stations as they had residents (13.5%), and on average programs had 9 more residents than drilling stations. The average age of temporal bone laboratories across all programs was 13 years, with the oldest having been built in 1985 and the newest in 2024. Only 16 programs (43.2%) had a metric of measuring resident performance in the temporal bone lab, and of those 16, thirteen programs used a grading rubric developed by their own institution. The ratio of drilling stations to residents ($\beta = -0.74$, $p = 0.004$) and the presence of a dedicated otology rotation ($\beta = 0.41$, $p = 0.020$) were strongly associated with residents pursuing neurotology fellowships by logistic regression.

Conclusions: There is variability in temporal bone education, resources, and time spent in the lab across US otolaryngology residency programs. Development of a more universal model for education may help to standardize educational practices an improve trainee preparedness for otologic surgery.

Professional Practice Gap & Educational Need: Otologic surgery is among the most technically and anatomically difficult subspecialties within otolaryngology and can be associated with significant morbidities. Previous studies have illustrated high variability in resident self-reported comfort with temporal bone surgery, but to date, no comprehensive evaluation of how temporal bone education is delivered has been performed.

Learning Objective: Review differences in temporal bone education models, resources, facilities, and instruments among otolaryngology programs and analyze factors that may influence resident comfort with otologic surgery

Desired Result: To highlight variability among otologic education and provide insight into possibilities for standardization of education.

Level of Evidence - V

Indicate IRB or IACUC: Exempt

Benefits of Early Cochlear Implantation in Children with Single-Sided Deafness (SSD)

Piotr H. Skarzynski Prof.; Artur Lorens, Prof.; Anita Obrycka,PhD
Anna Ratuszniak, PhD; Dorota Pastuszak, MSc; Henryk Skarzynski Prof.

Objective: To objectively assess the spatial hearing benefits after cochlear implantation (CI) and the daily device usage time in children with congenital/perinatal single-sided deafness (SSD) early implanted. This study described also surgical procedure used for this populations.

Study Design: The retrospective study was conducted to assess benefits of early cochlear implantation in SSD children.

Setting: Tertiary referral center.

Patients: Thirty-two children with congenital/perinatal SSD treated with CI participated in the study before age two and a half. The mean age and implantation was 18 months (SD = 6).

Interventions: Minimally invasive cochlear implantation via round window.

Main Outcome Measures: Their spatial hearing benefit with CI was measured using age-appropriate speech discrimination in noise tests. Daily processor usage time was obtained from two sources: parent interviews and datalogging technology.

Results: For speech discrimination in noise, children experienced the advantages of the head-shadow effect (4.3 dB SNR). The mean daily processor usage time was reported to be 9.5 hours/day according to parents, compared to 7.4 hours/day as recorded by datalogging.

Conclusions: Cochlear implantation is an effective treatment for children with congenital SSD.

Professional Practice Gap & Educational Need: Current SSD treatment options for young children are limited in effectiveness and not always can be used. The need for more data on long-term outcomes of SSD treatment options, is essential for guiding clinical practice.

Learning Objective: To evaluate the effectiveness of cochlear implants in children with SSD.

Desired Result: Clinicians will be better informed about cochlear implants, leading to improved treatment choices for SSD children.

Level of Evidence - III

Indicate IRB or IACUC: The study was approved by the Bioethics Committee of the Institute of Physiology and Pathology of Hearing (KB.IFPS:1/2019).

Influence of Insertion Speed on Cochlear Implant Hearing Preservation

Piotr Henryk Skarzynski, Prof.; Artur Lorens, Prof.; Marek Polak, PhD
Adam Walkowiak, PhD; Anita Obrycka; Henryk Skarzynski, Prof.

Objective: To evaluate the course of electrode insertion time and evaluate possible influence on cochlear implant hearing preservation.

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

Setting: Tertiary referral center.

Patients: Twenty-six patients were implanted with Flex electrodes according to anatomical and audiological considerations.

Interventions: Minimally invasive cochlear implantation via round window.

Main Outcome Measures: Preoperative computed tomographic imaging (CT) and audiogram was performed within 1 month before the surgical intervention. The electrode location of the intracochlear electrode contacts was estimated and cochlea parameters were measured by the Otoplan v 3.1 software. The electrodes were selected to achieve minimum insertion depth of 450 degree of electrode insertion and to overcome any anatomical gap meaning that tip of the array reached acoustic region of each cochlea. After implantation, postoperative CT and audiogram at 3 months postoperatively were obtained. The electrode location of the intracochlear electrode contacts and cochlea parameters were measured.

Results: All subjects had partial or complete hearing preservation. Among this group 9 subjects had complete hearing preservation. Duration of electrode insertion varied from 47 to 276 seconds. For subjects with complete hearing preservation insertion speed was not linear, but it varied. Typically, insertion speed was faster at the beginning and up to 3 times slower towards the end of the insertion. This corresponded to the estimation of 5 degree of insertion per second.

Conclusions: Several surgically related implicated findings could be found. The speed of the electrode insertion is an important factor during the surgery. Study suggest that speed of the electrode insertion is nonlinear and may be estimated by degree of insertion per second.

Professional Practice Gap & Educational Need: No defined guidelines for electrode insertion speed.

Learning Objective: Influence of insertion speed on cochlear implant hearing preservation.

Desired Result: It is therefore mandatory to better comprehend the impact of the implant on cochlear health.

Level of Evidence - III

Indicate IRB or IACUC: The study was approved by Bioethics Committee of the Institute of Physiology and Pathology of Hearing (KB.IFPS/16/2021).

Barriers to Hearing Healthcare in the Northern US: A Comparison of Rural and Urban Residents

Catherine L. Kennedy, MD; Nivedita Sabarinathan; August Richter
Meredith E. Adams, MD, MS

Objective: To compare awareness of hearing loss and barriers to hearing healthcare between rural and urban residents in Minnesota, the third best-ranked state for public hearing healthcare benefits.

Study Design: Cross-sectional study

Setting: Community-based screening at Driven to Discover Research Facility

Patients: Adults ≥ 18 years attending the Minnesota State Fair

Interventions: In-person survey, otoscopy, and audiometric screening at 25 dB across four frequencies.

Main Outcome Measures: Descriptive analysis of sociodemographics, awareness of hearing loss and healthcare, and Brief Health Literacy Screening (BHLS). Hearing loss (HL) was defined as failing at least 1 frequency in 1 ear.

