SELECTED ABSTRACTS

POSTER PRESENTATIONS

IN ORDER OF PRESENTATION

156th Annual Meeting
AMERICAN OTOLOGICAL SOCIETY

May 5-6, 2023
Sheraton Boston / Hynes CC
Boston, MA

Temporal Trends in Early Pediatric Cochlear Implantations in California from 2018 to 2020

Rance J.T. Fujiwara, MD, MBA; Emily C. Wong, MD
Gail Ishiyama, MD; Akira Ishiyama, MD

Objective: To characterize the demographics of children receiving cochlear implantations, identify factors associated with delayed implantations, and trend the impact of these factors over time

Study Design: Retrospective cross-sectional study

Setting: Healthcare Cost and Utilization Project California State Ambulatory Surgery Database for calendar years 2018-2020

Patients: Children ≤5 years old undergoing cochlear implantation

Interventions: cochlear implantation (*CPT* 69930)

Main Outcome Measures: The population-controlled number of cochlear implantations was calculated and stratified by race and insurance. Early implantation was defined as implantation at age ≤2 years old. A mixed effects logistic regression model was generated to identify factors associated with early implantation and how that association changed from 2018 to 2020.

Results: The final cohort included 467 children who underwent cochlear implantation. The number of implantations increased from 141 to 175 implants from 2018 to 2020 (24.1% increase); 229 (49.0%) children were implanted at ≤2 years of age. Medicaid insurance was associated with decreased odds of early implantation (OR 0.18 [95% CI 0.15-0.23], $p<0.001$), and this association with Medicaid insurance was significant when stratified across all racial groups. Black children had decreased odds of implantation at less than 2 years of age (OR 0.63 [95% CI 0.43-0.94], $p=0.02$), but Black children with private insurance had equal or higher odds of implantation than white children with private insurance (OR 4.13 [95% CI 1.26-13.46], $p=0.02$). Among children insured by Medicaid, the percentage who were implanted prior to 2 years old increased from 20.9% to 62.0% from 2018 to 2020.

Conclusions: Among children in California, socioeconomic factors, in particular public insurance, are associated with differences in access to early cochlear implantation. These disparities improved significantly from 2018 to 2020. Further investigation into changes and initiatives in California during this time frame, and barriers to access which may remain for differential socioeconomic groups, may aid in directing national efforts to improve pediatric cochlear implantation access.

Professional Practice Gap & Educational Need: variations in age of pediatric cochlear implantation relative to guidelines

Learning Objective: to understand variations in pediatric cochlear implantations and factors associated with delays, as well as how these trends have changed over time

Desired Result: to spur and encourage additional research to identify actionable, targetable measures for pediatric populations at risk for delayed implantation

Level of Evidence – Level III

Indicate IRB or IACUC : IRB#21-000110

The Role of Resident and Migrating Macrophages towards Sensory Hearing Loss in Chronic Suppurative Otitis Media

Viktoria Schiel, MD, PhD; Anping Xia, MD, PhD; Ritwija Bhattacharya, PhD
Ankur Gupta, MD; Peter Santa Maria, MD, PhD

Background: CSOM is a worldwide disease that afflicts 330 million people worldwide and is the most common cause of hearing loss in children in the developing world. We have previously found that macrophages are the main immune cells in the cochlea mirroring the timing of hair cell loss.

Hypothesis: In this report we investigated the function of resident and migrating cochlear macrophages towards hair cell loss in CSOM.

Methods: We investigated in our novel pseudomonas aeruginosa PA CSOM animal model, previously validated to mimic the human disease. We depleted cochlear resident macrophages by using the CSF-1 receptor inhibitor PLX5622 before inoculating them with PA. We determined macrophage numbers in the cochlea and hair cell loss at different timepoints (1, 3, 7, and 14 days) during the infection course using immunohistochemistry and confocal microscopy.

Results: We found that depletion of cochlear resident macrophages did not affect hearing or cause hair cell damage in wild type mice. This shows that resident cochlear macrophages are not required to maintain hearing. Total macrophages were significantly reduced in the cochlea after depletion of resident macrophages at all assessed timepoints during the infection, compared to the control group without depletion ($p < 0.05$). In CSOM, we did not find any hair cell loss after 1 and 3 days in both groups. However, we found hair cell loss at 7 and 14 days in both groups. We found significantly less hair cell loss at 14 days when resident cochlear macrophages were previously depleted ($p = 0.04$). The number of hair cells in the basal turn of the cochlea remained as 29/100 μm of the basilar membrane after depleting macrophages and 19/100 μm of the basilar membrane in the control group.

Conclusion: These data suggested that both the resident and migrating macrophages play a role in CSOM associated hair cell loss. Our further research plan will focus on the underlying molecular mechanism between macrophages and hair cell loss.

Professional Practice Gap & Educational Need: We propose to investigate how sensory hearing loss (SHL) is caused by chronic suppurative otitis media (CSOM): severe chronic middle ear infections. CSOM is a neglected disease that afflicts 330 million people worldwide and is the most common cause of permanent hearing loss among children in the developing world. It is characterized by a chronically discharging infected middle ear, and there is currently no effective cure.

Learning Objective: To investigate the role of resident and migrating macrophages towards hair cells loss in chronic suppurative otitis media.

Desired Result: To show the underlying mechanism between cochlear macrophages and hair cells in CSOM and identify macrophages as a potential target for therapy to prevent sensory hearing loss in CSOM;

Level of Evidence – Level III

Indicate IRB or IACUC : APLAC (Administrative Panel on Laboratory Animal Care, Stanford University) protocol number 32855

AOS POSTER F003

Fourth-generation Fluoroquinolones Fail to Show Improvement over Earlier Generations in Treating Chronic Suppurative Otitis Media

Adam C. Kaufman, MD, PhD; Brian S. Bacacao, BS; Devesh Sharma, MD
Laurent A. Bekale, PhD; Peter L. Santa Maria, MD, PhD

Hypothesis: Fourth-generation fluoroquinolones, compared to earlier generations of fluoroquinolones, will be more effective at eliminating biofilms and persister cells rapidly in *in-vivo* achievable concentrations.

Background: Fourth generation fluroquinolones were created to expand the spectrum of activity against gram-positive bacteria and delay the development of resistance. Whether this has led to improved efficacy in treating CSOM compared to earlier generations is unknown. Confusion has developed around the optimal first line topical antibiotic to be used to treat CSOM.

Methods: Bacterial and biofilm growth with quantification by spectrophotomer, *in-vivo* antibiotic treatment of murine CSOM, persister cell assay

Results: Moxifloxacin and ciprofloxacin have achievable minimum inhibitory concentrations for controlling planktonic clinical strains of *pseudomonas aeruginosa* and *staphylococcus aureas in-vitro*. Neither drug was able to eliminate biofilms of these strains in a 10-minute exposure window, however 24-hour exposure was. Ciprofloxacin had a lower minimal biofilm eradication concentration than moxifloxacin for 70% of the strains. Repeated exposure to sub-lethal concentrations of both drugs led to rapid development of intra- and extra-class resistance. Lastly, i*n vivo* CSOM infection recurred in all mice after the completion of treatment with moxifloxacin. There was no improvement in the bacterial load after treatment.

Conclusions: Moxifloxacin is effective at eliminating biofilm and persister cells *in-vitro* but fails *in-vivo*. Ciprofloxacin, although from an older generation, was as effective, if not more, than moxifloxacin. Neither generation was able to avoid the development of resistance developing. When choosing a first line topical antibiotic agent for treating CSOM, cost of agent may be the only major distinction between fluoroquinolones.

Professional Practice Gap & Educational Need: Ambiguity exists in determining the ideal first-line topical antibiotic treatment for CSOM. Newer generations of fluoroquinolones were created under the premise that they would have better bacterial coverage and develop less resistance. This has not been explicitly tested in CSOM.

Learning Objective: Ciprofloxacin, a second-generation fluoroquinolone, has equal, if not better coverage of the most common clinical bacterial strains of CSOM than moxifloxacin, a fourth-generation fluoroquinolone. Both fail to avoid the development of resistance.

Desired Result: Otolaryngologists should be choosing their topical antibiotic choice for CSOM based on availability and pricing as there does not appear to be a microbiologic difference between generations of fluoroquinolones.

Level of Evidence – N/A; Basic Science

Indicate IRB or IACUC : Stanford IACUC # 3353

The Efficacy of Amniotic Membrane as a Non-Autologous Graft in Tympanoplasty

Jeffrey Liaw MD; Juan C. Yanez-Siller, MD, MPH
Arnaldo L. Rivera MD

Objective: Amniotic membrane grafts for tympanoplasty have been described in the past for tympanic membrane repair in small studies. Published data regarding outcomes of these grafts, however, is lacking. This study reviews a series of patients who underwent tympanoplasty with amniotic membrane grafts and compares their outcomes with patients who underwent tympanoplasty with temporoparietal fascia or tragal cartilage.

Study Design: Retrospective review

Setting: Tertiary academic center

Patients: Patients undergoing tympanoplasty for tympanic membrane perforations

Interventions: Patients underwent underlay tympanoplasty for repair of tympanic membrane perforation with either amniotic membrane, temporoparietal fascia, or tragal cartilage grafts, as determined by the surgeon.

Main Outcome Measures: Rate of intact tympanic membrane on post-operative evaluation

Results: 114 patients were identified undergoing tympanoplasty from September 2021 to September 2022. Three patients were lost to follow-up. Overall, 93.7% of tympanic membranes were intact on follow up. Among the 37 cases using amniotic membrane grafts, 94.6% of tympanic membranes were intact on follow up. Of these cases, 23 were primary repairs, 14 were revision. Of the 33 cases using temporoparietal fascia grafts, 90.9% of tympanic membranes were intact on follow up. Of these cases, 24 were primary repairs, 9 were revision. Of the 41 cases using tragal cartilage grafts, 95.1% of tympanic membranes were intact on follow up. Of these cases, 26 were primary repairs, 15 were revision.

Conclusions: Amniotic membrane grafts appear to be as effective as autologous tissue for tympanoplasty. Amniotic membrane grafts may be especially useful for revision tympanoplasties with limited graft options.

Professional Practice Gap & Educational Need: Non-autologous graft materials have been described in the past for tympanic membrane repair. It obviates the need for a graft harvest which can prove beneficial in revision tympanoplasties where an autogenous graft may not be easily available. Non-autologous grafts also provide and can provide a uniform scaffold for consistent wound healing. To date, there is a lack of data regarding the outcome of amniotic membrane as a graft for tympanoplasty. This study was performed to evaluate the outcomes of patients who underwent tympanoplasty with amniotic membrane graft and compared them to the outcomes of patients in the same cohort who underwent tympanoplasty with temporoparietal fascia or tragal cartilage grafting.

Learning Objective: To understand the current gap in knowledge regarding the use of amniotic membrane grafts in tympanoplasty and appreciate its potential use as an option as a commercially available non-autologous graft.

Desired Result: Increased utilization of amniotic membrane as a non-autologous graft for tympanoplasty.

Level of Evidence: IV

Indicate IRB or IACUC : Exempt.

Multicenter Exploration of the Effect of Diabetes Mellitus on Tympanoplasty Outcomes

Jose H. Ting, MD; Jonathan Palmer, BS; Benjamin D. Lovin, MD; Alizah S. Gomez, MD
Alex D. Sweeney, MD; Hamid Djalilian, MD; Jacob B. Hunter, MD

Objective: To investigate whether diabetes mellitus (DM) or an elevated Hemoglobin A1c (HbA1c) impact tympanoplasty closure rates and hearing outcomes.

Study Design: Retrospective chart review.

Setting: Three tertiary care centers.

Patients: Adult patients who underwent tympanoplasties for tympanic membrane perforations without ossiculoplasties or mastoidectomies over a 10-year period.

Interventions: Therapeutic

Main Outcome Measures: Graft success at 3-months follow-up, defined as closure of perforation. Secondarily, audiometric measures of success, defined as a closure of the air-bone gap pure tone average to <10 dB.

Results: A total of 607 patients were included, aged 18 to 89 years (mean [SD], 48.3 [15.7]). Overall, 121 patients had DM, with 41 patients having HbA1c values within 4-months of surgery. The average HbA1c value was 7.0% (range, 5.1 – 13.5%). Patients with and without DM had 3-month tympanoplasty closure rates of 84.4% and 87.0%, respectively ($p < 0.001$). Patients with a HbA1c >6.5% (n = 18) (mean 8.6%) and those with a HbA1c <6.5% (n=23) (mean 5.8%) had 3-month closure rates of 72.2% and 82.6%, respectively (p=0.425). Comparing audiometric outcomes in 229 patients, air-bone gap (ABG) pure-tone average closure to <10 dB with DM versus no DM diagnoses was 29.8% and 35.4%, respectively, ($p = 0.473$), and ABG closure rates between HbA1c>6.5% and <6.5% were 0% and 20%, respectively.

Conclusions: Patients with a DM diagnosis have lower tympanoplasty closure rates as compared to those patients without DM. No association was found between DM diagnosis and ABG closure rates.

Professional Practice Gap & Educational Need: Currently, the effect of DM on tympanoplasty outcomes has not been evaluated. This study provides useful knowledge for preoperative counseling for patients and improving preoperative risk assessment in patients with DM.

Learning Objective: To evaluate the effect of DM on tympanoplasty outcomes

Desired Result: Changes in physician knowledge and patient outcomes

Level of Evidence – III

Indicate IRB or IACUC : University of Texas Southwestern Medical Center, #STU-2019-1753;
Baylor University, Protocol H-50149; University of California Irvine, #20173403

Improving Sound Localization While Wearing a Hearing Protection Device Through Neuroplasticity Training

Jason K. Adams, MD; Samuel A. Spear, MD; Jeffrey R. Mock, PhD; Jeremy T. Nelson, PhD
Jacek A. Walasek, BS; Enrique T. Piedra, BS; Carlos R. Esquivel, MD; Edward J. Golob, PhD

Objective: Noise induced hearing loss is a common hazard US military service members routinely encounter. Service members may choose not to use hearing protection devices (HPDs) due to impaired spatial hearing and situational awareness at the risk of future hearing loss, tinnitus and reduced operational effectiveness. Spatial hearing in central pathways exhibit neuroplasticity in early development and after unilateral hearing loss, alteration to pinna shape and cochlear implantation. Taking advantage of the principle that auditory pathways can adjust how they process spatial information to counteract disruptions from HPDs, the purpose of this study is to investigate whether focused training effort improves spatial hearing.

Study Design: Prospective study

Setting: Academic research center

Patients: Normal hearing volunteers

Interventions: Spatial hearing training, three consecutive days of 45 minute training sessions

Main Outcome Measures: Sound localization acuity, front-back confusions

Results: HPDs impair sound localization acuity (45% worse, $p<.001$) and increase front-back confusions (6x worse, $p<.001$) relative to performance without HPDs. After three days of spatial hearing training, sound localization and front-back confusion errors were reduced greater than 50%. The greatest improvements were seen after the first day of training. Training effects were specific to HPD wearers and did not influence non-wearing HPD controls. On training days, listening effort increased before vs. after training ($p<.01$) but was comparable across training days.

Conclusions: Relatively brief training can reduce HPD impairment on spatial hearing by about half, potentially leading to increased service member compliance in HPD use.

Professional Practice Gap & Educational Need: Acute noise induced hearing loss is a common hazard US military service members routinely encounter, hearing conservation through minimized exposure and hearing protective devices are the mainstays of treatment. Service members may not use hearing protective devices due to impaired spatial hearing and reduced situational awareness thus increasing wear compliance would reduce future hearing loss risk.