Results: There were 211 participants, mean age 48.4 years (18-86), 63.5% female, 86.7% white, 70.6% urban residents, 29.4% rural residents, 93.8% insured. Health literacy was adequate (mean urban BHLS 14.3 [95% CI 11.7-16.9], rural 13.9 [10.7 to 17.1], p=0.05*)*. Similar proportions of urban and rural residents reported subjective HL (30.9% and 40.3%, p=0.186) and audiometric HL (44.7% and 50.9%, p=0.743). Urban residents demonstrated lower concordance between perception of HL and the results of screening (50.9% vs. 44.4%, p=0.018*)*. Both groups had low rates of hearing testing within 5 years (urban 28.8% vs. rural 33.8%, p=0.471) and discussing hearing testing with their PCPs (urban 7.7% vs. rural 14.3%, p=0.180). Urban residents reported that location of hearing testing was a significant barrier (25.7% vs. 11.3%, p=0.02); both reported financial concerns as a barrier. Rural residents had lower awareness of normal hearing levels (6.6% vs. 20.8%, p=0.012). Both groups had low awareness of state healthcare benefits (rural 29.5% vs. urban 27.5%, p=0.771).

Conclusions: Urban and rural residents experience similar barriers in access to hearing healthcare. Both would benefit from public health initiatives to educate PCPs and increase awareness of state benefits.

Professional Practice Gap & Educational Need: This study aims to identify barriers to hearing healthcare for residents of the Northern US, where public insurance benefits afford greater coverage than in other previously described rural US regions. In spite of excellent insurance coverage and access to hearing healthcare, patients in Northern US communities do not receive adequate healthcare due to poor self-perception of hearing loss, lack of recommendation to pursue formal testing, and lack of awareness of insurance benefits.

Learning Objective:
To determine prevalence of hearing loss and participant awareness of hearing loss and rehabilitative options.
To identify public awareness of healthcare benefits in a state with excellent public insurance hearing healthcare coverage.
To compare barriers in access to hearing healthcare for residents of rural and urban communities.

Desired Result: To recognize new pathways to overcome barriers to hearing healthcare in Northern US rural and urban communities.

Level of Evidence: Level V

Indicate IRB or IACUC: IRB Study # 00019167, University of Minnesota (June 22, 2023).

Video High Impulse Testing Provides Insight into Patient Reported Outcome Measures and Falls in Patients with and without Unilateral Vestibular Hypofunction

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Anat V. Lubetzky, PT, PhD; Maura K. Cosetti, MD

Objective: To assess the relationship between Video High Impulse Testing (vHIT), caloric weakness, falls, and patient reported outcome measures (Dizziness handicap Inventory, DHI), in patients with and without unilateral vestibular hypofunction (UVH)

Study Design: Cross-sectional

Setting: Academic tertiary referral center

Patients: 23 adults with UVH, mean age 62 (range 32-82) 39 controls, mean age 52 (range 22-78)

Interventions: Diagnostic vestibular testing (vHIT, caloric function); DHI, falls

Main Outcome Measures: vHIT: affected ear gain, saccades

Results: Measured gains and number of saccades correlated with DHI (r=-0.63; r= 0.66 respectively) Patients with overt saccades had higher DHI (MD = 17, 95% CI: $5.5*10^{-5}$ – 33, $p < .001$) and patients with covert saccades had higher DHI (MD = 26 95% CI: 16 – 36, $p < .001$). Of the 10 patients with falls (n = 3 control, n = 7 UVH), 7 patients demonstrated saccades, 6 patients demonstrated overt saccades, and 5 patients demonstrated covert saccades ($p>.05$). Lateral gains in patients with falls were not different than those without falls (MD = -.11, 95% CI: -.28 - .02, p = .09). Caloric weakness correlated with DHI and patients with falls had greater unilateral weakness (r = .69, MD = 21 95%: CI: 5 – 42, p = .009).

Conclusions: Analysis of vHIT data suggests both gain and saccades correlate with DHI. Patients with falls had high frequency of saccades on vHIT and lower gains. This data suggests that vHIT can provide objective corroboration of patient reported outcomes. While caloric testing is the gold standard, vHIT may provide insight into patient handicap without provoking patient symptoms.

Professional Practice Gap & Educational Need: vHIT data and relationship to dizziness handicap and clinical function have been minimally investigated. This study aims to understand the relation between objective and subjective data in dizziness testing.

Learning Objective: To recognize the relationship between vHIT data and patient reported handicap and falls in patients.

Desired Result: Use vHIT data for the diagnosis and treatment of vestibular hypofunction.

Level of Evidence – Level 3

Indicate IRB or IACUC: Approved by the Biomedical Research Alliance of New York LLC Institutional Review Board (BRANY IRB, study #20-02-278-05) on 9/15/21

Pupil Diameter as an Indicator of Task Load during Simulated Mastoidectomies

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Hypothesis: Pupil diameter is a viable indicator of task demand among surgeons performing mastoidectomies.

Background: Temporal bone surgery requires significant cognitive effort to perform. Quantifying this demand is important for surgical training to assess procedural proficiency and identify phases which are particularly challenging. We sought to improve upon traditional evaluation methods by examining pupil diameter–a higher resolution and continuously monitored metric–as a surrogate for task demand in a simulated environment with limited confounders.

Methods: Operators at a single tertiary care institution performed mastoidectomies on a virtual-reality surgical simulator developed in our lab. Operators were divided into experts (fellow or attending) and nonexperts (medical student or resident). Continuous pupil measurements were recorded using a pupil tracking device (Core by Pupil Labs). Operators then completed a NASA Task Load Index (TLX) questionnaire–a well-validated quantifier of task demand–after each mastoidectomy. Spearman correlation and linear regression were used to assess relationships between pupil metrics and TLX responses. T-tests were used to assess differences between groups.

Results: Thirteen operators (3 experts, 10 nonexperts) performed a total of 86 mastoidectomies across 10 different temporal bone anatomies. Pupil diameter (in pixels) correlated positively with task mental demand ($p=0.04$), physical demand ($p=0.002$), temporal demand ($p=0.0001$), and self-rated performance ($p=0.002$). Temporal demand contributed significantly to increased pupil diameter ($p=0.0003$) while frustration contributed significantly to decreased diameter ($p=0.002$). Both average pupil diameter (22.3 vs. 19.2 pixels, $p=0.0009$) and average diameter standard deviation (3.7 vs. 3.2, $p=2E-7$) were larger in experts than in nonexperts, signaling increased cognitive demand.