Learning Objective: To determine the role of spatial hearing training in improving sound localization while wearing hearing protective devices.

Desired Result: Participants will understand the effect brief auditory training has on spatial hearing while wearing hearing protective devices.

Level of Evidence – III

Indicate IRB or IACUC : FY20-21-25, Title: Hearing Protection with Neuroplasticity

Adverse Events Associated with Vibrant Soundbridge: A MAUDE Study

Christopher Yam, MS; Adam Hammer; Esther Lee, DO; Timothy Shaver, MD
Punam Thakkar, MD; Ashkan Monfared, MD

Objective: To summarize adverse events and their root causes reported to the United States Food and Drug Administration (FDA) on Vibrant Soundbridge (VSB) hearing device (Med-El, Innsbruck, Austria), an active middle ear implant for patients with moderate to severe hearing loss.

Study Design: The FDA's Manufacturer and User Facility Device Experience (MAUDE) database was queried for reports of VSB adverse events from January 1, 2012, to July 27, 2022.

Setting: Database

Patients: Patients implanted with VSB.

Interventions: VSB implantation.

Main Outcome Measures: Adverse events and their root causes related to VSB.

Results: Six hundred sixty-three total medical device reports were identified, from which 979 adverse events were extracted. Of these, 564 (57.6%) were adverse events to patients (AEPs), while 415 (42.4%) were device malfunctions (DMs). The most common AEPs were hearing performance issues 428 (75.9%). The most common DMs were compromised conductive link 125 (30.1%). Root causes identified for DMs were surgical errors 74 (55%), patient-related 31 (23%), and external causes 29 (21.6%). The most common surgically related errors involved damage to the conductive link during revision surgery 12 (14.1%). The most common patient-related causes of DMs were excessive middle ear tissue growth 16 (57%), and abrupt body movements 5 (17.9%). The most common external cause of DM was cleaning of the ear canal or mastoid cavity 20 (69%).

Conclusions: Despite its well-known limitations, the MAUDE database provides valuable information on possible complications of VSB as it relates to device malfunction or adverse events for patients. Implementation of standardized reports with relevant and well-defined categories could certainly allow for a more meaningful analysis.

Professional Practice Gap & Educational Need: Obtain an understanding of adverse events and their root causes related to VSB.

Learning Objective: Develop an understanding of the adverse events and their root causes related to VSB.

Desired Result: Heightened awareness of the adverse events and their root causes related to VSB.

Level of Evidence – N/A

Indicate IRB or IACUC: Exempt.

Targeted Immune Inhibitor Therapies to Prevent Noise-Induced Hearing Loss

Kourosh Eftekharian, MD, MPH; Anping Xia, MD, PhD; Viktoria Schiel, MD, PhD
Ritwija Bhattacharya, PhD; Ankur Gupta, MS; Peter L. Santa Maria, MBBS, PhD

Hypothesis: The immune response may play a role in hair cell injury after noise exposure and targeted immune therapies may prevent hearing loss during noise exposure.

Background: Noise-induced hearing loss (NIHL) is the second most common sensorineural hearing deficit after presbycusis, affecting almost 1 in 5 adults in the US. Many reports have shown that noise trauma can result in two types of injury to the inner ear: temporary threshold shift (TTS) or permanent threshold shift (PTS). After acoustic trauma, macrophages increase in number and migrate throughout the cochlea. The migrating macrophages and injured tissue inside the cochlea release cytokines and other toxic factors that could enhance the inflammation causing further damage.

Methods: We expose cohorts of six to eight-week-old CBA/CaJ mice to a noise band of 8-16 kHz frequency at 100 dB SPL for two hours to generate TTS. Mice receive an immune inhibitor therapy as the treatment group, and others receive placebo as the control group before and after noise exposure. The auditory brainstem response (ABR) and distortion-product otoacoustic emission (DPOAE) are measured before, immediately, three days, seven days, and fourteen days after noise exposure in the treatment and control group. Cochlear samples are collected, and immunohistochemistry is performed afterward to assess the hair cell injury. The control group receives no treatment.

Results: We report the ABR and DPOAE before and after, as well as cochlea immunohistochemistry after noise exposure, for the treatment and control groups.

Conclusions: We report on the potential for immune inhibitors for protection from noise-induced hearing loss.

Professional Practice Gap & Educational Need: Recent evidence shows the increase of macrophages in the cochlea as a response to noise exposure. Until now, there has been less attention to the role of macrophages in NIHL.

Learning Objective: Understand the potential role of immune inhibitors after noise exposure in the damage to hair cells.

Desired Result: Using immune inhibitors as a possible agent to reduce the damage after noise exposure.

Level of Evidence: N/A

Indicate IRB or IACUC: Stanford University – Stanford APLAC Number: 32855

Predisposing Factors for the Development of Superior Canal Dehiscence Syndrome

Pavan S. Krishnan, BA; Oren Wei, BS; Eric J. Formeister, MD, MS; Desi P. Schoo, MD
Nicholas S. Andresen, MD; Zahra N. Sayyid, MD, PhD; John P. Carey, MD

Objective: To correlate occupational and recreational histories and events with development of symptoms of SCDS.

Study Design: Retrospective case series.

Setting: Tertiary referral center.

Patients: Adult patients with superior canal dehiscence syndrome (SCDS) who underwent surgical repair.

Interventions: Not applicable.

Main Outcome Measures: Data on occupational and recreational histories, inciting events, and presenting symptoms were collected from the medical records.

Results: Records of 254 patients were reviewed. Fifty-eight percent were female; average age was 49 years. Thirteen percent underwent bilateral surgeries. Of those with a reported occupation (n=120), 24% had sedentary desk jobs, 16% were healthcare workers or veterinarians, 10% were educators, and 6.8% were musicians. Four patients reported occupational noise exposure that may have contributed to symptoms. Of the 25 reported hobbies, 72% were a form of physical exercise (weightlifting, running, etc.) and 24% were musical instrument players; scuba diving, flying airplanes, and singing were each reported once (4%). Records described trauma (e.g., fall, motor vehicle accident, etc.) in 15% of patients, an internal cause (e.g., Valsalva-induced such as sneezing or coughing, etc.) in 13%, and an external cause not involving trauma (e.g., loud noise exposure, ambient pressure changes such as during SCUBA diving) in 12%. In patients with at-risk occupational and recreational histories (n=63), presenting symptoms were autophony to voice (86%), bone-conduction hyperacusis (78%), pulsatile tinnitus (63%), sound-induced vertigo or oscillopsia (71%), and pressure-induced vertigo or oscillopsia (63%).

Conclusions: Certain occupational and avocational factors may predispose to development of symptoms of SCDS.

Professional Practice Gap & Educational Need: Superior Canal Dehiscence Syndrome (SCDS) was first described in 1998 by Minor et al., but the mechanism of pathogenesis is still unclear. Proposed mechanisms include congenital thinning of the otic capsule that may require a second event disrupting the bone entirely thus exposing the membranous labyrinth. This theory is originally based on a 1999 study of temporal bone histopathology specimens and has been substantiated by several case series and reports. No large-scale review of patients with SCDS has been conducted to identify predisposing histories and events that may play a role in the development of symptoms of SCDS. There is a scientific need for further understanding of how events causing a full dehiscence are associated with the development of symptoms required for diagnosis of the *syndrome*.

Learning Objective: Participants should be able to describe theories of pathophysiology of SCDS, most common occupational and recreational histories of patients diagnosed with SCDS and presenting symptoms consistent with SCDS.

Desired Result: Participants will gain an understanding of how certain occupational and recreational activities may contribute to presenting symptoms of SCDS. Our results will give participants further insight into the development of SCDS.

Level of Evidence - V

Indicate IRB or IACUC : Johns Hopkins School of Medicine's Institutional Review Board (IRB00324480)

Outcomes after Exoscopic versus Microscopic Tympanoplasty

Caleb J. Fan, MD; Jacob C. Lucas, MD; Robert M. Conway, DO
Seilesh C. Babu, MD

Objective: To analyze the outcomes of exoscopic versus microscopic tympanoplasty

Study Design: Retrospective chart review

Setting: Tertiary care otology-neurotology practice

Patients: Adult subjects with a diagnosis of tympanic membrane perforation from 2018-2022.

Interventions: Exoscopic or microscopic tympanoplasty with cartilage+perichondrium or perichondrium/fascia graft

Main Outcome Measures: Primary outcomes were graft success rate at the first postoperative visit and operative time. Secondary outcomes at 6-month follow-up included audiometric outcomes of postoperative air-bone gap (ABG), change in ABG, pure tone average (PTA), speech reception threshold (SRT), and word recognition score (WRS) and complication rates of delayed graft failure, cerebrospinal fluid leak, facial nerve injury, persistent tinnitus, and persistent vertigo.

Results: Seventy-one subjects underwent tympanoplasty by a single surgeon. Thirty-six subjects underwent exoscopic tympanoplasty and 35 subjects underwent microscopic tympanoplasty. Cartilage+perichondrium was utilized in 27 subjects (75.0%) in the exoscopic group and in 25 subjects (71.4%) in the microscopic group (p=0.7). Graft success rate was 97.2% (35/36, 95% CI [86%,100%]) in the exoscopic group and 97.1% (34/35, 95% CI [85%,100%]) in the microscopic group (p=1.0). Operative time was 57.7 minutes for the exoscopic group and 65.4 minutes for the microscopic group (p=0.08). Each group had 2 cases of delayed graft failure (p=1.0) with no other complications. Preoperative and postoperative audiometric outcomes were comparable (postoperative exoscope vs microscope, p-value): ABG (10.9dB vs 9.2dB, p=0.06), change in ABG (8.9dB vs 7.5dB, p=0.6), PTA (29.1dB vs 25.6dB, p=0.5), SRT (26.2dB vs 24.0dB, p=0.7), and WRS (95.5% at 65.0dB vs 93.6% at 62.8dB, p=0.5).

Conclusions: The outcomes after exoscopic tympanoplasty are comparable to those after microscopic tympanoplasty.

Professional Practice Gap & Educational Need: The current standard of care is that otologic surgery is performed with a microscope. Newer technologies such as the endoscope and exoscope have become more popular in recent years, which requires a comparison of patient outcomes to uphold standards in otologic surgery.

Learning Objective: The outcomes after exoscopic tympanoplasty are comparable to those after microscopic tympanoplasty.

Desired Result: For otologic surgeons and patients to understand that newer technologies such as the exoscope do not sacrifice outcomes in tympanoplasty surgery.

Level of Evidence – IV

Indicate IRB or IACUC : Exempt

Developing Hearing Screening Outreach: Successes and Challenges

Emily G. Evangelista, MS; Jesse Casanova, MS; Kimberly Coca, MD
Tamsyn Barlow, MBChB; Ayanda Gina, MECI, BSC
Julia Toman, MD; Sibiya, A. MBChB, MMed

Objective: The burden of auditory disease that lies on elderly populations in old-age homes is exacerbated by widespread patterns of hearing loss under-detection. The purpose of this study was a pilot attempt at building a routine hearing screening program that is contextually realistic and sustainable for the population.

Study Design: A multi-center remote hearing screening pilot.

Setting: Old-age homes in Durban, South Africa.

Patients: Patients >65 years old residing in old-age homes.

Interventions: Otoscopy, tympanometry, pure-tone testing, DIN testing, on-site cerumen removal, hearing aid fitting, and audiologist referral.

Main Outcome Measures: Subjective improvement with cerumen removal, auditory testing results, interventions performed, follow-up required.

Results: 85 patients were tested and of these patients 50 (58.8%) required referral to either an ENT or audiologist. This study demonstrated the need for routine testing and hearing health monitoring among population groups living in old-age homes.

Conclusions: Optimization of clinical documentation for clarity and conciseness, standardization of clinical notetaking, and collaboration with local clinics and providers for fluid patient follow-up are all adjustments that could be made to improve the efficiency and effectiveness of the outreach. Local stakeholders should have well-described pipelines for referrals, clinical documents pre-defined and readily available, and a short training session for clinical volunteers one day prior to screening.

Professional Practice Gap & Educational Need: Partnership between local medical centers, university collaboration, and administrators and residents in old-age homes.

Learning Objective: Successes and areas for improvement for a remote hearing screening program in old-age homes.

Desired Result: Guidance for best practice in a collaborative approach to standardize hearing screening development in old-age homes in Durban, South Africa.

Level of Evidence – III

Indicate IRB or IACUC: Exempt.

Risk Analysis Index Frailty Score Predicts Non-Home Discharge following Cochlear Implantation

Traeden Wilson, BS; Kavellin Rumalla, MD; Alis Dicpinigaitis, MD
Christian Bowers, MD; Richard Gurgel, MD, MSCI

Background: The Risk Analysis Index (RAI) uses clinical and patient-reported factors to generate a score to classify a patient's frailty and predict their risk for adverse outcomes following surgery. We aimed to study the prognostic significance of preoperative frailty measured by RAI for prediction of non-home discharge (NHD) after cochlear implantation.

Study Design: The National Inpatient Sample (NIS) 2006-2018 was queried using ICD codes to identify discharges associated with cochlear implantation. Baseline frailty scores and discharge outcomes were analyzed using crosstabulation chi-square tests. Discriminatory accuracy was assessed by computation of C-statistics.

Setting: The NIS is the largest public all-payer inpatient database in the United States, containing data on over seven million hospital stays per year.

Patients: 4913 patients discharged following cochlear implantation were included in the study.

Interventions: RAI.

Main Outcome Measures: NHD disposition.

Results: Baseline frailty, mean (SE) RAI score was 7.4 (0.5) with scores categorized for analysis: 0-9 (61%), 10-20 (31.7%), and 21+ (7.3%). For discharge destination, 93.9% were routine home, 3.3% to facility, and 2.7% home with home health. The NHD rate increased significantly with increasing RAI score: 1.7% for 0-9, 3.2% for 10-20, and 18.0% for 21+ ($p<0.001$). The RAI score predicted primary endpoint of NHD with acceptable discriminatory accuracy ($c=0.750$), whereas the mFI-5 score demonstrated poor discrimination ($c = 0.688$).

Conclusions: This is the first application of the RAI for measurement of frailty and prediction of outcomes after cochlear implantation. Increasing frailty, as determined by RAI, may help predict NHD in patients undergoing cochlear implantation.

Professional Practice Gap & Educational Need: Patients and clinicians may believe that older patients should not be considered for CI due to risks of surgery. Many studies have been devoted to the safety of CI in older adults, though few report on an accurate metric to account for medical comorbidities, i.e., frailty, and how frailty may impact the postoperative course of CI patients. This study utilizes a novel way to stratify risk – the RAI- to determine whether increasing frailty may require more intensive post-operative monitoring for discharge to home.

Learning Objective: Understanding RAI's predictive ability on postoperative complications, namely non-home discharge, following CI.

Desired Result: To provide a metric that can risk stratify adult CI patients for post-operative complications or non-home discharge.

Level of Evidence - Level III

Indicate IRB or IACUC: University of Utah IRB_00147585

Ageism in Hearing Loss Diagnosis and Treatment

Emily M. Ishak; Michael W. Denham, MPhil; Maeher R. Grewal
Justin S. Golub, MD, MS

Objective: To explore the relationship between age and hearing loss (HL) diagnosis/treatment for those with borderline/mild hearing loss (≥20 to <40 dB pure-tone average).

Study Design: Cross-sectional epidemiologic study (National Health and Nutrition Examination Survey; NHANES)

Setting: US community

Subjects: ≥12 years old with borderline/mild HL

Methods: Multivariable logistic regressions controlling for hearing level. Age (the predictor of interest) was grouped into quartiles (Q1: <25 years; Q2: 25-49 years, Q3: 50-74 years; Q4: ≥75 years). Q1 was used as a reference in all odds ratios.