Conclusions: Pupil diameter correlates significantly with various metrics of task demand during a simulated mastoidectomy. Future studies will investigate additional pupil and gaze characteristics throughout specific phases of surgery.

Professional Practice Gap & Educational Need: Understanding task load of various surgical procedures is important for surgical education, where operator demand can impact performance both positively and negatively. Current methods for evaluating task load are often subjective and static. Pupillometry represents a new assessment platform that can provide more targeted feedback during surgical training, especially in a simulated environment. Validating this platform is important for improving current training practices.

Learning Objective: To introduce otolaryngologists to pupillometry as an intraoperative assessment platform and to provide insights into the validity of pupil diameter as an indicator of surgical task load.

Desired Result: Readers will become familiar with pupillometry and gain an understanding of its applications in assessing task demand.

Level of Evidence - V

Indicate IRB or IACUC: Johns Hopkins University School of Medicine IRB00264318

Pitfalls of the Current Temporal Bone Fracture Classification System

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Aidan Wright, BS; David Z. Allen, MD; Vivian F. Kaul, MD

Objective: To evaluate the utility of the current classification system in predicting outcomes of patients with temporal bone fractures and propose alternative imaging findings that are associated with outcomes.

Study Design: Retrospective study.

Setting: Tertiary referral center.

Patients: Consecutive patients with traumatic temporal bone fractures (TBF) confirmed via CT between 10/8/2019 and 03/22/2024.

Interventions: Diagnostic evaluation.

Main Outcome Measures: Association of TBF type (longitudinal vs transverse, otic capsule sparing vs involving) with clinical outcomes (facial nerve paresis (FNP), hearing loss (HL)) and the presence of imaging findings associated with FNP and HL.

Results: Among 598 temporal bone fractures, 74% were longitudinal and 26% were transverse. Longitudinal fractures had a higher rate of ossicular chain discontinuity (15% v 6%, $p < 0.05$) and transverse fractures were more likely to be otic capsule involving (59% v 20%, $p = 0.006$). There were no significant differences in development of FNP or HL. Patients with otic capsule involving fractures were no more likely to develop FNP or HL than patients with otic capsule sparing fractures. Univariate analysis elicited a higher rate of FNP in patients who had ossicular discontinuity (19% vs. 5%, $p < 0.01$), carotid canal fractures (27% vs. 12.5%, $p < 0.05$), and vascular injury (26% vs. 12.7%, $p < 0.05$) on imaging. Multivariate analysis identified ossicular discontinuity as the sole predictor of FNP (OR = 3.28, 95% CI: 1.08-8.9, $p = 0.0253$).

Conclusions: The current TBF classification system does not provide clinically prognostic value in this patient cohort. A new classification system that incorporates alternative imaging features of the middle ear and carotid artery may provide more clinically useful associations when it pertains to FNP.

Professional Practice Gap & Educational Need: The current TBF classification system is not consistent in providing clinically meaningful prognostic value. We assessed its utility in our patient cohort and suggested alternative imaging findings to be incorporated into a more effective classification system.

Learning Objective: To realize the pitfalls and limitations of the current TBF classification system and explore alternative imaging findings that could provide clinically useful associations with patient outcomes.

Desired Result: Improve the clinical value of the current classification system used for patients with TBF.

Level of Evidence - Level IV.

Indicate IRB or IACUC: UTHealth Houston HSC-MS-24-0358.

Artificial Intelligence and Over-The-Counter Hearing Devices: A Scoping Review

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Objective: To characterize the marketplace for commercially available, over the counter (OTC) hearing augmentation devices that utilize artificial intelligence (AI).

Study Design: Scoping review

Methods: A Google search for "OTC AI hearing devices" was conducted to find OTC hearing devices that incorporate AI. Manufacturer websites were accessed to search for product features, price ranges, and targeted symptoms.

Results: Our search yielded 35 devices, with 4 devices meeting the criteria of OTC hearing augmentation devices incorporating AI. For OTC hearing devices with AI, the prices ranged from $399 to $2,950, whereas OTC devices without AI ranged from $99 to $1,995. Non-OTC hearing device pricing varies based on patient insurance. In non-OTC AI hearing devices, private insurance and Medicaid generally provide coverage depending on individual plans. However, Medicare users, whose age range places them in a population that utilizes hearing devices often, are not provided coverage for hearing care. AI devices primarily target improvements in noise reduction and speech clarity. These OTC AI devices were all indicated for mild-to-moderate hearing loss, unlike IYO Audio, which can address mild-to-moderate hearing loss, but is not indicated as a medical device.

Conclusions: In the growing markets for AI and OTC hearing devices, the implementation of AI and accessibility to this state of the-art equipment has dramatically increased. AI hearing devices emphasize personalization of hearing profiles in real time, focusing on controlling noise spontaneously. While this new technology for hearing loss is exciting, future studies must be conducted to determine a difference in impact on health outcomes with the implementation of AI into hearing augmentation devices.

Professional Practice Gap & Educational Need: Growing prevalence of advanced AI technology in the OTC hearing device market changes how clinicians may inform patients of their intervention options. Therefore, awareness of the market available to patients is crucial for medical decision making.

Learning Objective: To improve awareness of devices available on the market for OTC hearing devices and develop an understanding of the features provided by implementing AI into these devices.

Desired Result: We hope clinicians can gain a deeper understanding of AI hearing devices available OTC to patients to best guide them in finding an audiologic intervention that suits their hearing needs.

Level of Evidence – N/A

Indicate IRB or IACUC: Exempt.

Magnetic Resonance Imaging (MRI) Markers of Temporal Bone Pneumatization

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Richard H. Wiggins, MD; Neil S. Patel, MD

Objective: Computed tomography (CT) imaging of the temporal bones is often obtained prior to routine otologic and cochlear implant surgery to assess surgical anatomy. However, magnetic resonance imaging (MRI) is often required in cochlear implant candidates for indications such as asymmetric hearing and evaluation of cochlear fluid signal. Obtaining both studies prior to a routine case is costly and inefficient. The objective of this study is to identify markers on MRI that correlate with temporal bone pneumatization assessed by CT and may obviate the need for CT in anatomically typical, unoperated ears.

Study Design: Retrospective review.

Setting: Tertiary academic referral center.

Patients: Fifty-two adult subjects (92 ears) who underwent both contrast-enhanced MRI brain and CT temporal bone without contrast from 2013-2022. Twelve ears were excluded due to prior temporal bone surgery or temporal bone pathology interfering with imaging measurements.

Interventions: Contrast-enhanced MRI brain and CT temporal bone without contrast.

Main Outcome Measures: Volume of pneumatized temporal bone on CT and MRI linear measurements in the axial and coronal planes were assessed using Horos software. Statistical analyses were performed with SPSS version 29. Pearson correlations between medical student and neurotologist/neuroradiologist measurements were 0.89 or greater ($p<0.05$).

Results: Laterality was 48% right and 52% left. Median volume of pneumatized temporal bone was 11.33 (interquartile range [IQR] 8.24 – 15.25) cm^3. Median MRI linear measurements were the following: sigmoid to mastoid cortex 7.11 mm (IQR 5.55-8.50 mm), sigmoid to external auditory canal (EAC) 14.70 mm (IQR 12.36-17.59 mm), EAC to temporal lobe 5.85 mm (IQR 4.76-6.98 mm), and jugular bulb to internal auditory canal (IAC) 6.68 mm (IQR 5.51-8.26 mm). On univariable, binary logistic regression analysis, distance from the sigmoid to mastoid cortex, sigmoid to EAC, and EAC to temporal lobe were associated with volume of pneumatized temporal bone ≥ 12 cm^3, while jugular bulb to IAC was not. On multivariable binary logistic regression analysis, the following remained associated with volume of pneumatized temporal bone ≥ 12 cm^3: distance from the sigmoid to mastoid cortex (odds ratio: 1.45, 95% confidence interval (CI): 1.05-2.00; median (IQR) of 5.87 mm (4.94-7.24 mm) with volume < 12 cm^3 and 8.48 mm (7.06-9.97 mm) with volume ≥ 12 cm^3) and EAC to temporal lobe (odds ratio: 2.00, 95% CI: 1.10-3.66; median (IQR) of 5.02 mm (4.28-6.06 mm) with volume < 12 cm^3 and 6.92 mm (5.94-7.43 mm) with volume ≥ 12 cm^3).

Conclusions: A minimum sigmoid to mastoid cortex distance of 8 mm and EAC to temporal lobe distance of 7 mm are highly correlated with a well-pneumatized temporal bone. These clinically useful measurements provide insight into the pneumatization of the temporal bone that may obviate the need for CT in routine cases.

Professional Practice Gap & Educational Need: MRI markers associated with temporal bone pneumatization are unknown. Identification of these markers may preclude the need for CT in uncomplicated cases.

Learning Objective: To determine the MRI makers that correlate with temporal bone pneumatization assessed by CT.

Desired Result: Increase understanding of MRI markers that are correlated with temporal bone pneumatization that may obviate the need for CT in anatomically typical, unoperated ears.

Level of Evidence – IV

Indicate IRB or IACUC: IRB 00045048; University of Utah

Sleep Quality of Service Members and Veterans with and without Reports of Dizziness

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Objective: Sleep management may exacerbate dizziness symptoms and worsen patient fall risk. The purpose of this study was to evaluate the sleep quality of active-duty service members (ADSM) and Veterans with and without reports of dizziness.

Study Design: Cross-sectional study.

Setting: Multi-institutional tertiary care.

Patients: ADSM and Veterans (n=1,524) enrolled in the Noise Outcomes In Servicemembers Epidemiology (NOISE) study.

Interventions: Survey.

Main Outcome Measures: Sleep disorder and Epworth Sleepiness Scale scores.

Results: Self-reported dizziness was found in 27% of the sample. Common symptoms included "Feeling faint or light-headed" (40%), "Loss of balance" (27%), and "Spinning sensations" (24%). Those with dizziness were 1.7 (95% CI: 1.3, 2.2) times more likely to have a sleep disorder and 1.6 (95% CI: 1.2, 2.2) times more likely to experience excessive daytime sleepiness than those without dizziness.

Conclusions: Patients with self-reported dizziness were more likely to have poor sleep quality. More work is needed to determine if poor sleep is an independent risk factor for dizziness, or alternatively, a factor for worsening better-established causes of vestibular insults and compensation. Management of sleep disorders should be considered in patients being evaluated for dizziness, and physical therapists may also consider integrating sleep hygiene education into vestibular therapy.

Professional Practice Gap & Educational Need: Current practice patterns often overlook the connection between dizziness and sleep disorders, despite evidence that poor sleep quality exacerbates dizziness symptoms and increases fall risk. Routine screening for sleep disturbances is not consistently performed, leading to suboptimal patient outcomes. Addressing this gap can enhance the comprehensive care of individuals with dizziness, particularly within the military and veteran populations.

Learning Objective: Understand the relationship between dizziness and sleep quality in service members and Veterans; Incorporate sleep disorder screening into clinical practice.

Desired Result: Increase awareness of the prevalence of sleep disorders in patients with dizziness, leading to better screening, management, and patient outcomes.

Level of Evidence: Level III

Indicate IRB or IACUC: Joint VA Portland Health Care System/Oregon Health and Science University (#3159/9495 and #4655/22488) and 59th Medical Wing/Joint Base San Antonio Military Healthcare System (#FWH20180143H)

Anatomy-Specific Virtual Safety Barriers for Cooperative Control Robotic Temporal Bone Surgery

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Adnan Munawar, PhD; Manish Sahu, PhD; Russell H. Taylor, PhD
Francis X. Creighton, MD

Hypothesis: Virtual safety barriers can be enforced in cooperatively controlled robotic mastoidectomies with submillimeter accuracy to prevent damage to critical structures.

Background: Temporal bone surgery is technically challenging, with complex anatomy and landmarks often encased in bone. Cooperatively controlled robots (CCRs), in which a surgeon and robot manipulate an instrument simultaneously, can improve the accuracy and safety of this surgical domain. These systems allow for robotic precision while leveraging the surgeon's technical expertise. As an added safety measure, CCRs can implement virtual safety barriers around relevant anatomy to prevent intraoperative damage. This study assesses the feasibility and accuracy of anatomy-specific CCR-enforced safety barriers for temporal bone surgery.