Main Outcome Measures: Hearing test within the past 1 or 4 year(s), hearing aid usage

Results: Of 2,115 subjects with borderline/mild HL, 3% (n=53) were in age quartile Q1; 7% (n=147) were in Q2, 56% (n=1,190) were in Q3, and 34% (n=725) were in Q4. Compared to Q1, those in Q2, Q3, and Q4 had 4.06 times (95% CI=2.11-8.02, $p<0.001$), 4.51 times (2.56-8.19, $p<0.001$), and 4.56 times (2.55-8.39, $p<0.001$) lower odds of a hearing test within the past 4 years. Similar, although slightly larger, odds ratios were obtained when the outcome was hearing test within 1 year. Compared to Q1, those in Q2, Q3, and Q4 respectively had 4.38 times (1.47-13.5, $p<0.05$), 5.41 times (2.27-11.8, $p<0.001$), and 3.95 times (1.65-8.72, $p<0.05$) lower odds of using a hearing aid.

Conclusions: A large, unaddressed disparity exists in the diagnosis and treatment of borderline/mild HL as individuals age out of the first quartile of life.

Professional Practice Gap & Educational Need: To raise awareness of disparities in screening and treatment of HL in individuals older than the first quartile of life.

Learning Objective: To identify the relation between age and likelihood of a recent hearing test and hearing aid usage among those with borderline/mild HL.

Desired Result: Increased HL testing and treatment for the aging population.

Level of Evidence – III

Indicate IRB or IACUC: Exempt

Real-Time Virtual Surgical Scene Representation and Tool Tracking for Temporal Bone Procedures

Jesse D. Haworth, BSE; Andy S. Ding, MD, MSE; Manish Sahu, PhD
Katherine J. Zhu, BS; Russell H. Taylor, PhD
Francis X. Creighton, MD; Robin Yang, MD

Background and Objectives: Given the complex anatomy of the temporal bone, image navigation systems have been developed to help identify nearby critical structures but have been hampered by subpar registration accuracy. In this study, we show feasibility of an optical tracking system that can accurately create virtual representations of the surgical scene including tools and pre-operative cone-beam computed tomography scans (CBCTs).

Methods: Three temporal bone phantoms were 3D-printed with a photopolymer resin. Optical markers were attached to each phantom and to an Anspach EG1 drill. An Atracsys tracking system was used to intraoperatively locate optical markers on the surgical drill and phantoms. Six 2-mm divots were placed on the surface of each phantom for verification of the visualization system. Pre-operative CBCTs obtained for each phantom were then segmented using 3D Slicer, denoting the coordinate of each divot. A pivot calibration was performed to determine the drill tip's location with respect to the Atracsys. Using the virtual visualization software RViz, the drill was overlaid onto the phantom segmentation. Accuracy of the system was evaluated by comparing drill tip positions in RViz to divot positions segmented from CBCTs.

Results: Euclidean distance was calculated between each divot coordinate from RViz and the corresponding point on CBCT. The result was an average error of 0.79mm with a standard deviation of 0.28mm.

Conclusions: We developed a real-time virtual representation for temporal bone procedures with submillimeter registration accuracy. This technology could integrate with other computer-aided surgical systems to accurately determine the position of surgical instruments relative to critical anatomy.

Professional Practice Gap & Educational Need: Although image navigation systems exist for temporal bone surgery, our study is the first to show a system that is also able to virtually represent surgical scenes and accurately depict surgical tool locations in this space. This functionality has a variety of applications, including the ability to 1) replay surgeries in a 3D virtual space, 2) examine and determine optimal drilling paths for freehand procedures, 3) generate training data for neural network applications, and 4) determine the location of instruments relative to underlying anatomy in real-time to improve surgical safety.

Learning Objective: This experiment was designed to determine if the current visualization system could accurately represent the surgical scene in virtual space.

Desired Result: We hope our study inspires further research to utilize and develop computer-aided surgical technologies like this in other applications of otolaryngology.

Level of Evidence – N/A – Feasibility study only.

Indicate IRB or IACUC: IRB00322104

Endoscopic versus Microscopic Resection of Glomus Tympanicum

Ansley J. Kunnath, BA; Michael H. Freeman, MD; Nathan R. Lindquist, MD
Kareem O. Tawfik, MD

Objective: Comparison of short and long-term outcomes of microscopic and endoscopic resection of glomus tympanicum (GT) tumors.

Study Design: Retrospective case review

Setting: Single tertiary referral center

Patients: All adult patients undergoing GT resection without mastoidectomy from 2007-2021

Interventions: Surgical resection – endoscopic versus microscopic approach. Preoperative and postoperative audiometry was also performed.

Main Outcome Measures: Primary outcomes were tumor recurrence at 1 year and presence of residual tumor at conclusion of surgery. Secondary outcome measures included operative time, postoperative air-bone gap, postoperative symptom resolution, and surgical complications.

Results: 38 patients underwent resection of GT (76% female, mean age 59 years). 29 cases were performed microscopically, 8 cases were endoscopic, and 1 case was endoscopic-assisted microscopic. Both endoscopic and microscopic approaches yielded high rates of complete tumor resection (7/8 endoscopic cases, 27/29 microscopic cases). There was no significant difference in operative time (136 minutes for microscopic; 138 minutes for endoscopic). There was no difference in mean postoperative air-bone-gap between microscopic and endoscopic approaches (p=0.20). One patient in the endoscopic group who had residual tumor at the time of surgery was found to have clinically significant tumor recurrence after 5.2 months. The remaining patients in our cohort were not found to have tumor recurrence after a mean follow-up of 21.2 months.

Conclusions: These results suggest comparable outcomes with both endoscopic and microscopic approaches. Endoscopic transcanal resection of glomus tympanicum does not appear to compromise surgical outcomes.

Professional Practice Gap & Educational Need: Establishment of non-inferiority of endoscopic glomus tympanicum resection

Learning Objective: Endoscopic and microscopic approaches to glomus tympanicum are not different in terms of operative time, recurrence rate, or audiometric outcome.

Desired Result: Non-inferiority

Level of Evidence – IV

Indicate IRB or IACUC: Vanderbilt University Medical Center IRB, #220712

Impact of CCR2 Deletion on Outer Hair Cells in Chronic Suppurative Otitis Media

Ankur Gupta, BA; Anping Xia, MD, PhD; Viktoria Schiel, MD, PhD
Ritwija Bhattacharya, MS; Kourosh Eftekharian, MD, MPH
Peter L. Santa Maria, MD, PhD

Hypothesis: Deletion of CCR2 enhances outer hair cell loss through reduction of migrating macrophages in the cochlea of mice with CSOM

Background: Chronic Suppurative Otitis Media (CSOM) is one of the most common causes of permanent hearing loss among children in the developing world. It is characterized by chronically draining middle ear, with no effective cure. We have shown that CSOM induces an inflammatory macrophage response in the inner ear, associated with hair cell damage. We have also revealed that CCL-2, part of the monocyte chemoattractant protein (MCP) family, is elevated over time following middle ear infections. MCP receptor CCR2 has been implicated in many neurodegenerative disorders. In our current study, we investigate the role of CCR2 on hair cell damage in CSOM.

Methods: PCR genotyping was done to isolate CCR2-/-, CCR2+/-, and CCR2 +/+ mice. We inoculated Pseudomonas bacteria to the mouse middle ear cavity for generating CSOM and monitored them at 7 and 14 days after middle ear infection, time points before and after hair cell damage occurs in our model. We dissected the cochlea to assess hair cell damage with whole mount specimens and evaluated macrophages within cross sections.

Results: Our results measure the OHC survival number, with Myosin VIIa immunostaining, in the cochlear basal, middle, and apical turns at 7 and 14 days. We also measured the number of F4/80 macrophages with F4/80 immunostaining in the cochlear turns.

Conclusions: In the future, we will continue to learn more about the mechanism in which CCR2 influences the immune response in the inner ear and whether it plays a protective or harmful role on hair cells in CSOM.

Define Professional Practice Gap & Educational Need: Limited understanding in the inflammatory mechanism of action in the inner ear that causes sensorineural hearing loss in CSOM.

Learning Objectives: 1. Develop an understanding of the mechanism of inner ear inflammation in CSOM.
2. Study possible pathways that may explain the role of CCR2 on outer hair cells.

Desired Result: Deletion of CCR2 demonstrates increased outer hair cell loss relative to CCR2 control in mice with CSOM, showing a possible mechanism in sensorineural hearing loss due to cochlear inflammatory response.

Level of Evidence does not Apply – Basic Science Study

IRB/IACUC: Stanford APLAC 32855

The Hampshire Sheep as a Large-Animal Model for Cochlear Implantation

Nicholas A. Waring, BS; Brandon J. Vilarello, BA; Yew Song Cheng, MD
Elizabeth S. Olson, PhD; Hideko Heidi Nakajima, MD, PhD; Alexander Chern, MD

Hypothesis: The round window membrane (RWM) in Hampshire sheep is surgically accessible via an extended facial recess approach without sacrificing the facial nerve.

Background: Sheep have been proposed as a large-animal model for studying cochlear implantation. However, in the limited literature, cochlear implantation in studied sheep breeds has required either sacrifice of the facial nerve or a retrofacial approach to access the RWM. Here we use Hampshire sheep to assess RWM accessibility via a facial recess approach.

Methods: Five temporal bones from adult female Hampshire sheep were surgically prepared with a mastoidectomy and extended facial recess approach for access to the RWM. Sheep were pre-screened for *Coxiella burnetii*. RWM visibility was graded using St. Thomas' Hospital (STH) classification. Micro-CT scans with a slice thickness of 80 microns were obtained for all temporal bones. Cochlear implant (CI) electrode insertion was performed (Nucleus® 24 Contour Advance™ Practice Electrode), with micro-CT confirmation of appropriate electrode placement and insertion depth.

Results: RWM was exposed in all specimens without sacrificing the facial nerve. Under the STH classification, RWM visibility was determined to be Type I (100% visibility) for 2 specimens and Type IIA (>50% visibility) for 3 specimens. Facial nerve was exposed in 2 specimens. Chorda tympani was sacrificed in all specimens. Successful CI electrode insertion was confirmed by micro-CT.

Conclusions: Contrary to other breeds reported in the literature, Hampshire sheep appear to be a suitable large-animal model for CI electrode insertion through an extended facial recess approach without sacrificing the facial nerve.

Professional Practice Gap & Educational Need: Sheep are a suitable large-animal model for cochlear implants and other implantable hearing devices; however, the sheep breeds currently reported in the literature have unfavorable anatomy for RWM access via a facial recess approach and require either sacrifice of the facial nerve or a retrofacial approach. Here, we report a breed of sheep that allows for RWM access via a facial recess approach with preservation of the facial nerve. This breed is thus potentially better suited for large-animal studies of cochlear implants and other implantable hearing devices.

Learning Objective: To evaluate RWM accessibility via the facial recess in Hampshire sheep.

Desired Result: Describe the anatomic suitability of the Hampshire sheep as a useful animal model for research on cochlear implants and other implantable hearing devices.

Level of Evidence - N/A

Indicate IRB or IACUC: Exempt.

A Systematic Review of Otologic Manifestations of Hematologic Malignancies

Allie M. Ottinger, BS; Mallory J. Raymond, MD; M. Andrew Rowley, BS
Michael Bobian, MD; James Dornhoffer, MD
Emily Brennan, MLIS; Habib G. Rizk, MD

Objective: To examine the array of otologic and neurotologic symptoms, physical exam findings, and imaging features of patients with hematologic malignancies.

Data sources: PubMed, Scopus, and CINAHL were searched through February 26, 2021.

Study selection: English language articles that included patients with hematologic malignancies with 1) inner, middle, or outer ear manifestations, and/or 2) temporal bone, cerebellopontine angle, vestibulocochlear or facial nerve involvement.

Data extraction: Patient and study demographics, timing and classification of otologic symptoms and physical exam findings, associated imaging features, and methods of diagnoses.

Data synthesis: Pooled descriptive analysis was performed within the three broadly defined malignancies of leukemia, lymphoma and multiple myeloma. Two-hundred seventy-two articles reporting on 553 patients, of whom 307 had leukemia, 204 had lymphoma and 42 had multiple myeloma, were included. Hearing loss and unilateral facial palsy were the most common presenting symptoms for 111 reported subjects with leukemia (n=46, 41.4%; n=43, 38.7%) and 90 with lymphoma (n=38, 42.2%; n=39, 43.3%). Similarly, hearing loss and otalgia were the most common presenting symptoms for 21 reported subjects with multiple myeloma (n=10, 47.6%; n=6, 28.6%). Hearing loss and unilateral facial palsy were the most common otologic symptoms indicative of relapse in subjects with leukemia (n=14, 43.8%) and lymphoma (n=5, 50%), respectively.

Conclusions: The otologic symptoms of hearing loss, facial palsy, and otalgia might be the first indication of a new diagnosis or relapse of leukemia, lymphoma, or multiple myeloma. Providers should have a heightened level of suspicion of hematologic malignant etiologies of otologic symptoms in patients with current or past medical histories of these malignancies.

Professional Practice Gap & Educational Need: Otologic manifestations of hematologic malignancies are diverse and overlap with many common otologic conditions. To date, the literature on otologic manifestations of hematologic malignancies has been comprised primarily of rare or unique presentations, limiting clinicians' abilities to evaluate the medical necessity of investigating a hematologic malignancy as a cause of a relatively common otologic symptom.

Learning Objective: To recognize the array of otologic symptoms, physical exam findings, and imaging features associated with and caused by hematologic malignancies; to recognize the similarities of otologic manifestations of hematologic malignancies with benign conditions.

Desired Result: Attendees should recognize the array of otologic symptoms, physical exam findings, and imaging features associated with and caused by hematologic malignancies and the similarities of otologic manifestations of hematologic malignancies with those of benign conditions.

Level of Evidence - Level III

Indicate IRB or IACUC: Exempt

Idiopathic Sudden Sensorineural Hearing Loss: Efficacy of Oral and Intratympanic Steroid Therapy

Grace Callan, BS; Erin A. Harvey, MD; Neil Osafo, BS; Jazzmyne A. Adams, MPH
David R. Friedland, MD, PhD; Jake Luo, PhD

Objective: Determine oral steroid (OS) treatment response for idiopathic sudden sensorineural hearing loss (ISSNHL) and compare clinical outcomes to intratympanic (IT) steroids.

Study Design: Retrospective cohort study.

Setting: Tertiary Academic Center.

Patients: Patients diagnosed with ISSNHL receiving at least 1 course of OS between January 2009 and February 2022. OS patients were compared to a previously reported cohort of 74 patients who underwent IT treatment.

Interventions: OS or IT steroid therapy for ISSNHL.

Main Outcome Measures: 1) Efficacy of OS for ISSNHL; 2) Relative efficacy of OS to IT steroids.

Results: There were 96 patients treated with OS; 56.2% male, mean age 55.8±13.9 years; 84.4% ≥40 years. Average presenting 4-frequency pure tone average (4PTA) was 60.8±29.8dB. Low frequencies exhibited full recovery in 53.5% of patients while high frequencies recovered in 44.6%. 43.8% of OS patients had full 4PTA recovery compared to 25.7%) who underwent IT (p=.017). For patients under 40 years old, full recovery rates were similar between OS (60.0%) and IT (61.5%). In patients over 40 years old, however, full recovery was seen in 40.7% of patients on OS and 18% for IT. A greater proportion of patients with mild to moderate hearing loss had full recovery on OS than IT therapy.