Methods: The CCR used in this study consists of a 5-degrees-of-freedom gantry arm that carries an optically tracked surgical drill. Three cadaveric temporal bone specimens were registered to this CCR. Preoperative CT images were segmented to identify relevant anatomy (e.g., ossicles, inner ear, facial nerve, chorda, sigmoid sinus). A safety barrier of 0.5mm was set along all structures, and the robot was programmed to provide resistance scaled by the proximity of the drill to the closest anatomy. Robot-assisted mastoidectomies were performed by the senior author, with deliberate effort to skeletonize the facial nerve and expose the sigmoid sinus. Postoperative CT scans were obtained and compared against preoperative segmentations.

Results: Mastoidectomies were successfully completed for all specimens without violation of critical structures. Distance (mean±SD) from the drilled mastoid cavity and the facial nerve and sigmoid sinus were 0.285±0.461mm and 0.587±0.966mm, respectively.

Conclusions: This study shows the feasibility of anatomy-aware virtual safety barriers in robot-assisted temporal bone surgery. Future studies will investigate replacing optical tracking with computer vision-based instrument tracking.

Professional Practice Gap & Educational Need: Although previous studies describe the use of robotic guidance in performing mastoidectomy, prior work has focused on autonomous designs. Our work in developing a CCR for surgery, in which the surgeon and robot work together to manipulate the surgical instrument, demonstrates a semi-autonomous method which allows the system to benefit from the surgeon's inherent skill and knowledge, while providing increased safety. To our knowledge, this is the first assessment of anatomy-specific CCR-enforced virtual barriers for temporal bone surgery reported in a clinical venue.

Learning Objective: The learning objectives were to examine the efficacy of using a cooperatively controlled robotic system for temporal bone surgery and to determine the accuracy of robot-enforced virtual safety barriers around relevant anatomy.

Desired Result: We hope our study will highlight the role of robotics in otology and will spark discussion of methods to improve this technology in the future.

Level of Evidence – Level V

Indicate IRB or IACUC: Johns Hopkins School of Medicine IRB00264318

Association between Cigarette, E-Cigarette, and Marijuana Use and Eustachian Tube Dysfunction

Kaitlin Hori, BS; Tyler Gallagher, BS; Janet S. Choi, MD, MPH

Objective: To evaluate the association between cigarette, E-cigarette and marijuana use and obstructive eustachian tube dysfunction (OETD) in US adults.

Study Design: Cross-sectional

Methods: Multivariable regression analysis of National Health and Nutrition Examination Survey (2015-2018)

Patients: Participants (>= 18 years) with data on tympanometry, pure-tone audiometry, and drug and smoking questionnaires (n=18,383).

Interventions: Cigarette, E-cigarette and marijuana use were evaluated based on never, former or current use.

Main Outcome Measures: OETD was defined as middle ear pressure < -100 decapascals (daPa).

Results: 5.9% of US adults [95%CI 4.9%-7.2%] had OETD. When accounting for demographics and other drug use, current cigarette use was significantly associated with OETD (OR2.6, 95%CI 1.5-4.0), while former use was not (OR1.2, 95%CI 0.6-2.6). For E-cigarettes, 6% [95%CI 5.2%-6.7%] were current users and 16.1% [95%CI 14.6%-17.6%] were former users. When accounting for demographic factors, former e-cigarette use was significantly associated with OETD (OR1.9, 95 %CI 1.1-3.1) while current use was not (OR2.0, 95%CI 0.9-4.2). When additionally adjusting for cigarette smoking, there was no significant association between former or current e-cigarette use and OETD. For marijuana, 14.1% [95%CI 12.2%-16.4%] were current users and 26.1% [95%CI 24.0%-28.5%] were former users. When accounting for demographic factors, current marijuana use was significantly associated with OETD (OR2.3, 95%CI 1.3-4.3), while former use was not (OR0.8, 95%CI 0.4-1.4). When adjusting for cigarette smoking, former or current marijuana use was not associated with OETD. A subgroup analysis among never cigarette smokers found no significant associations between independent e-cigarette or marijuana use and OETD.

Conclusions: In this national cohort, traditional cigarette smoking was independently associated with OETD, while e-cigarette and marijuana use was not. Further studies can explore the independent and combinatorial impact of e-cigarette and marijuana use on OETD.

Professional Practice Gap & Educational Need: There lacks current consensus on the association between E-cigarette and marijuana use and obstructive eustachian tube dysfunction. This study provides preliminary insight into the relationship between the use of these drugs and OETD.

Learning Objective: To explore the relationship between cigarette, E-cigarette and marijuana use and OETD in a national sample.

Desired Result: To recognize that cigarette, E-cigarette and marijuana use can be associated with OETD. However, future research needs to explore the discrete and additive effects of these drugs on the development of OETD.

Level of Evidence – Level 3

Indicate IRB or IACUC: Exempt

Eustachian Tube Dysfunction following LeFort I Orthognathic Surgery: A Prospective Cohort Study

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Ethan McGann, MD; Michael Eliason, MD

Objective: To prospectively evaluate the incidence of eustachian tube dysfunction following LeFort I orthognathic surgery.

Study Design: We conducted a prospective cohort study to evaluate the occurrence of new-onset ETD following LeFort I orthognathic surgery.

Setting: A single, tertiary-care, military treatment facility.

Patients: Adult patients undergoing LeFort I orthognathic surgery.

Interventions: The validated Eustachian Tube Dysfunction Questionnaire 7 (ETDQ-7) was administered to patients undergoing LeFort I orthognathic surgery, The same questionnaire was administered 3 months following surgery.

Main Outcome Measures: ETDQ-7 total score and mean item score following LeFort I surgery. Multivariate analysis was performed to stratify the data based on age, race, and gender.

Results: Preliminary analysis suggests no significant change in incidence of ETD following LeFort I surgery. Pre-operative mean item score average was 1.97; total score 13.8, with postoperative mean item score average being 1.79; total score 12.5, an overall decrease, not reaching statistical significance. As the study is ongoing, multivariate analysis has been postponed as further data is collected.

Conclusions: LeFort I osteotomes are commonly performed to improve dental occlusal abnormalities. Major anatomic shifts of the mid face may result in many unintended physiologic changes. We hypothesized that advancing the maxilla relative to the skull base could theoretically change the orientation of the eustachian tube, and thus, decrease its functionality. However, our preliminary results do not support this. Further data should be collected in this realm to adequately analyze this relationship, allowing for proper patient counseling.