Conclusions: Oral steroid therapy shows prognostic benefit for full recovery in all patient age groups as well as in patients with milder degrees of hearing loss when compared to IT.

Professional Practice Gap & Educational Need: Both oral steroid and intratympanic steroid therapy is utilized currently in ISSNHL. A gap exists in understanding the relative efficacy of each therapy as stratified by patient characteristic.

Learning Objective: Understand recovery rates for oral steroid therapy in different age demographics, degrees of hearing loss, and use of oral or IT steroid.

Desired Result: For physicians to use evidence-based information in counselling patients during decision making for treatment in ISSNHL.

Level of Evidence - IV

Indicate IRB or IACUC : IRB# 1538127

The Association of Hearing Loss and Music Engagement in the Canadian Longitudinal Study of Aging

Alexander Chern, MD; Srishti Nayak, PhD; Peyton L. Coleman, BS
Reyna Gordon, PhD

Objective: Music engagement has been associated with increased quality of life, health, and well-being. However, studies investigating its relationship with hearing loss (HL) have been limited to small samples. Our objective was to examine the association of HL with music engagement on a population level.

Study Design: Cross-sectional analysis of prospective, epidemiologic cohort study

Setting: Canadian Longitudinal Study of Aging

Patients: 26,236 adults ≥45 years old

Interventions: none

Main Outcome Measures: The exposure was HL, measured by better hearing ear pure tone average (PTA). The outcome was music engagement, measured by frequency of singing or playing a musical instrument (1=every day, 2=several times/week, 3=several times/month, 4=several times/year, 5=once/year or less) or having played a musical instrument, listened to radio/music, or participated in a musical program in the past 7 days. Multivariable linear/logistic regressions were performed to assess associations between music engagement and HL, adjusting for age, sex, socioeconomic status, and hearing aid usage.

Results: Mean (SD) age was 62.7 (10.1) years; 51% were women. Mean (SD) better ear PTA was 17.6 (10.9) dB; 5.2% were hearing aid users. Multivariable regression demonstrated a significant association between increased severity of HL and decreased active music engagement. For every 10-dB worsening in better ear PTA, there was a 0.051-point decrease in frequency of singing or playing a musical instrument (95% CI 0.035-0.068, $p<0.0001$).

Conclusions: Using population-level analyses, increased severity of HL was independently associated with reduced active music engagement. Our findings align with behavioral studies demonstrating decreased music appreciation in individuals with HL.

Professional Practice Gap & Educational Need: Music engagement has been associated with increased quality of life, health, and well-being. Recent literature has suggested that hearing loss is associated with decreased music engagement; however, these studies are limited by their small sample sizes, heterogeneous outcome variables, and inconsistent results. Examining this association on a population level with significantly higher-powered analyses will help further elucidate the relationship and potential mechanism between hearing loss and music engagement.

Learning Objective: After this presentation, the learner should be able to describe the relationship between hearing loss and music engagement from an epidemiologic perspective.

Desired Result: Clinicians will better understand the relationship between hearing loss and music engagement.

Level of Evidence: III

Indicate IRB or IACUC: Exempt

Failure in HiRes Ultra Series Recall Devices Does Not Necessarily Lead to Decrement in Performance

Erin A. Harvey, MD; Muhammad Khokhar, BS; Michael S. Harris, MD
Jazzmyne A. Adams, MPH; David R. Friedland, MD, PhD

Objective: To assess performance for patients identified with Advanced Bionics Ultra/3D (V1) cochlear implant electrode failure.

Study Design: Retrospective cohort study.

Setting: Tertiary academic center.

Patients: Adult patients implanted with a V1 device.

Interventions: Cochlear implantation and audiometric testing.

Main Outcome Measures: Failure rate, auditory performance.

Results: There were 104 ears representing 102 patients implanted with a V1 device. Of the 55 patients marked as non-failure, 44 (80%) consistently tested normal in follow up. Forty-eight (46.2%) devices showed failure as indicated by a drop in impedance, which is higher than previously reported in the literature (21.1%). Eleven patients with failure opted for observation (22.9%). These patients reported both subjectively stable hearing, and had no significant change in CNC word or AzBio in quiet testing between their best performance and performance at failure($p>.05$). Sentence testing for patients who elected observation was significantly higher (74.5±22%) at failure compared to those undergoing revision (60±37%, $p=.02$). Age at implant and time from implant to failure was similar between observation and revision groups ($p>.05$). Twenty-nine patients were revised and showed significant improvement in post-activation score compared to time of failure, with a mean improvement of 12.9% ($p<.0001$) for CNC word scores and 17.2% ($p<.001$) for AzBio in quiet.

Conclusions: Our identified failure rate for the HiRes Ultra Series (V1) recall is higher than that previously reported. A significant number of patients with signs of failure do not demonstrate decrement in subjective or objective performance which may inform a decision to not undergo revision surgery.

***Professional Practice Gap & Educational Need:** Understanding of current V1 failure rates, and knowledge of speech perception outcomes in patients who either observe or revise after failure is detected.

***Learning Objective:** Understand auditory perception outcomes for observed and revised V1 failures.

***Desired Result:** To inform decision making for management of patients experiencing V1 device failure.

***Level of Evidence -** IV

***Indicate IRB or IACUC :** IRB# 1538127

Pioneering Surgical Cures: Vestibular Neurectomy for Meniere's Disease

Dianela Perdomo; Jeremy Greene, MD, PhD; Nathaniel C. Comfort, PhD
Andy Harrison; Bryan K. Ward, MD

Objective: Elucidate the development of vestibular neurectomy as a treatment for Meniere's disease (MD) from its proposition in the late 1800s to present day.

Study Design: Historical review and analysis

Methods: The Walter Dandy, Samuel Crowe, and surgical log collections at the Chesney Medical Archives were reviewed (1905-1955). Google Scholar was used to identify relevant articles in English and French (1861-2000).

Results: The dawn of antiseptics, advancements in anesthesia, and proliferation of medical specialties rendered the 20th century ripe with surgical experimentation. In 1908, Frazier was the first to section the auditory nerve for MD, but uncertainty over surgical candidacy constrained interest in the procedure. At Johns Hopkins, the birth of the Otologic Laboratory in 1924 introduced new technologies like the audiometer, adding rigor to clinical assessment and evaluation. While Crowe, the chair of otolaryngology, focused on developing the novel specialty, Meniere's cases were referred to neurosurgeon Walter Dandy, whose fascination with paroxysmal epilepsies seeded his interest in MD. From 1924-1946, Dandy performed 692 neurectomies, marketed as the first cure for what was believed to be a progressive disease. After his passing, trainees' attention shifted to traumatic injuries, likely influenced by WWII. This left the procedure scarcely utilized until third parties rekindled interest decades later.

Conclusions: Neurectomy as the preferential treatment for MD was not driven by pure scientific reasoning but was rather contingent on historical context and sponsorship by a prominent figure like Walter Dandy. Appreciation of MD's natural history has since curtailed the favorability of destructive procedures in preference for conservative management.

Professional Practice Gap & Educational Need: Appreciate the evolving epistemology of MD from the 1900s to present day, and why a procedure once esteemed a cure is now scarcely utilized.

Learning Objectives: Understand the origin and development of vestibular neurectomy as a treatment for MD

Desired results: Understand the historical drivers of surgical experimentation and factors contributing to widespread adoption of procedures like neurectomy apart from evidence-based research.

Level of Evidence – N/A

Indicate IRB or IACUC: Johns Hopkins Privacy Board application #2022-05. Exempt from IRB.

Vestibular Dysfunction after Cochlear Implantation: A Retrospective Cohort Study

Aparna Govindan, MD; Mia Saade, BS; Jennifer Kelly, PT, DPT, NCS
Zachary Schwam, MD; Enrique Perez, MD; George B. Wanna, MD
Maura K. Cosetti, MD

Objectives: To characterize vestibulopathy in patients with cochlear implants and assess the temporal relationship between implantation and vestibular dysfunction.

Study Design: Retrospective review

Setting: Tertiary otology care center

Interventions: None

Patients: Patients undergoing vestibular rehabilitation from 2017-2022 with prior cochlear implantation preceding vestibular symptoms.

Main Outcome Measures: Demographics, time from implantation to vestibular symptom onset, dizziness handicap index (DHI), activities-specific balance confidence (ABC), and number of falls in past year were collected. Univariate analysis was performed to assess the relationship between these measures and diagnosis. A subset analysis of patients with benign paroxysmal positional vertigo (BPPV) versus those without was performed.

Results: 32 patients met inclusion criteria. 19 (59%) were men. Mean age at implantation was 54 years (range 4-88). Average time from implantation to symptom onset was 50.8 months (range 0-206). Commonly reported symptoms included dizziness (91%), imbalance (84%), and vertigo (72%). Top diagnoses at time of evaluation were BPPV (38%) and peripheral vestibular dysfunction (50%). Of those with BPPV, 58% experienced canalithiasis in a previously implanted ear. Mean age implantation was found to be significantly different between those with and without BPPV (64 vs. 48, $p = 0.04$). There were no differences in time to vestibular symptoms onset, DHI, or ABC.

Conclusions: Vestibular dysfunction developed years after cochlear implantation in this cohort, suggesting that chronic or persistent vestibulopathy is seldom a direct result of implantation despite being highly cited on the differential. Close monitoring and prompt follow-up of vestibular symptoms after implantation are warranted given the prevalence of diagnoses with effective treatment options.

Professional Practice Gap & Educational Need: Few studies have studied the impact of cochlear implantation on the vestibular system, yet vestibulopathy in implanted patients are often anecdotally correlated to the presence of the implant. The purpose of this study is to understand if there is temporal correlation between vestibular dysfunction and cochlear implantation.

Learning Objective: To characterize the presentation of vestibular dysfunction after cochlear implantation and to assess the temporal relationship between cochlear implantation and post-implantation vestibular dysfunction

Desired Result: Persistent vestibular dysfunction rarely develops immediately after cochlear implantation.

Level of Evidence – IV

Indicate IRB or IACUC: 21-01768, Icahn School of Medicine at Mount Sinai Hospital, approved 12/30/2021

Facial Nerve Aberrations Encountered during Cochlear Implant Surgery

Chisei Satoh, MD, PhD; Yukihiko Kanda, MD
Haruo Yoshida, MD, PhD; Yoshihiko Kumai, MD, PhD

Objective: To define the frequencies and types of facial nerve aberrations encountered during cochlear implant surgery.

Study Design: A retrospective review.

Setting: A university-based tertiary medical center.

Patients: A total of 485 patients who received cochlear implants from 1997 to 2022.

Interventions: Patients with intraoperatively discovered nerve aberrations were included.

Main Outcome Measures: The types of facial nerve aberration, coexisting inner- or middle-ear malformations, and electrode insertion method.

Results: Facial nerve abnormalities were found in 11 ears (of 6 cases) (1.7%). All evidenced inner ear malformations and stapes deformities or loss. Cochlear malformations were apparent in six ears and cochlear nerve hypoplasia was observed in eight. Preoperative, three-dimensional (3D) computed tomography (CT) images of all such cases were studied. When the images indicated that electrode insertion might be difficult using the posterior tympanotomy approach, the posterior wall of the external auditory canal was removed in three ears and a combined approach was employed to treat one ear. All such cases evidenced (abnormal) inferior dislocation of the horizontal facial nerve segment and anterior dislocation of the vertical segment. No case exhibited postoperative facial nerve paralysis or vestibular dysfunction.

Conclusion: Most cases exhibiting facial nerve aberrations during cochlear implant surgery evidenced middle- or inner-ear problems, or cochlear nerve malformations. A canal wall-down approach has been used to treat some such cases; the point is that safe electrode placement is always possible.

Professional Practice Gap & Educational Need: Surgeons placing cochlear implants must be aware of possible facial nerve aberrations; these may compromise safe electrode placement. We define the facial nerve aberrations that may be encountered, perhaps coexisting with inner- and middle-ear malformations.

Learning Objective: Facial nerve aberrations encountered during cochlear implant surgery are associated with high rates of inner- and middle-ear malformations. Thus, careful surgical planning is required. We emphasize that the abnormal facial nerve patterns are similar in most cases.

Desired Result: Electrode insertion is safe in patients with facial nerve aberrations but careful preoperative planning is necessary.

Level of Evidence - Level V

Indicate IRB or IACUC: IRB 20032302-3, Nagasaki University Hospital

Effect of Cochlear Implantation on Social Life

Priyanka Reddy, MD; Kara J. Schneider, AuD; Terrin N. Tamati, PhD
Aaron C. Moberly, MD

Objective: Explore the effects of hearing loss on social life and identify residual social life deficits that remain after cochlear implantation.

Study Design: Retrospective Review of Prospectively Obtained Data

Setting: Tertiary Care Adult Neurotology Center

Patients: Adults between the ages of 35 and 83 years were included. Participants either had normal hearing (NH) or used a cochlear implant (CI).

Interventions: CI and non-CI specific quality of life (QOL) surveys focused on social and overall QOL.

Main Outcome Measures: (1) The difference in non-CI specific social QOL survey responses between NH and CI participants. (2) The relationship between CI specific social and global QOL responses and non-CI specific social QOL responses in CI users.

Results: A total of 51 participants were included: 31 CI users and 20 NH participants. Of the non-CI specific social QOL questionnaires, CI users reported significantly poorer scores on Self-Efficacy in Social Interactions than NH peers ($p=0.049$). Both the Self-Efficacy in Social Interactions scores and the Social Isolation Questionnaire scores were significantly correlated with the CI specific social domain of QOL ($r=0.64$, -0.58 respectively). Only the Self-Efficacy in Social Interactions scores had a moderate association with global CI QOL ($r=0.47$).

Conclusions: CI users self-report similar social life outcomes as their NH peers with the exception of poorer self-efficacy in social situations. Moreover, self-efficacy in social interactions and social isolation were associated with social QOL in CI users, and self-efficacy in social interactions was associated with broader CI-related QOL. Findings support the relevance of individuals' perception of their social life to their overall QOL with a CI.

Professional Practice Gap & Educational Need: This study evaluates the social life of patients with hearing loss and CIs in comparison to NH peers. This study also analyzes in greater detail the relationship of CI specific QOL to various granular assessments of social life and identity.

Learning Objective: Understand the effects of hearing loss on various aspects of social life and identity as well as the effect of cochlear implantation on these granular assessments of social life and identity.

Desired Result: To better counsel patients on the aspects of social life and identity that are affected by hearing loss and cochlear implantation as well as which aspects of social life are most related to CI QOL.

Level of Evidence - Level IV

Indicate IRB or IACUC : Local IRB #2015H0173

Robotics-Assisted Cochlear Implantation with the iotaSOFT: Initial User Experience Results

Rick Nelson, MD, PhD; Matthew Carlson, MD; Oliver Adunka, MD; Felipe Santos, MD
Robert Hong, MD, PhD; Bruce Gantz, MD; Marlan R. Hansen, MD

Objective: Robotics-assisted electrode array insertion provides slow, steady insertion profiles that help mitigate damage to cochlear structure and function. We collected and evaluated data from initial users of the iotaSOFT™ Insertion System, a recently FDA-cleared device that robotically controls the insertion

Study Design: Retrospective Case Review.

Setting: Survey from 10 surgeons from 6 hospitals.

Patients: Cochlear implant recipients with radiographically normal cochleae.

Interventions: Cochlear implantation with robotic-assistance during the electrode array insertion portion of the surgery. Speed of insertion was limited to 0.1 or 0.2mm/sec.

Main Outcome Measures: Survey feedback from users regarding case times, problems and solutions encountered, and advice to other users were solicited to develop best practices for the device.