Professional Practice Gap & Educational Need: Eustachian tube dysfunction has not been described as a complication of LeFort I orthognathic surgery to our knowledge. This represents an anatomically interesting surgical complication which is not discussed by surgeons when counseling patients.

Learning Objective: To 1) review the muscular and skeletal anatomy of the eustachian tube as it relates to LeFort orthognathic surgery and 2) discuss the impact of this surgery on the physiology of the eustachian tube and its relevance to peri-operative counseling.

Desired Result: To further characterize the impact of LeFort orthognathic surgery on the structure and function of the eustachian tube.

Level of Evidence - Level III

Indicate IRB or IACUC: Navy Medical Readiness and Training Command - Portsmouth IRB 0072

ENTGPT: A Large Language Model for Automated Data Extraction in Otolaryngology

Akash Kapoor, BS; Joshua Fuller, BS; Michael A. Hewitt, BA
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Hypothesis: We hypothesized that a large language model (LLM) can accurately extract data from otolaryngology charts.

Background: Manual chart review is time-intensive yet essential for clinical research. While LLMs show promise in automating data extraction, their potential in otolaryngology remains unexplored. In this study, we compare an LLM's performance in extracting clinical data to a manual chart review.

Methods: We extracted de-identified clinical notes from 40 patients previously reviewed by research fellows for a published study. ENTGPT (built with GPT-4o) was given notes from multiple providers, specialties, and time points and asked to extract study variables. Variables were categorized as “discrete” (e.g. implanted ear), “calculated” (e.g. pre-operative pure-tone average), and “clinical judgement” (e.g. hearing loss etiology). For clinical judgment variables, the model provided both discrete answers and descriptive summaries. A negative control (patient height), absent from the notes, was also requested. Accuracy was calculated and verified by a board-certified otolaryngologist.

Results: The model achieved 100% accuracy in extracting discrete variables (95% CI: 0.98-1.0) and correctly identified the absence of the negative control variable (95% CI: 0.91-1.0). For variables requiring calculation, accuracy was 98% (95% CI: 0.96-0.99). For descriptive variables, the LLM’s discrete answer had a concordance of 63% (95% CI: 0.54-0.71) with the manually extracted data. However, the descriptive summaries were medically accurate 100% of the time (95% CI: 0.97-1.0) as determined by physician review.

Conclusions: ENTGPT reliably extracted clinical variables from complex charts without hallucination, performing best on discrete and calculated variables. For variables requiring clinical judgement, descriptive summaries were accurate and useful. LLMs have the potential to transform retrospective clinical studies, by streamlining data extraction and saving significant time for researchers.

Professional Practice Gap & Educational Need: Otolaryngology is a complex surgical subspecialty with diverse patient presentations, making chart review heterogeneous and challenging to automate. Manual chart review is time-intensive and often essential for clinical research and trial enrollment. Limited literature is available evaluating the efficacy of LLMs in otolaryngological data extraction.

Learning Objective: To review the application and limitations of large language models in clinical data extraction, assess the accuracy of a large language model on a heterogenous set of otolaryngology data, and provide a blueprint for use of this tool in otolaryngology.

Desired Result: This study supports the potential role of Large Language Models as tools to streamline data extraction and saves significant time for researchers to ask more clinical questions and derive insights from patient charts.

Level of Evidence – N/A

Indicate IRB or IACUC: IRB approved, IRB #AAAV4730

Evaluation of Electrode Placement and Cochlear Implantation Results in Incomplete Partition Type I

Anna K. Piecuch, MD; Piotr H. Skarzynski, Prof; Henryk Skarzynski; Prof

Objective: Evaluation of cochlear implant electrode position in a cystic cochlea lacking modiolus and spiral lamina and auditory assessment of early and long-term results of cochlear implantation in incomplete partition type I.

Study Design: Retrospective case review.

Setting: Tertiary referral center; ambulatory and hospital.

Patients: The study group included 6 patients (3 males and 3 females) with a congenital inner ear defect of cystic cochleovestibular malformation (IP I), bilateral (n=5), IP I with another inner ear defect in the opposite ear (n=1). Cochlear implant (CI) for IP I defect was implanted in 6 patients, 2 of them bilaterally (8 ears with CI). The mean age at first cochlear implantation was 12 years 4 months (range: 11 months - 38 years).

Interventions: Diagnostic, therapeutic, and rehabilitative.

Main Outcome Measures: Assessment of straight electrode position using CT images. Post-implantation effects were assessed with the following tests: behavioural observation audiometry (BOA) and visual reinforced audiometry (VRA) in children, free-field threshold audiometry and adaptive auditory speech test in adolescents and adults.

Results: Average CI implant electrode position in a cystic cochlea lacking a modiolus and spiral lamina (IP I): 523.33 degrees. CI implant effects: early - children's BOA test and VRA mean 67.17dB (n=3) after 4 months, early - adaptive auditory speech test 20% in quiet, 15% in noise (n=1) after 1 year. Late effects: free-field threshold audiometry mean 34.44dB (n=3) at 5, 8 and 10 years, adaptive auditory speech test 50% in quiet, 20% in noise (n=1) at 12 years after implantation.

Conclusions: It is possible to effectively stimulate the auditory nerve in a cochlea without a modiolus by stimulating the cochlear wall region. The distal effects of cochlear implantation in patients with IP I can be satisfactory but depend on the age of implantation and the length of rehabilitation.

Professional Practice Gap & Educational Need: Lack of knowledge about the indications for cochlear implantation and the locations of auditory nerve fibre stimulation in a type I incompletely partitioned cochlea without a miodiolus.

Learning Objective: Education and indications on cochlear implantation for IP I and the need for preoperative diagnostic imaging to select an appropriate electrode in a cochlea without a modiolus (straight).

Desired Result: Patients with IP I are suitable candidates for cochlear implantation and can achieve satisfactory results with CI after a long period of rehabilitation.

Level of Evidence - Level V

Indicate IRB or IACUC: Exempt.

Pain Medication Prescribing Trends Among Otologists and Neurotologists

Zachary Buxo, MD; Masanari Kato, MD; Lulia Kana, MD; Robert S. Hong, MD, PhD

Objective: Describe pain medication prescribing patterns of otologists and neurotologists.