Results: Users found the device valuable for providing consistent insertion speed, stability of electrode insertion, and the ability for hands-free insertion. 8/10 users felt proficient with less than 10 cases, and found the device adds 5-15 minutes to total case time once proficient. Some users encountered problems during loading, but experience varied. The most important best practices were to provide adequate incision size and location and an ample facial recess. Lastly, nearly half of respondents used ECochG as a complimentary technology during cases.

Conclusions: Through user experience, proficiency of a robotics-assisted device during CI surgery can be achieved with minor adjustments of the surgical approach. As experience with the device expands, techniques for best practices will continue to improve and the inherent advantages in robotic assistance will improve patient care.

Professional Practice Gap & Educational Need: The use of robotics-assisted devices during CI electrode array insertion is still novel, but the recognition of differences in technique between surgeons and the development of best practices will advance the field and improve patient care.

Learning Objective: Understand the surgical challenges and potential advantages of robotics-assisted cochlear implantation with the iotaSOFT.

Desired Result: Clinicians will understand how robotic-assisted technologies can be implemented within their current surgical workflows.

Level of Evidence – Level V

Indicate IRB or IACUC : Exempt

Capacity of Ionic Liquids in Transtympanic Dexamethasone Delivery

Oghomwen E. Ogbeide-Latario, BSc; Yutaka Koizumi, MD
Eden Tanner, DPhil; Elliot Kozin, MD; Samir Mitragotri, PhD
Aaron K. Remenschneider, MD, MPH

Hypothesis: We hypothesize that ionic liquids can enhance trans-tympanic delivery of therapeutics for the treatment of middle and external ear disease.

Background: Local delivery of drugs to the middle ear are limited by the tympanic membrane's squamous epithelial layer. Ionic liquids are a class of compounds comprised of cations and anions that have been shown to enhance transdermal delivery of therapeutic molecules. Taken together, ionic liquids may represent a new delivery method for drugs to reach the middle ear through an intact tympanic membrane.

Methods: A custom ex-vivo Franz diffusion cell system was generated to model trans-tympanic drug delivery. Thin porcine skin was used as a proxy for the tympanic membrane at a liquid/liquid interface. 100μL each of 5mg/mL of dexamethasone-loaded ionic liquid, 5mg/mL dexamethasone-loaded PBS and ionic liquid alone were placed in the donor chamber and samples from the receptor chamber collected over 4 hours. Absorbance at 241nm was assessed to quantify transmembrane dexamethasone delivery.

Results: Dexamethasone was delivered transcutaneously at higher concentrations in IL-Dex as compared to PBS-Dex. Nearly all of the dexamethasone was delivered across the stratum corneum into the dermis with IL-Dex, compared to significantly less in PBS-Dex ($p=0.002$). Dermal penetration of dexamethasone was significantly greater than transcutaneous flux of drug in IL-Dex preparations.

Conclusion: We identify an ionic liquid/dexamethasone construct with superior skin penetration, but without significant release from the underlying dermis. Preparations of drug with ionic liquids may have implications for dermal conditions of the external ear, such as otitis externa and require further assessment.

Professional Practice Gap & Educational Need: Innovation in the field of external and middle ear disease is needed to reduce the morbidity associated with external and middle ear conditions and improve efficacy.

Learning Objective: At the end of this presentation, the audience will recognize the potential for non-invasive drug delivery in the ear using ionic liquids, a new class of compounds.

Desired Result: The audience will understand the benefits and limitations and need for further research into new therapeutics for common external and middle ear disease.

Level of Evidence – N/A

Indicate IRB or IACUC: Exempt

Evaluating the Impact of a Temporal Bone Dissection Course on Resident Confidence and Efficiency with Otologic Procedures

Ido Badash, MD; Alison Yu, MD; Liyang Tang, MD; James Kim, MD
Raymond Kung, MD; Seiji B. Shibata, MD, PhD

Objective: Determine if participation in a temporal bone dissection course is associated with increased resident confidence and efficiency with otologic procedures.

Study Design: Prospective, single-center survey study.

Setting: Academic teaching hospital.

Subjects: 15 residents of different training levels (PGY2-PGY5) from a single residency program in the United States.

Interventions: Residents participated in a 3-day temporal bone dissection course including a validated temporal bone dissection examination. Just before starting the course and immediately after completing the course, residents completed surveys assessing their confidence and efficiency with different otologic procedures. Surveys also contained questions regarding training level, previous experience with otologic procedures, fidelity of temporal bone specimens, and usefulness of the course for surgical training.

Main Outcome Measures: Confidence and efficiency with otologic procedures, anatomic fidelity of temporal bones, and usefulness of the temporal bone dissection course for surgical training. Responses were measured on a five-level Likert Scale with options of strongly agree (1), agree (2), neither agree or disagree (3), disagree (4), and strongly disagree (5).

Results: Compared with responses prior to the course, residents reported increased confidence with performing facial recess dissection (3.1 vs. 3.8, $p<0.05$), facial nerve decompression (3.5 vs. 4.3 vs. $p<0.001$), canal wall down mastoidectomy (3.0 vs. 3.7 vs. $p<0.05$), and labyrinthectomy (3.5 vs. 4.4, $p<0.01$) after course participation. Residents also reported increased efficiency with opening ears (1.7 vs. 2.3, $p<0.01$) and performing cortical mastoidectomy (2.3 vs. 3.1, $p<0.01$), facial recess dissection (3.5 vs. 4.3, $p<0.01$), facial nerve decompression (3.8 vs. 4.3, $p<0.05$), and labyrinthectomy (3.9 vs. 4.5, $p<0.05$) after the course. Postgraduate year, prior experience with otologic procedures, and dissection examination scores did not correlate with changes in confidence or efficiency. Residents reported that temporal bones had a high degree of anatomic fidelity (1.5) and were useful for improving operative technique (1.4).

Conclusions: Residents reported increased confidence and efficiency with otologic procedures after participation in a temporal bone dissection course regardless of training level or prior experience. Overall confidence and efficiency with techniques more advanced than cortical mastoidectomy remained low even after course completion.

Professional Practice Gap & Educational Need: Due to recent work-hours limitations, there has been increasing demand for surgical training outside of the operating room. While frequently utilized, there is limited information about the association of temporal bone dissection courses with resident confidence and efficiency with otologic procedures.

Learning Objective: 1) Understand the impact of a temporal bone dissection course on resident confidence and efficiency when performing otologic procedures.

Desired Result: 1) Increased incorporation of temporal bone dissection courses into residency training; 2) Recognition of the impact of temporal bone dissection courses on improving resident confidence and efficiency with otologic procedures.

Level of Evidence: III – Cohort.

Indicate IRB or IACUC : Exempt.

Calibration and Validation of a Force Sensing Surgical Drill

Yuxin Chen, BS; Anna Goodridge, MS; Manish Sahu, PhD
Russell H. Taylor, PhD; Deepa J. Galaiya, MD

Objective: Demonstrate the capacity of a novel force-sensing surgical drill to tell measure real-time forces applied on the surgical drill tip during robotic surgery.

Background: Measurement of tool-to-tissue forces during robotically assisted surgery is necessary, both to provide haptic feedback and to define force limits. We have therefore developed a force-sensing otologic drill to measure tool-to-tissue forces. In this study, we show the calibration and validation of this drill.

Methods: A specialized drill holder was designed using an ATI Nano43 force sensor for the Anspach EG1 surgical drill and attached to the robot arm. We calibrated the drill (1) for its weight against gravity and (2) for the surgeon's hand force on the drill, allowing us to calculate the resultant force on the drill tip. To validate the predicted resultant force, a raw egg was mounted on a second ATI force sensor as ground truth. 15 egg-drilling trials of 8 points and 16 egg-drilling trials along a circular path were done, comparing the drill tip forces to the ground truth forces.

Results: (1) The self-weight calibration was validated at >100 points with an average error of 0.0145 N. (2) The hand force calibration was validated with an average error 0.0169 N. (3) The average root mean square error (RMSE) on points was 0.0569 N with a standard deviation 0.0091 N and the average RMSE along the path was 0.0649 N with a standard deviation 0.0068 N. (4) The average max peak force in each trial is 2.0074 N with a standard deviation 0.5514 N.

Conclusions: We have demonstrated the design, calibration and validation of a robotic force-sensing drill, showing minimal error compared to the measured drill forces.

Professional Practice Gap & Educational Need: Demonstrates innovations in robotically assisted otologic surgery by showing the design, calibration and validation of a force-sensing drill. Accurate tool-to-tissue force measurements are needed to prevent tissue damage during robotically assisted drilling.

Learning Objective: To validate a force-sensing robotic surgical drill.

Desired Result: Attendees will recognize this as a first step in a series of innovations required for force sensing in robotic surgery.

Level of Evidence: III

Indicate IRB or IACUC: Exempt.

Predicting Cochlear Implant Postoperative Audiologic Outcomes Using Preoperative Lip-Reading Scores

Alexander J. Jones, MD; Jasmine Moawad, BS; Douglas J. Totten, MD, MBA
Evan Cumpston, MD; Rick F. Nelson, MD, PhD

Objective: To assess predictive ability of visual-assisted City University of New York (CUNY) sentence test scores on postoperative AzBio sentence scores in cochlear implant (CI) patients

Study Design: Retrospective cohort study

Setting: Tertiary referral center

Patients: Patients undergoing CI with preoperative CUNY testing

Main Outcome Measures: Impact of high pre-operative combined audio + visual CUNY (defined as ≥70%) scores, low-frequency pure tone average scores, and duration of deafness on one-year postoperative AzBio scores.

Results: Twenty-three mostly white (83%) female (61%) patients with mean age 49 years were included. Comparing patients with good preoperative CUNY audio + visual scores (≥70%) to those with poorer performance (<70%), there were no statistical differences in age (p=0.877), sex (p=0.102), duration of deafness (p=0.827), preoperative low tone (250 + 500 Hz) average (p=0.328), or preoperative pure tone average (p=0.896). Similarly, there was no statistical difference between postoperative AzBio scores between CUNY scoring groups (p=0.123, Cohen's d = 0.650).

Conclusions: Preoperative visual-assisted CUNY scores were not associated with postoperative CI AzBio scores. Further, larger investigations are required to determine role of multisensory processing in CI speech perception.

Professional Practice Gaps: As many potential candidates pursue cochlear implantation, identifying good candidates for CI is imperative.

Learning Objectives: Responses to visual may not predict postoperative CI performance

Desired Results: Patients with hearing loss often utilize visual cues for communication. The effect of patient multisensory processing capacity on postoperative CI results is yet to be determined.

Level of Evidence: V

IRB: Indiana University IRB #13133 (approved 10/8/2021)

Long-term Outcomes and Prognostic Factors of Cochlear Implantation in Pre-terms Children

Idit Tessler, MD, MPH; Jonathan Adler, MD
Ziva Yakir; Amit Wolfovitz, MD

Objective: To evaluate long-term hearing outcome in preterm infants following cochlear implantation (CI) in compare to term-borne infants, and to assess prognostic effect of birth-week and birth-weight.

Study design: Retrospective comparative study.

Setting: Single tertiary center.

Patients: Children who underwent CI between 2008-2017 with documented 5-year follow-up. Study cohort was divided into preterm infants, and two control groups: (I) mixed etiologies hearing-loss, and (II) GJB2-related deafness.

Main outcome measures: Speech-reception-threshold (SRT) and mono-syllabic word identification (HAB) scores were assessed at 2- and 5- years post implantation.

Results: Study included 21 preterm-borne (35 ears), 31 children (59) in control I, and 39 (67) in the control II. The cases mean birth-week was 31.5, and birth weight 1531±668 grams. Cases chronologic and corrected age at implantation was 26.4 and 21.9 months, respectively, and control I and II 26.3 and 24.5 respectively. Best SRT performance were for control II, while cases and controls I had comparable results (23±6.6 vs. 26.5 ±6.3 and 26.1±6.8, respectively, p=0.01). No significant difference was found in 2- and 5-years HAB scores between all groups (2-years: 68.1±21.4%, 67.4±18.3%, and 66.9±17.4%, p=0.97; 5-years: 72.8±16.1%, 77.5±18.8% and 72.7±15.8%, for cases, controls I, II, respectively). Extremely low birth-wight (ELBW, <1000g) infants had significantly worse HAB scores, compare with other preterm infants (55±17.3% vs. 82.1±18.2%, p=0.01). No significant difference was found according to birth-week.

Conclusions: Our findings suggest prematurity itself does not affect CI outcome, and preterm-borne can achieve comparable hearing outcomes to term-children. However, ELBW in preterm-borne is associated with worse outcomes.

Professional Practice Gap & Educational Need: Preterm implantees are a unique group, with scant literature regarding CI outcomes and hearing prognosis. This data can be essential for expectation mitigation for the patient's family and treating physicians.

Learning Objective:
1. Understanding hearing outcomes of CI in preterm borne infants
2. To identify prognostic factors for CI successes in preterm borne infants

Desired Result: Data from this study could assist physicians in the management of hearing disorders in preterm borne infants and to facilitate the patient's family expectation.

Level of Evidence: III

Indicate IRB or IACUC: 5076-18-SMC

Patient-Related Predictors of Hearing and Speech Recognition Outcomes after Adult Cochlear Implantation in a Southern Louisiana Population

Sara E. Bressler, MD; Ari Saravia, BS; Stephanie Warrington, MD
Kelsey Lacourrege, MD, MPH; Moises A. Arriaga, MD, MBA
Anne K. Maxwell, MD; Rahul Mehta, MD

Objective: To determine patient-related predictors of hearing and speech recognition outcomes after cochlear implantation (CI) among adults in a region with prevalent health disparities.

Study Design: Retrospective review of a CI database (2017-2020).

Setting: Academic tertiary-care hospital.

Patients: Adults (>18 years) with bilateral severe-to-profound hearing loss.

Interventions: Cochlear implantation.

Main Outcome Measures: Pre- and post-operative auditory testing (pure tone average, speech reception threshold, and open-set sentence testing in quiet [AzBio]) compared across demographics, medical history, and intraoperative pathology.

Results: 125 CI surgeries were performed. Mean age was 60.9±18.6 years (18-88). Ninety-eight (78%) patients were white and 14 (11%) black, while the surrounding community is 44.8% white and 46.3% black. Black patients had worse pre-operative PTA (p=0.0079) and AzBio (p=0.04), yet a longer time from evaluation to activation (12.8 vs. 8.2 months, p=.0183), and unfortunately worse post-operative AzBio in quiet (34 ± 19 vs. 75 ± 23, p=0.001). Most had a long duration of deafness (>10 years), which was not dependent on race (79% black vs. 64% white, p=0.36). Medicaid would not pay for CI in adults, despite 31.5% of adult state residents having this insurer. Cochleostomy, performed in 12 (10%) ears for round window fibrosis (n=6), anatomic abnormalities (n=6), and middle ear inflammation (n=1), resulted in worse post-operative PTA (p=0.039). Age at implantation, insurer (private vs. Medicare), and communication method were not significant predictors.

Conclusions: While CI remains an effective intervention for auditory rehabilitation, hearing and speech recognition outcomes and access to care may differ based on racial disparities.

Professional Practice Gap & Educational Need: Although cochlear implantation remains a standard of care for patients with severe-to-profound hearing loss, the impact of certain patient-related factors and social determinants of health on hearing and speech recognition outcomes remains largely unaddressed.

Learning Objective: Learners will better appreciate the importance of patient-related predictors and access to care on hearing and speech recognition outcomes following cochlear implantation.

Desired Result: Healthcare teams involved with cochlear implant patients will strive to maximize access to improved hearing health outcomes.

Level of Evidence – III

Indicate IRB: IRB #1412 at Louisiana State University Health Sciences Center-New Orleans

Balloon Dilation for Chronic Eustachian Tube Dysfunction under Local and General Anesthesia: A Systematic Review and Meta-Analysis

Usman Khan, MD, MSc; Jon Nam, BSc; Nael Shoman, MD

Objective: There has been a recent increase in the publication of articles evaluating outcomes of balloon dilation of the eustachian tube (BDET) as a treatment for chronic eustachian tube dysfunction (ETD) in both clinical and operating room settings. Our objective was to evaluate the overall efficacy of BDET for treating ETD, with a subgroup analysis of BDET performed under local (LA) versus general anesthesia (GA).

Data sources: PUBMED, EMBASE and Cochrane databases were searched for English articles from January 2010 to October 2022.

Study selection: The PRISMA guidelines were followed. Only RCTs and prospective trials evaluating BDET for ETD were included. All articles evaluating BDET performed under LA versus GA were assessed. Our search identified a total of 19 articles after screening (365 articles).

Data extraction: Only studies using homogeneous and validated outcomes measures (Eustachian Tube Dysfunction Questionnaire (ETDQ-7), tympanometry) were included for meta-analysis (6 studies). Other reported parameters include surgical time, LA protocols, and surgical complications.

Data synthesis: A meta-analysis using the random effects model demonstrated a decrease in mean ETDQ-7 scores by 2.60 up to a year following BDET (328 patients, CI -1.61 to -3.59, $p<0.001$). Descriptive weighted statistics were used to analyze in-office BDET studies (179 patients), demonstrating no significant differences in outcomes (tympanometry/ETDQ-7 scores), minimal complications, faster surgical time, and high patient-reported willingness to choose LA vs GA.

Conclusions: BDET is effective for treating chronic ETD. BDET performed in office with careful patient selection and an established LA protocol is safe and comparable to BDET in the operating room.

Professional Practice Gap & Educational Need: There has been a considerable increase in publication of high-quality articles evaluating long-term outcomes of BDET for chronic ETD. A recent publication trend towards performing BDET in a clinical setting under local anesthesia is also new in the literature. The aim of our study is to address this educational gap to guide clinical decisions regarding the use of BDET for chronic ETD in both the clinical and operating room settings.

Learning Objective: To provide an up-to-date analysis on outcomes of BDET for chronic ETD and compare surgical parameters and outcomes when BDET is performed in a clinical setting versus the operating room.

Desired Result: BDET is an effective treatment for symptomatic chronic ETD that is refractory to medical treatment and can be considered in both clinical and operative room settings depending on patient selection and local anesthesia protocols.

Level of Evidence – Level I (systematic review and meta-analysis)

Indicate IRB or IACUC: Exempt (systematic review and meta-analysis)

Is There a Need for ICU Admission following Routine Acoustic Neuroma Surgery?

Nayeon Kim, BS; Anusha Sherwani, BS
Christopher A. Bogaev, MD; Brian P. Perry, MD

Objective: To determine if there is a need for ICU admission following acoustic neuroma removal by analyzing differences in complication rates in patients who are admitted to the regular neurosurgical floor vs the neuro ICU.

Study Design: Retrospective review.

Setting: Tertiary referral center.

Patients: Fifty patients undergoing acoustic neuroma removal using either translabyrinthine, retrosigmoid, or middle cranial fossa approaches from January 2020 to August 2022.

Intervention: acoustic neuroma resection and post-operative care setting.

Main Outcome Measures: All patients who underwent acoustic neuroma removal by the neurotology and neurosurgical authors between January 2020 and August 2022 at a single facility were reviewed for inclusion for the chart review. The majority of patients were admitted to the regular neurosurgical floor based on tumor characteristics and comorbidities. Post-operative complications are identified and stratified into major and minor complications. Statistical analysis with Mann-Whitney U test is used against an internal control cohort with surgeries performed between 2017 and 2020.

Results: Data collection and analysis is ongoing; however, preliminary results show that there are no statistically significant differences in either major or minor complications between study group and the control group.

Conclusions: To our knowledge, this is the first study to analyze complication rates of patients who are admitted to the neurosurgical floor following acoustic neuroma surgery. Our findings suggest that for routine acoustic neuroma surgery, admitting patients to the regular neurosurgical floor is not inferior to the ICU. Further prospective, randomized studies are necessary to validate these findings in order to make systematic changes to the post-operative standard of care.

Professional Practice Gap & Educational Need: Reconsideration of standard recovery protocol for selected patients undergoing acoustic neuroma resection surgery to reduce healthcare costs, and increase patient satisfaction via less restricted family visitation.

Learning Objective: There are no significant differences in post-operative complications in selected patients who are cared for in a non-ICU setting.

Desired Result: Changes to patient recovery protocol following acoustic neuroma surgery.

Level of Evidence: III

Indicate IRB or IACUC: Exempt

AOS POSTER F035

The Impact of Inpatient Audiometry on Clinical Decision Making

Nadine Ibrahim, MD; Madison Epperson, MD; Chioma Anidi, BA
Gerilyn Jones, AuD; Renee Banakis Hartl, MD, AuD

Objective: Evaluate the degree to which inpatient audiometry impacts in-hospital outcomes and clinical decision making.

Study Design: Retrospective case review.

Setting: Academic tertiary referral center.

Patients: A retrospective chart review was completed of patients at the University of Michigan who were admitted to the hospital between January 2000 and September 2022 and underwent consultation for inpatient audiometric evaluation.

Main Outcome Measures:

1. Qualitative description of indication, diagnosis, and changes to management plan resulting from inpatient audiometric evaluation.
2. Impact of inpatient audiometric evaluation on clinical decision making quantified by descriptive statistical analysis, including percentage of consultations resulting in active change to inpatient management plan.
3. Test-retest reliability of inpatient vs outpatient audiograms, quantified by dB change in puretone and speech thresholds and percent change for word recognition testing.

Results: A total of 3,797 patient records were reviewed for analysis. Common indications for inpatient audiograms included temporal bone trauma, new onset sudden sensorineural hearing loss, and chronic hearing impairment. In some cases, audiometric testing resulted in changes to inpatient treatment plans, though most did not impact hospital-related management. Bedside testing resulted in less reliable threshold measurements compared with audiometry completed in a sound-treated booth.

Conclusions: Inpatient audiometry is a time- and resource-intensive intervention without well-established guidelines outlining its indications or a clear understanding of its utility in the inpatient setting. Results presented here suggest that inpatient audiometry has a minor impact on clinical outcomes and that outpatient audiograms may be sufficient for the majority of otologic consults in combination with a complete history and a thorough physical exam including tuning forks. Additional study across institutions with variable practice would be beneficial to help establish practice guidelines that could be applied more widely.

Professional Practice Gap & Educational Need: Audiometry is a critical component of a detailed assessment of many otologic and neuro-otologic concerns. Some clinical practice includes obtaining an inpatient audiogram for quick assessment of hearing sensitivities in the acute setting, however the value of an inpatient evaluation relative to a delayed, outpatient audiogram has not yet been demonstrated in the literature. Data presented here will help guide practitioners in determining when inpatient assessment is indicated.

Learning Objective:

1. To assess the clinical significance, as well as expected versus realized improvement in outcomes, related to inpatient audiometry.
2. To quantify the test-retest reliability of inpatient audiometric evaluation compared with outpatient testing.

Desired Result: We aim to provide context around the clinical value of an inpatient versus outpatient audiogram for providers. Ultimately, determining the clinical value of the inpatient audiogram will guide and improve clinical management when evaluating an Otologic or Neuro-Otologic concern.

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

Indicate IRB or IACUC: University of Michigan HUM00225111 – Exempt status.

Delayed Diagnoses in Patients with Dizziness in the U.S. Commonwealth of Virginia and the Tidewater Region

Kendra N. Walker, BS; Kevin M. Guy, MS; Peter G. Volsky, MD

Objective: Vestibular disease and dizziness are common causes of impairment in the US and accurate diagnosis is necessary to provide appropriate management using available healthcare resources. The objective of this study is to address a regional public health need for timely diagnosis of dizziness and vestibular disease.

Study Design: Cross-sectional study.

Setting: TriNetX Research Network.

Patients: Adults diagnosed with dizziness or vestibular disease between 2010-2020 at a Sentara Healthcare facility in the Tidewater region of southeastern Virginia.

Interventions: N/A

Main Outcome Measures: Prevalence of dizziness symptom diagnoses followed by delayed vestibular disease diagnoses.

Results: During the study period, 31,670 diagnoses of dizziness were rendered; 18,390 were followed with a dizziness related non-vestibular diagnosis, 930 were followed with a vestibular disease diagnosis, and 12,350 were never followed by a diagnosis to explain the dizziness symptom. The proportion of patients diagnosed with vestibular disease (3%) after receiving a dizziness diagnosis in the region is far below expected norms (25-34%) in the general population. There were greater proportions of delayed diagnoses of labyrinth dysfunction (OR 4.8, $p<0.0001$), superior semicircular canal dehiscence (OR 3.1, $p=0.0023$), otolith disease (OR 3.1, $p=0.0023$), among others, and a decreased proportion of delayed diagnosis of benign paroxysmal positional vertigo (OR 0.56, $p<0.0001$).

Conclusions: Approximately 40% of patients with dizziness do not obtain a specific diagnosis. The discrepancy between expected and observed prevalence in our region indicates that vestibular disease is likely underdiagnosed, resulting in lost opportunities to access rehabilitation and medical management, and suggests the need for more thorough evaluation.

Professional Practice Gap & Educational Need: Recognize weaknesses in rendering diagnoses to patients with dizziness and understand the importance of timely and accurate vestibular disorder diagnosis.

Learning Objective: Define diagnostic rates of vestibular disease in our region and better understand the confounding diagnoses that are more difficult to identify in cases of dizziness.

Desired Result: Tailor clinical programs for improved patient access to care.

Level of Evidence – N/A

Indicate IRB or IACUC : IRB # 21-12-NH-0256 at Eastern Virginia Medical School, Approved 12/01/2021

The Placebo Effect in Tinnitus: A Systematic Review and Meta Analysis of Randomized Controlled Trials

Rameen K. Walters, BS; Frederick G. Durrant, BS; Shaun A. Nguyen, MD
Ted A. Meyer, MD, PhD; Paul R. Lambert, MD

Objective: To quantify the placebo effect in randomized clinical trials (RCTs) treating tinnitus with oral or intratympanic placebo treatment.

Data Sources: CINAHL, PubMed, and Scopus were searched for articles from conception to October 2022. MESH and key terms such as "Tinnitus," "Placebo," and "Medication" were used to find randomized, placebo-controlled trials. The search was limited to articles in English.

Study selection: RCTs with adult subjects evaluating tinnitus pre- and post-treatment with an oral or intratympanic medication versus a placebo arm were included. Cross-over studies, studies involving middle/inner ear surgeries or devices, and studies that exclusively included non-idiopathic etiologies of tinnitus were excluded.

Data extraction: Mean tinnitus symptom survey scores for the Tinnitus Handicap Index (THI) and Visual Analog Scales (VAS) (Intensity, Annoyance, Awareness) of the placebo arm were extracted for analysis by two independent reviewers (RKW, FGD). Risk of bias was completed using the Cochrane risk-of-bias tool.

Data synthesis: 953 studies were screened with 16 studies being included in the final analysis. Meta-analysis of mean difference (MD) was calculated using RevMan 5.4. MD between pre- and post-treatment THI scores of the placebo arms was 5.14 ([95% CI 2.75 to 7.54], $p < 0.0001$). MD between pre- and post-treatment VAS scores for Intensity, Annoyance, and Awareness were 0.32 ([-0.01 to 0.65], p = 0.06), -0.03 ([-0.27 to 0.20], p = 0.78), and 0.29 ([0.04 to 0.55], p = 0.02), respectively.

Conclusions: Placebo significantly reduced THI scores and VAS Awareness scores in patients receiving oral or intratympanic placebo treatment for tinnitus.

Professional Practice Gap & Educational Need: There are no meta-analyses evaluating the placebo effect in the medical treatment of tinnitus.

Learning Objective: To understand the placebo effect in patient's being treated for tinnitus with medication.

Desired Result: Statistically significant difference between pre- and post- treatment tinnitus symptom scores in patients in the placebo arm of RCTs.

Level of Evidence: Level IA.

Indicate IRB or IACUC: Exempt.

Impact of Pre-Operative Imaging on Surgical Planning for Cochlear Implantation

Torri E. Lee, BA; Diana Y. Lee, MD; Sean Weiss, MD
Seth R. Schwartz, MD; James E. Saunders, MD, MS

Objective: To identify the most common pre-operative imaging practices for cochlear implantation and how these findings influence surgical decisions.

Study Design: Cross-sectional study.

Setting: Electronic survey.

Population: Neurotologists who perform cochlear implantation surgery (n=59).

Main Outcome Measures: Imaging techniques (computed tomography (CT), magnetic resonance imaging (MRI)) surgical decision changes.

Results: Pre-operative CT scans were used 1.48 times more than MRIs for adults with acquired hearing loss (38 CTs, 21 MRIs) while MRIs were used 1.84 times more than CT scans for children (42 MRIs, 28 CTs). Imaging that revealed partial ossification of the cochlea changed 77.5% of surgeon's electrode array choice. There was no consensus about changing electrode choice for partial round window ossification (36, 44.4%) and type 2 cochlear hypoplasia (34, 46%). Moderate dilation of the vestibular aqueduct changed 8.5% of surgeons' electrode choice (n=6). For all scenarios, imaging did not significantly change surgical approach outside of electrode choice (p=0.682).

Conclusions: Pre-operative imaging is predominately used to select appropriate electrode array rather than to inform additional surgical approach. Partial ossification of the cochlea highly influences electrode array choice while vestibular aqueduct dilation is less likely to change surgical decisions.

Professional Practice Gap & Educational Need: Pre-operative imaging is commonly used for patients undergoing cochlear implantation, but the influence of imaging results on surgical approaches and decision making needs to be better understood.

Learning Objective: To gain knowledge about the ways in which pre-operative imaging guide surgical decisions in cochlear implantation surgery.

Desired Result: To inform attendee that pre-operative imaging predominantly affects electrode array surgical decisions for cochlear implantation.

Level of Evidence – Level V

Indicate IRB or IACUC: Dartmouth Health Institutional Review Board STUDY02000363- approved 7/24/2020

Utility of Single-Item Subjective Hearing Questions in Older Adult Hearing Screening

Janet S. Choi, MD, MPH; Tyler J. Gathman, MS
Tina C. Huang, MD; Meredith E. Ada,ms, MD MS

Objective: In the recent US Preventive Service Task Force review on hearing screening for older adults, single-item questions on subjective hearing were described as reliable screening tools. Using a population-based sample, we examined the accuracy of single-item questions on detecting objective hearing loss.

Study Design: Cross-sectional study

Setting: 2005-2016 National Health and Nutrition Examination Survey

Patients: 14,230 participants (12-85+ years)

Interventions: Participants were asked to assess their hearing: Q1-"Which statement best describes your hearing?"(Excellent-1, good-2, a little-3, moderate-4, a lot of trouble-5, or deaf-6) and Q2/Q3-"Hear a whisper/normal voice from across a quiet room"(yes/no). Mild(≥25dB) and moderate(≥40dB) hearing loss were defined as better hearing ear speech-frequency pure-tone average(0.5, 1, 2, and 4kHz).