Study Design: Retrospective cohort study.

Method: Otologists and neurotologists were identified through the National Plan and Provider Enumeration System National Provider Identifier Registry between 2013-2022 and their respective pain medication claims data through the Medicare Part D Prescribers by Provider and Drug database. Prescribing patterns were then evaluated over time.

Results: 195 prescribers were included annually on average (±10.4). Opioids were consistently prescribed more frequently than non-opioids. Hydrocodone-acetaminophen was the most prescribed pain medication by volume, totaling 3806 claims by 75.4% of surgeons in 2013 down-trending to 3200 claims by 54.5% of surgeons in 2022. Negative trends by percent of active prescribers were observed in most combination opioids and positive trends in non-combination opioids with oxycodone demonstrating the greatest increase in percent prescribers over time (+9.9%) and hydrocodone-acetaminophen the greatest decrease (-20.9%). Among non-opioids, gabapentin was the most frequently prescribed, accounting for 174 total claims by 3.7% of surgeons in 2013, growing to 1361 claims by 11.5% of surgeons in 2022. Either static or positive trends were observed in non-opioids with gabapentin experiencing the greatest increase in active prescribers over time (+7.8%). On linear regression, absolute claim counts for opioids decreased (-39.7/year) while non-opioids increased (+198.9/year).

Conclusions: Opioids consistently remain the most prescribed pain medications among otologist and neurotologists, although steady changes are observed in the profile of medications utilized. Non-opioids appear to be increasingly adopted in practice.

Professional Practice Gap & Educational Need: Prescribing patterns of pain medications by otologists and neurotologists are not well-characterized.

Learning Objective: Understand recent trends and underlying rationales in opioid and non-opioid prescribing patterns among otologists and neurotologists.

Desired Result: Increase awareness of appropriate pain medication prescribing practices amongst otologists and neurotologists.

Level of Evidence: Level V

Indicate IRB or IACUC: Exempt

Association of Chronic Otitis Media with Rhinologic and Otologic Variations: A High-Resolution Computed Tomography Study

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Shakir Ullah, MBBS, FCPS; Zeeshan Ali, MBBS

Objective: To compare anatomical variations between diseased and healthy sides of the skull of patients with unilateral chronic otitis media (COM).

Study Design: With-in-subject case-control study

Setting: Department of ENT of Khyber Teaching Hospital, Peshawar, Pakistan

Patients: 50 adult patients with unilateral COM

Interventions: High-resolution computed tomography scans of temporal bone and paranasal sinuses.

Main Outcome Measures: Prevalence of rhinologic and otologic anatomical variants in the COM and healthy sides. Statistical comparison using McNemar's test for categorical variables and paired t-tests for continuous variables. Effect sizes (Cohen's d for continuous variables, Cramér's V for categorical variables) and odds ratios (OR) for significant findings.

Results: Among rhinologic variants, a deviated nasal septum was more frequent on the COM side compared to the healthy side (19 vs 8; $p = 0.05$, OR = 2.37), and the angle of septal deviation was significantly larger on the COM side (1.89 ± 2.66 vs 0.46 ± 1.13; $p = 0.003$, Cohen's $d = 0.44$). Concha bullosa was more common on the COM side (18 vs 9; $p = 0.04$, OR = 3.25). Sinus opacification and turbinate hypertrophy showed no statistically significant discordance between the two sides ($p > 0.05$). Among otologic variants, the mastoid was less pneumatized (4 vs 20) and more frequently sclerotic on the COM side (39 vs 12; $p < 0.01$, Cramér's V = 0.54). The prevalence and thickness of the Korner septum were similar on both sides ($p > 0.05$). Eustachian tube lengths were comparable between sides, but the Eustachian tube angle was narrower on the COM side (22.09 ± 1.80 vs 22.90 ± 1.76; $p = 0.01$, Cohen's $d = 0.34$). The tubotympanic angle was wider (148.86 ± 3.57 vs 144.76 ± 2.15; $p < 0.001$, Cohen's $d = 0.96$), and the pretympanic diameter was smaller on the COM side (3.30 ± 0.77 vs 3.91 ± 0.56; $p < 0.001$, Cohen's $d = 1.01$).

Conclusions: Significant anatomical differences were observed between the diseased and healthy sides of the skull in patients with unilateral chronic otitis media, particularly in the nasal septum, concha bullosa, mastoid pneumatization, and Eustachian tube anatomy.

Professional Practice Gap & Educational Need: There is a lack of awareness regarding the anatomical variants associated with unilateral chronic otitis media, and their potential role in disease pathogenesis. Educating clinicians on identifying and considering these variants could enhance diagnostic accuracy and treatment outcomes in patients with COM.

Learning Objective: To understand the anatomical disparities between the COM-affected and healthy sides in patients with unilateral chronic otitis media, and how these findings may influence clinical decision-making and treatment strategies.

Desired Result: Clinicians will improve their understanding of the anatomical factors contributing to chronic otitis media, enabling more precise diagnostic evaluations and personalized treatment plans that address these underlying anatomical issues.

Level of Evidence - Level III

Indicate IRB or IACUC: 495/DME/KMC

The Upside-Down Approach with a Lazy-S Incision for Osia Implantation

David Shimunov MD; Huseyin Isildak, MD

Objective: To introduce and evaluate the efficacy of an alternative "upside-down" approach with a "lazy-S" incision for the implantation of the OSIA300 bone conduction hearing system, aimed at improving patient comfort, sound localization, and cosmetic outcomes.

Study Design: A descriptive case study evaluating surgical outcomes and improvements associated with the modified OSIA300 implantation technique.

Setting: Tertiary care center.

Patients: Patients indicated for OSIA300 bone conduction hearing implants, particularly those transitioning from traditional bone-anchored hearing systems (BAHA).

Interventions: The intervention involves an "upside-down" approach for OSIA300 implantation, repositioning the actuator and coil for enhanced performance, alongside a "lazy-S" incision to reduce skin tension and improve cosmetic outcomes.

Main Outcome Measures: The main outcomes measured include the absence of surgical and post-operative complications, improved sound localization, and enhanced patient comfort, especially with headwear.

Results: The modified technique resulted in successful implantations without complications. Sound localization was improved by positioning the coil closer to the ear canal, and patient comfort was enhanced, particularly in relation to headwear.

Conclusions: The "upside-down" approach with a "lazy-S" incision presents several advantages over traditional OSIA300 implantation techniques, offering improved patient comfort, sound localization, and cosmetic outcomes, while simplifying the surgical process. This method is especially beneficial for patients transitioning from BAHA systems.

Professional Practice Gap & Educational Need: There is a need for improved surgical techniques that enhance patient outcomes, specifically regarding ease of surgery, comfort in OSIA300 implantation, and transition to OSIA from BAHA system.

Learning Objective: To understand the surgical technique and benefits of the "upside-down" approach with a "lazy-S" incision for OSIA300 implantation.

Desired Result: The application of this technique should result in improved patient comfort, better sound localization, and reduced complications.

Level of Evidence - Level V

Indicate IRB or IACUC: Exempt.

Audiologic Outcomes in Temporal Bone Trauma Patients

Nina Gallo, MD; Ashley Kraft, MD; Anna Rawls, BS; Zahide Fang, MD; Rahul Mehta, MD

Objective: To evaluate the audiologic outcomes in patients sustaining temporal bone fractures by comparing hearing loss on the ipsilateral side to the contralateral side and to assess the implications for clinical management and patient care.

Study Design: Retrospective chart review

Setting: Data was collected from a tertiary medical center.

Patients: The study cohort consisted of 431 patients diagnosed with temporal bone fractures between January 2010 and December 2020. Of these, 147 patients had detailed audiologic assessments available for analysis.

Interventions: Audiologic data, including pure tone averages (PTA), speech reception thresholds (SRT), and word recognition scores (WRS), were collected and analyzed for each patient. The ipsilateral ear (fractured side) was compared to the contralateral ear (non-fractured side).

Main Outcome Measures: The primary outcomes assessed were PTA, SRT, and WRS in both fractured and non-fractured ears, as well as the impact of facial nerve paralysis on hearing outcomes.

Results: The mean PTA was 36±28 dB on the fractured side versus 20±13 dB on the non-fractured side. The mean SRT was 28±22 dB on the fractured side versus 18±12 dB on the non-fractured side. The mean WRS was 86±26% on the fractured side and 96±10% on the non-fractured side. 77% of fractured ears exhibited serviceable hearing (PTA <50 dB and WRS >50%) compared to 96% in non-fractured ears. Patients with complete facial nerve paralysis demonstrated significantly poorer audiologic outcomes (PTA: 68±38 dB, WRS: 58±34%) compared to patients with incomplete paralysis (PTA: 25±15 dB, WRS: 94±8%). Higher follow-up rates were observed among patients presenting with subjective hearing loss, vertigo, and cerebrospinal fluid (CSF) leaks.

Conclusions: Temporal bone fractures have a considerable impact on hearing outcomes, with significant audiologic differences between fractured and non-fractured ears. Early and targeted audiologic rehabilitation is crucial for optimizing long-term auditory outcomes.

Professional Practice Gap & Educational Need: There is a clear need to increase awareness of the audiologic complications associated with temporal bone fractures and to implement early diagnostic and rehabilitative interventions, including routine hearing assessments and tailored rehabilitation strategies.

Learning Objective: To understand the impact of temporal bone fractures on audiologic outcomes and recognize the importance of early diagnosis and treatment to optimize hearing recovery.
Desired Result: Improved long-term patient outcomes through enhanced follow-up care, targeted audiologic interventions, and better patient education on the risks of hearing loss after temporal bone trauma.
Level of Evidence - III

Indicate IRB or IACUC: IRB approval was obtained from LSUHSC-New Orleans, University Medical Center New Orleans, and Our Lady of the Lake Baton Rouge (IRB #367428).

Decreasing Medicare Reimbursement for Facility-Performed Neurotology Procedures from 2000 to 2024

Julia J. Shi, BA; Rance J. T. Fujiwara, MD; Lisa M. Punnen
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Objective: To understand trends in Medicare reimbursement for neurotology procedures from 2000 through 2024.

Study Design: The Physician Fee Schedule (PFS) Look-Up Tool from the Center for Medicare and Medicaid Services was utilized to assess reimbursement data for relevant otologic/neurotologic Current Procedural Terminology (CPT) codes from 2000 through 2024. All monetary data were adjusted to 2024 U.S. Dollars using the U.S. Bureau of Labor Statistics Consumer Price Index. Percent changes in reimbursement were calculated.

Setting: Center for Medicare and Medicaid Services

Patients: Not applicable.

Interventions: Not applicable.

Main Outcome Measures: Nominal and inflation-adjusted reimbursement for selected otology and neurotology procedures.

Results: The average nominal value of reimbursement for all procedures from 2000 to 2024 increased from $1400.54 (SD $714.52) to $1557.38 (SD $796.26), representing a 11.2% increase from 2000 to 2024. However, after adjusting for inflation, the average Medicare reimbursement decreased by 33.52% from $2576.99 (SD $1314.72) to $1713.12 (SD $875.88). Changes in inflation-adjusted reimbursement ranged from -66.43% for CPT code 69714 (osseointegrated implant) to +43.43% for CPT code 61798 (gamma knife radiosurgery). An increase in reimbursement for all CPT codes occurred only in 2024. This increase was associated with the calendar year 2024 PFS final rule, which came into effect on March 9 and increased the PFS conversion factor from $32.7442 to $33.2875. From 2000 to 2024, the PFS conversion factor decreased from $36.6137 to $33.2875.

Conclusions: From 2000 to 2023, Medicare reimbursements for otologic and neurotologic procedures decreased after adjusting for inflation. The only year with an increase in reimbursement was 2024, which saw an increase to the PFS conversion factor. These trends highlight the need for greater awareness of, and agreement on, neurotology reimbursement models amongst surgeons, policy makers, and facility administrators.

Professional Practice Gap & Educational Need: Several studies have described temporal trends in Medicare reimbursement rates in otolaryngology, including various subspecialties. No prior studies to our knowledge have described these trends in the otologic and neurotologic setting.

Learning Objective: To understand changes in Medicare reimbursement rates for otologic and neurotologic procedures, differences between nominal and inflation-adjusted values, and how policy changes have impacted reimbursement rates

Desired Result: To raise awareness of discrepancies between nominal and inflation-adjusted reimbursement rates and provide evidence for future policy initiatives

Level of Evidence – N/A

Indicate IRB or IACUC: Exempt