Main Outcome Measures: Area Under the Receiver Operating Characteristic Curve (AUC)

Results: Among adults ≥50 years, the AUC for diagnosing mild hearing loss using Q1 was fair at 0.75 [95%CI:0.74-0.76] and was poor for Q2 (0.64 [95%CI:0.62-0.66]) and Q3 (0.60 [95%CI:0.57-0.63]). Using Q1 as the screening tool, cut points that obtain highest correct classification varied by age (3 for ≥50 years vs. 2 for ≥70 years) and sex (3 for male vs. 4 for female). The AUC for diagnosing mild hearing loss for adults ≥50 years was lower than for diagnosing moderate hearing loss for adults ≥50 years (0.84 [95%CI:0.83-0.86]) or mild loss for younger adults (20-49 years) (0.81 [95%CI:0.77-0.86]).

Conclusions: Single-item questions on subjective hearing exhibit limited utility as screening tools for mild hearing loss among older adults. Accuracy varies by the question, hearing loss severity, and demographics. Effective hearing screening for older adults should include objective assessments and additional questionnaire.

Professional Practice Gap & Educational Need: This study will improve the current gap in our knowledge on the accuracy of single questions on subjective hearing in detecting variable degrees of hearing loss and factors associated with its accuracy.

Learning Objective: At the conclusion of this presentation, the participants should be able to recognize the limited utility of single questions on subjective hearing as screening tools for hearing loss in older adults despite the statements within the recent US Preventive Service Task Force review describing single questions as reliable and consistent screening tools.

Desired Result: Results from the study support that future studies investigating the role of hearing screening in older adults would benefit from incorporating objective assessments and/or augmentation of the single-item questions with additional clinical information.

Level of Evidence: Level III

Indicate IRB or IACUC: exempt

A Confidence Booster: No Association Found Between COVID-19 Vaccination and Audio-Vestibular Dysfunction

Víctor de Cos, BS; Olivia A. La Monte, BS; Timothy J. Sears, BS
Omid Moshtaghi, MD; Peter Dixon, MD; Rick Friedman, MD, PhD

Objective: The purpose of this study is to compare the potential prevalence of neurotologic side effects of COVID-19 vaccine against expected vaccination side effects.

Study Design: Surveys were distributed to otolaryngology clinic patients to assess the presence of neurotologic symptoms occurring within 4 weeks of receiving a COVID-19 vaccination.

Setting: Single institution academic hospital otolaryngology clinic

Patients: Surveys were administered to adult (>18-year-old) patients who presented to an outpatient otolaryngology clinic for any reason from January to September of 2022.

Interventions: Diagnostic

Main Outcome Measures: Surveys distributed assessed patient demographics, COVID-19 vaccination status and associated side effects, as well as presence of neurotologic symptoms including dizziness, headaches, aural fullness, tinnitus, otalgia, and hearing loss. A Wilcoxon signed-rank test and nonparametric comparison of medians was conducted to compare the two groups of symptoms.

Results: The preliminary data for this pilot study included 27 patients with a mean age of 56.85, 48% male, and 93% White. Patients who received the COVID-19 vaccination were significantly less likely to experience any neurotologic side effects post-vaccination as compared to symptoms formerly established as vaccination side effects (0% vs. 22%; $p = 0.04$).

Conclusions: Hesitancy and mistrust surrounding COVID-19 vaccines have affected global rates of vaccination, which has severely impacted the ability of public health officials to stop the spread of this lethal infection. These initial findings demonstrate that audio-vestibular side effects are unlikely to occur in patients vaccinated against COVID-19 and can aid in improving vaccine trust.

Professional Practice Gap & Educational Need: Although the COVID-19 pandemic has affected the healthcare landscape on a global scale, physicians continue to have limited published literature on whether neurotologic side effects of vaccination exist.

Learning Objective: At the conclusion of this presentation, the participants should be able to identify whether COVID-19 vaccination demonstrates a possible association with audio-vestibular dysfunction.

Desired Result: These findings may improve the ability of physicians to promote vaccine trust and improve awareness about which side effects are and are not associated with COVID-19 vaccination.

Level of Evidence – IV

Indicate IRB or IACUC: UCSD IRB #801971

Effects of Newborn Hearing Screening Timing: pre-COVID versus COVID-era

Mary Morcos, BS; Lauren McGrath, AuD; Christina Khalil; Sophie Wiltshire
Carleton Eduardo Corrales, MD; Jennifer Shin, MD

Objective: To investigate whether auditory brainstem response newborn hearing screens (NBHS) resulted in higher refer rates during the COVID-19 pandemic. We assessed whether these rates and diagnostic outcomes were affected by observed difference screening result timing.

Study Design: NBHS was performed in 10,870 patients. Newborns who did not pass their first screen were referred for a second screen and subsequently referred for diagnosis. Assessments of refer rates, hour-of-life at screening, time between first and second screen, and diagnostic outcomes were performed.

Setting: Tertiary academic medical center.

Patients: Newborns with hearing screens performed at well-baby units.

Intervention: Diagnostic screening.

Main outcome measure: Postnatal age, time difference between screenings, and pandemic timeframe all may have contributed to whether neonates received downstream testing. Primary outcomes were screening "refer" and permanent hearing loss diagnosis rates.

Results: Vaginally-delivered COVID-era newborns had significantly higher "refer" rates, as compared to pre-COVID-era (23.67% versus 18.25%, p=0.026). Pandemic newborns underwent NBHS at statistically significantly earlier ages. When two screens were performed, the time difference between screens was significantly shorter in the COVID-era group. Post-screening diagnosis of bilateral hearing loss occurred at significantly lower rates (20.4% versus 41.0%). Although COVID-pandemic C-section newborns were screened significantly earlier, this was not a significant predictor of confirmed hearing loss on post-screening diagnostic testing.

Conclusions: COVID-era newborns were screened significantly earlier in life than pre-COVID newborns. Earlier screening was associated with a statistically significant impact on "refer" rates and lower permanent hearing loss diagnoses. Earlier screening may have contributed to unnecessary diagnostic follow-up testing.

Professional Practice Gap & Educational Need: NBHS resulted in higher refer rates in vaginally delivered newborns during the COVID-19 pandemic, and we investigate potential causes.

Learning Objective: To quantify the impact of the pandemic on refer rates, rate of post-screening hearing loss diagnoses, and timing of screening.

Desired Result: To understand whether newborn hearing screenings during the COVID-19 pandemic occurred earlier, and whether earlier screening affected downstream referral rates and diagnoses of bilateral hearing loss.

Level of Evidence - Level IV

Indicate IRB or IACUC : Exempt

Bedside Vestibular Tests as a Clinical Screening Tool for Cerebellopontine Angle Masses

Kevin P. Stavrides, MD; W. James Azeredo, MD; Tice Harkins, BS
Arun Gadre, MD; J. Scott Greene, MD; Jeffrey Walter, DPT

Objective: Cerebellopontine angle (CPA) masses are a concerning cause of unilateral hearing loss, imbalance, and tinnitus. The gold standard evaluation for these masses is magnetic resonance imaging (MRI). However, MRIs are costly, low yield, and anxiety-inducing for claustrophobic patients. Identification of vestibular abnormalities may enhance CPA mass detection in patients with asymmetrical hearing loss and tinnitus. The objective of this study is to determine if bedside vestibular tests can identify patients with unilateral cochlear symptoms at increased risk for CPA masses.

Study Design: Prospective observational study.

Setting: Tertiary care center.

Patients: 83 non-institutionalized U.S. citizens age >18 years with a chief complaint of asymmetrical sensorineural hearing loss and/or tinnitus. Patients with a history of dizziness or imbalance were excluded.

Interventions: Diagnostic.

Main Outcome Measures: Each patient was evaluated for positive or negative exam findings with bedside vestibular tests consisting of head impulse, spontaneous nystagmus, gaze-evoked nystagmus, mastoid vibration, and hyperventilation-induced nystagmus. Findings from vestibular tests were correlated with the presence or absence of CPA mass on MRI.

Results: A total of seven out of 83 patients had confirmed CPA masses on MRI (8.4%). Patients with all negative findings from vestibular tests were only 1.43% less likely to have a CPA mass on MRI compared to patients with one or more positive findings. The presence of at least one positive bedside vestibular test is not significantly correlated with the presence of a CPA mass on MRI, X^2 (1, N = 83) = 0.0392, p = 0.84. Patients with the presence of both hyperventilation-induced and gaze-evoked nystagmus were 33.6% more likely to have a CPA mass on MRI compared to patients without the presence of both and 31.6% more likely than the study population. The presence of both hyperventilation-induced and gaze-evoked nystagmus was correlated with a positive MRI finding of CPA mass, X^2 (1, N = 83) = 6.9, p = 0.0088.

Conclusions: Normal bedside vestibular testing does not reliably rule out the presence of a CPA mass. However, positive bedside exam findings of both gaze-evoked and hyperventilation-induced nystagmus together are significantly associated with the presence of CPA masses on MRI. Therefore, the presence of these exam findings in a patient with borderline asymmetric hearing loss and/or tinnitus may increase the likelihood of CPA mass.

Professional Practice Gap & Educational Need: Since 95% of MRIs are negative for CPA masses, more effective clinical screening tools should be employed prior to further imaging studies.

Learning Objective: To understand the relation between bedside vestibular test findings and the presence of CPA masses.

Desired Result: To demonstrate that simple bedside vestibular tests can be used to identify which patients referred to otolaryngologists with potential CPA masses should undergo further evaluation with imaging.

Level of Evidence: Level V

Indicate IRB or IACUC: Exempt

Neck Angles, Drilling Forces, Drilling Accuracy, and Frustration Levels Differ According to Ergonomic Position in a Simulated Otologic Drilling Task

Eric J. Formeister, MD, MS; Hyonoo Joo, BS; Zihao Lin, MS, Aditi Kishore, BS
Michael Pozin, BS, John P. Carey, MD; Deepa Galaiya, MD

Objective: To characterize neck flexion angles, drilling force, drilling accuracy, and perceived exertion/frustration during performance of a simulated otologic drilling procedure in different ergonomic positions.

Study Design: Randomized cross-over trial.

Setting: Tertiary center.

Subjects: Attending (n=5), fellow (n=2) and resident (n=6) otolaryngologists.

Interventions: Participants performed microscopic drilling of eggs consecutively in three different seated positions: (1) ergonomically ideal ("good"); (2) ergonomically unfavorable "slouch" position; (3) ergonomically unfavorable (neck "craning") position.

Main Outcome Measures: Neck angle measurement via inertial measurement units; force applied during otologic task; drilling accuracy, and perceived effort and frustration as measured by the NASA Task Load Index (NASA-TLX).

Results: The average neck angle in the good position was 18.2 degrees, compared to 28.8 degrees in the craning position and 36.2 degrees in the slouch position. Average peak forces in the good position (0.65 N) were lower than that in the slouch position (0.97 N) or craning position (0.75 N). Accuracy of egg drilling was significantly better in the good compared to craning position ($p=0.04$) but not in the good compared to slouch position ($p=0.13$). All domains of the NASA-TLX were significantly worse in the slouch and craning position compared to the ergonomically favorable position $p<0.01$).

Conclusions: In this simulated task of microscopic otologic surgery, measured neck angles over time were worse in ergonomically unfavorable positions compared to the favorable position, which was accompanied by higher mean forces applied during drilling, decreased accuracy of drilling, and higher perceived effort, exertion, and frustration levels. Future studies are needed to characterize the effects of ergonomic interventions on ergonomic risk in otology.

Professional Practice Gap & Educational Need: Ergonomic risk in otology is a well-known entity and can place surgeons at increased risk of burnout and reduced career longevity. However, this risk is based primarily on small survey studies using convenience samples from professional societies and single institution investigations. A more comprehensive assessment of ergonomic risk in otology using quantitative, objective measures is needed in order to guide interventions and curricular changes in training programs.

Learning Objective: To investigate whether ergonomically unfavorable positioning is accompanied by increasing neck flexion during performance of a microscopic otologic simulation and to assess whether positioning affects force applied during this task, accuracy of the task, and perceived exertion and frustration levels during the task.

Desired Result: At the end of the presentation, the participant will learn what constitutes ideal ergonomic positioning in the otology operating room, several measures of ergonomic risk, and how unfavorable ergonomic positioning can influence accuracy of drilling and perceived frustration levels.

Level of Evidence - Level IV.

Indicate IRB or IACUC:
This study was approved by the Johns Hopkins Institutional Review Board (IRB number 00289314).

The Role of Socioeconomic Status in the Outcomes of Patients with Malignant Otitis Externa

Woo Yul Byun, BSE; Lisa Zhang, MD; Joseph F. Bonanno, BS
Stephanie S. Wentzel, BS; Yin Ren, MD, PhD

Study Design: Retrospective Cohort

Setting: University-based tertiary medical center

Patients: Adult patients (n= 23) presenting with confirmed Malignant Otitis Externa from 2010-2022

Interventions: None

Main Outcome Measures: Data including race, marital status, zip code, days hospitalized, insurance type, five-year mortality, admissions, and follow-up visits was collected from patients diagnosed with malignant otitis externa.

Results: A total of 39 charts were reviewed among patients with suspected malignant otitis externa between 2010-2022. 23 patients were included total. 26.1% (6/23) of patients lived in a zip code where the median family income lied below the first quartile of our data set. There were significant associations between those lost at > 1-year follow-up & insurance type (**p = 0.016**) and between those with an income below the first quartile and days hospitalized (**p= 0.037**). There was a significant association between race & overall 5-year survival (**p = 0.016**); however, survival specific to malignant otitis externa was not significantly associated with race (p = 0.676).

Conclusions: The income quartile of patients with malignant otitis externa had a role in the duration of their inpatient course, possibly suggesting a more severe disease course among those from areas with a lower median family income.

Professional Practice Gap & Educational Need: Educate otologists on the role of socioeconomic factors in the management of patients with malignant otitis externa.

Learning Objective: To gain insight into the factors contributing to disease severity in those with malignant otitis externa.

Desired Result: Given the significant associations with income level and length of hospitalization, clinicians should be mindful of potential financial barriers when determining a treatment plan for patients at high risk for developing malignant otitis externa.

Level of Evidence – IV

Indicate IRB or IACUC: IRB 2022H0178

Revision Balloon Eustachian Tuboplasty: Conclusions of Initial Experience

Ophir Handzel, MD; Brynn Lopez; Dennis S. Poe, MD, PhD

Objective: Evaluate the response to revision balloon Eustachian tuboplasty (BET). Analyze factors influencing the success or failure of the procedures.

Study Design: A retrospective chart review

Setting: Tertiary referral center.

Patients: Patients with dilatory Eustachian tube (ET) dysfunction (ETD) who have undergone both primary and revision BET.

Interventions: Primary and revision BET.

Main Outcome Measures: Results of interventions are evaluated based on the change in otoscopy (normal, retracted, middle ear fluids), tympanic membrane response to Valsalva's maneuver, symptoms of barochallenge ETD, evaluation of the degree of inflammation and opening of the ET orifice by nasopharyngoscopy, degree of air-bone gap and tympanometry (A/B/C).

Results: Of 360 patients undergoing primary BET, fifteen were revised. All the latter failed to achieve a complete resolution with the primary procedure. Two patients had barochallenge ETD, and delayed symptomatic relapse that responded to revision BET. Three patients with barochallenged ETD required adjunctive procedures to revision BET. Ten patients had variable forms of otitis media and ETD. All required adjunct procedures to revision BET. Nonresponders to primary BET tended to have anatomical obstruction not initially recognized (i.e., cartilage spur bulging to the ET lumen) addressed during revision surgery. Some delayed failures resulted from inadequate medical treatment and inflammation of the ET.

Conclusions: Patients not responding to primary BET should be examined thoroughly for anatomical contributing factors to obstruction. Delayed failure can be helped by maximizing medical treatment and adjunct procedures to revision BET, especially when tympanic membrane pathologies are present.

Professional Practice Gap & Educational Need: BET is becoming an increasingly popular treatment choice for ETD, applied by many surgeons. Despite its popularity, the role of revision BET has not been established. Few data exist regarding the indications for the repeated procedure and the characteristics of patients most likely to benefit from it.

Learning Objective: The audience/reader will be aware of the results of revision BET, the suggested selection criteria for revision BET, and which patients will most likely benefit from a revised procedure. The specifics of the targeted physical examination to define the best candidates for and components of revision BET will be discussed.

Desired Result: Clinicians will incorporate the presented data in their management of patients who failed to completely respond to primary BET for dilatory ETD. This will include differentiating between immediate and delayed failures and the details of the targeted physical examination. This will hopefully result in a higher proportion of patients benefitting from revision BET and fewer revisions performed in patients less likely to benefit from the procedure.

Level of Evidence - IV

Indicate IRB or IACUC: Children hospital of Boston IRB-00010256

Novel Diagnostic Implications from Absence of the H3.3 K36M Mutation in Chondroblastoma of the Temporal Bone

Michael J. Ye, MD; Krishna V. Hegde, MD; Pei-Ciao Tang, PhD
Mitesh V. Shah, MD; Shaoxiong Chen, MD, PhD
Rick F. Nelson, MD, PhD

Hypothesis: Screening for histone gene H3.3 driver mutations in chondroblastoma of the temporal bone (CTB) will elucidate pathogenesis, aid in diagnosis, and guide management for these challenging tumors.

Background: Distinct driver mutations in histone gene H3.3 (H3F3B-K36M and H3F3A-G34W) define chondroblastomas of the long bones (CLB) and giant cell tumors (GCT), respectively. 95% of CLB harbor the H3F3B K36M mutation, which results in decreased tri-methylation of lysine 36. The genetic drivers of CTB are unknown. We aim to report our findings on the unique genetics of CTB and aid in pathological differentiation versus other histologically similar bone tumors.

Methods: Sanger DNA sequencing of H3.3 and all core histones was performed in human pathological specimens of CTB, CLB, and GCT (n = 3 each). Relative H3.3 methylation levels were compared between specimens using immunohistochemical staining and Western blot utilizing an anti-K36me3 antibody.

Results: H3F3B-K36M mutation was detected in all CLB but was not detected in CTB or GCT tumors. H3F3A-G34W mutation was observed in all GCT but not in CLB and CTB. No novel mutations within other histones were detected in CTB. H3.3 K36 tri-methylation was robust in GCT but was decreased across both CLB and CTB.

Conclusions: Accurate diagnosis of CTB can be challenging even for experienced pathologists. Despite the lack of H3F3B mutations, CTB exhibit similar K36M methylation status implicating a common mechanism of chondroblastomas. Our findings suggest anti-K36me3 immunohistochemistry may be effective at differentiating between CTB and other histologically similar lesions such as GCT.

Professional Practice Gap & Educational Need: The histopathologic characteristics of chondroblastoma overlap with other bone tumors including chondromyxoid fibroma and giant cell tumor of bone. Treatment options and modalities differ between each of these entities. This study brings to light nuances unique to the diagnosis of chondroblastoma of the temporal bone in order to aid with accurate diagnosis.

Learning Objective: To understand the unique genetics, pathogenesis, and immunohistochemistry of chondroblastoma of the temporal bone.

Desired Result: To screen for genetic differences between chondroblastoma of temporal bone and those arising from long bones in order to aid in pathological workup and accurate diagnosis, elucidate pathogenesis, and guide future investigation for these tumors.

Level of Evidence – III

Indicate IRB or IACUC: Exempt

Cochlear Implantation After Head and Neck Radiation: Case Series, Systematic Review, and Meta-Analysis

Jumah G. Ahmad, MD; Benjamin D. Lovin, MD
Marc-Elle Nader, MD; Paul W. Gidley, MD

Objective: To report results of cochlear implantation (CI) after head and neck (HN) external beam radiation (XRT).

Study Design: Retrospective review with systematic review and meta-analysis.

Setting: Tertiary referral center.

Patients: History of HNXRT.

Interventions: CI.

Main Outcome Measures: Audiologic outcomes and complications.

Results: Six (60%) patients had HN cancer (HNC) and 3 (30%) had central nervous system pathologies (CNS). One HNC patient had bilateral implants. There were no complications. The mean time from XRT to CI was 9.6 years in HNC and 31.2 years in CNS. The mean time from CI to last follow up was 1.8 years. Twenty articles with an additional 98 cases were suitable for systematic review. Sixty-seven cases (61.5%) had HNC and 17 had CNS (15.6%). A bimodal distribution of age was noted with a mean of 59.1 years for HNC and 35.8 for CNS. Abnormal intraoperative findings were common with soft mastoid bone most frequent. Complications occurred in 10% of cases, including dehiscence, infection, and extrusion. Seventeen cases had staged procedures. Two devices were implanted without magnets. Free flaps were used before, during, and after CI. Sixty-three cases fit inclusion criteria for the meta-analysis of audiologic outcomes. All cases demonstrated improvement in speech discrimination with mean increase of 57% at a mean of 25.7 months post-operatively.

Conclusions: CI is effective in hearing rehabilitation in patients with a history of HNXRT. Special considerations related to planning, patient expectations, technique, and post-operative care are required in this unique population.

Professional Practice Gap & Educational Need: Although there have been many studies on this topic, none have comprehensively reviewed all the data in the literature.

Learning Objective: To understand appropriate considerations when performing CI on patients with history of HNXRT.

Desired Result: Improved outcomes of patients with CI after HNXRT through appropriate planning, technique, post-operative care, and appropriate patient counseling.

Level of Evidence: Level IV.

IRB: PA19-0106.

Incidence of Pattern and Location of Superior Semicircular Canal Dehiscence: A Computer Topographic Scan Review with Correlation of Presentation and Implications for Surgical Management

Juan C. Yanez-Siller, MD, MPH; Jeffrey Liaw, MD
Edmund Howe, BS; Arnaldo L. Rivera, MD

Objective: Superior semicircular canal dehiscence (SSCD) location varies greatly. Preoperative knowledge of SSCD location may influence selection of surgical approach. We seek to evaluate the location pattern of SSCD and add to the available literature in terms of their clinical and surgical significance.

Study design: Retrospective review

Patients: as of the time of this submission, computer tomography temporal bone scans (CTTB) of 21 patients with SSCD have been reviewed. CTTB of additional 30 patients (total 51), plus audiogram and symptoms at presentation (all patients) will be reviewed and presented in the final publication.

Intervention: CTTB of 21 patients with symptomatic SSCD (36 affected sides) have been evaluated. CTTB of additional 30 patients and symptoms and audiogram patterns at presentation will also be reviewed.

Main outcome measures: age, sex, location of SSCD, symptoms and audiogram at presentation.

Results: So far CTTB of 21 patients (10 male, 11 female; mean age 54.8-years) with symptomatic SSCD have been evaluated; (36 affected sides; 20 right, 16 left). Centrally located (i.e., highest point of superior semicircular canal) have been detected in 7/36 affected sides (19.4%). 12/36 (33.3%) involved the ascending+central portions, 5/36 (13.9%) central+descending portions, 5/36 (13.9%) isolated to the descending portion ("downsloping") and 2/36 (5.6%) ascending+central+descending ("half-arch") portions of the superior semicircular canal. Separate ascending and descending defects (same side) were noted in 5/36 (13.9%).

Conclusions SSCD defect location patterns vary considerably. Defect location may impact symptom presentation and may help determine appropriate surgical approach for repair.

Professional Practice Gap & Educational Need: SSCD defect location varies significantly. The defect location has been briefly described. Further detail on its clinical and surgical implications is necessary to advance the literature and knowledge of this disease.

Learning Objective: Evaluate the location pattern of SSCD and add to the available literature in terms of their clinical and surgical significance.

Desired Result: Knowledge gain regarding incidence of different SSCD patterns and its clinical and surgical implications.

Level of Evidence: Level V

Indicate IRB or IACUC: Exempt

Comparison of Hearing Results with the Use of Different Heat-Activated Crimping Prostheses in Stapedotomy

Benjamin D. Liba, MD; Sara Kortebein, MD; John Symms, MD
Todd A. Hillman, MD; Douglas A. Chen, MD

Objective: To determine differences in hearing outcomes of a completely encircling heat-activated crimping prosthesis (SMart 360°) compared to partially encircling prosthesis (SMart)

Study Design: Retrospective chart review

Setting: Private neurotology tertiary referral center

Patients: Patients who underwent stapedotomies performed by the senior authors from 2008-2019 using the SMart prosthesis and SMart 360° prothesis**.**

Interventions: Stapedotomy operations with placement of a SMart or SMart 360° prosthesis.

Main Outcome Measures: Differences in pre-operative air bone gap (ABG) compared to post-operative ABG at 3-months, 1 year and 2 years after surgery.

Results: 228 stapedotomies were performed (SMart n=48 and SMart 360° n= 220). Mean pre-operative ABG for SMart and SMart 360° were 27 dB and 29 dB respectively. The mean difference in ABG for SMart and SMart 360° at 3 month, 1 year, and 2 years were 17 dB, 18 dB, and 11 dB respectively and 20 dB, 20 dB, and 19 dB. ABG differences were not statistically significant ($p = 0.97$ at 3 months, 0.55 at 1 year, and 0.26 at 2 years). There were 6 failures of the SMart prosthesis (12.5%) and 5 for the SMart 360° (2.3%)

Conclusions: No statistically significant differences in ABG changes for SMart compared to SMart 360°. Higher rate of prosthesis failure was found with the SMart prosthesis.

Professional Practice Gap & Educational Need: Determination of most efficacious stapes prosthesis.

Learning Objective: Which stapes prosthesis produces better hearing results with fewer failures.

Desired Result: To disseminate information necessary to choose the best stapes prosthesis for patients.

Level of Evidence – Level III

Indicate IRB or IACUC: 2022-029-agh

AOS POSTER F050

Characteristics of Eustachian Tube Dysfunction in Migraine Patients

Eunice Park BS; Austin Miller, MD; Yuan Liu, MD, PhD

Objective: To investigate the prevalence of and characterize Eustachian tube dysfunction (ETD) in patients with migraine.

Study Design: Retrospective case series

Setting: academic, tertiary care center neurology clinic

Patients: Adult patients diagnosed with migraine from 2010-2022 who underwent tympanometric testing.

Interventions: N/A

Main Outcome Measures: Prevalence and severity of ETD based on tympanometry; association between patient-reported symptoms and ETD; comparison of characteristics between migraine patients with and without ETD.

Results: Of 216 patients, 48 (22%) had at least 1 ear with an abnormal tympanogram (type As, B, or C), indicating ETD, compared to a prevalence of 5% in US adults from previous literature. The ETD group had a mean Tympanometric Peak Pressure of -32.4 daPa (vs -3 daPa in the non-ETD group, $p<0.001$) and mean Static Admittance of 0.44 mmho/ml.(vs 0.80 mmho/mL in the non ETD group, $p<0.001$). Migraine patients with ETD were more likely to be female (88% vs. 73%, $p=0.033$), older (mean age 54 vs. 46, $p=0.002$), and have hypertension (48% vs. 25%, $p=0.002$), but less likely to have tinnitus (56% vs. 73%, $p=0.031$) than those without ETD. Migraine patients with ETD were not more likely to report ear pain, aural fullness, hearing loss, or dizziness than patients without ETD. On univariate logistic regression, sex ($p=0.039$), age ($p=0.003$), hypertension ($p=0.003$), and tinnitus ($p=0.03$) were independent predictors for ETD. In a multivariate logistic regression model, sex, age, and tinnitus remained statistically significant.

Conclusions: ETD appears to be more common in patients with migraine than the general population. Ear pain, fullness, and subjective hearing loss were not reliable predictors of ETD.

Professional Practice Gap & Educational Need: Better understanding of how aural symptoms relate to underlying eustachian tube problems in migraine patients.

Learning Objective: To recognize higher rates of ETD in migraine patients and realize that symptoms commonly used to diagnose ETD may not correlate with ETD based on tympanometry in this population.

Desired Result: Demonstrate and characterize ETD in patients with migraine.

Level of Evidence - Level V

Indicate IRB or IACUC : IRB #5210258—Loma Linda University

Cost Effectiveness Model of Non-echo Planar Diffusion Weighted MRI in Place of Planned Second-Look Surgeries for Cholesteatoma

Terral A. Patel, MD; Abhinav Ettyreddy, MD; Tracy Cheng, MD
Kenneth J. Smith, MD, MS; Shaum S. Sridharan, MD
Andrew McCall, MD

Objective: Identify the cost effectiveness of using non-echo planar diffusion weighted MRI (non-EP DWMRI) in the management of residual cholesteatoma after primary surgical management.

Data sources: Pubmed database was queried for relevant probability parameters to use in the statistical model.

Study selection: Studies with patients who have had primary canal wall up surgeries for cholesteatoma and planned to undergo second-look surgery. Inclusion criteria included the use of non-EP DWMRI with surgical confirmation.

Data extraction: Analysis parameters were manually abstracted from published historical data and a health care perspective. Cost data were based on current Centers for Medicare and Medicaid Services fee rates in US dollars.

Data synthesis: A cost-effectiveness analysis model comparing planned second-look surgery to serial non-EP DWMRI was performed using a decision-analytic model that assumes primary surgical management. Effectiveness was defined as proper identification and treatment of residual disease. Base case analysis found MRI to be less costly but less effective than planned second-look surgery with incremental cost effectiveness ratio value over $100,000 per patient with missed cholesteatoma. When effectiveness included avoidance of surgery in cholesteatoma-free patients, non-EP DWMRI was more effective and less costly.

Conclusions: Non-EP DWMRI may be a less costly and more effective alternative to planned second look surgery in the management of residual cholesteatoma. However, this strategy has some potential downsides, such as greater extent of disease at time of identification due to delay in diagnosis and missed disease in infrequent cases. Future studies are warranted to determine the impact of a wait-and-scan approach following primary surgical management of cholesteatoma.

Professional Practice Gap & Educational Need: Currently, second-look surgery is commonly undertaken in the management of cholesteatoma after initial surgery. The introduction of non-echo planar diffusion weighted MRI has allowed for the improved detection of cholesteatoma and although it is currently used in the management of cholesteatoma in some situations, more data are needed to evaluate its cost effectiveness in lieu of planned second-look surgery.

Learning Objective:
1. Understand the cost-effectiveness of non-echo planar diffusion-weighted MRI in managing cholesteatoma following primary surgery for cholesteatoma.
2. Consider alternative strategies for management of cholesteatoma following primary surgery for cholesteatoma.

Desired Result: Changes in physician knowledge and promoting future study.

Level of Evidence – III

Indicate IRB or IACUC: Exempt

The Impact of Regional Nerve Blocks in Otologic Surgery

Olivia A. La Monte, BS; Fernanda Pacheco; Morgan Davis, MD
Brenton Alexander, MD; Rodney Gabriel, MD
Omid Moshtaghi, MD; Elina Kari, MD

Objective: To investigate the impact of regional nerve blocks on postoperative opioid use.

Study Design: Retrospective chart review of patients undergoing cochlear implantation at our institution. Data collected includes patient demographics, chronic pain, procedure type, anesthetic used, perioperative opioid administration in morphine milligram equivalents (MME), intraoperative and postoperative pain scores, and postoperative opioid use.

Setting: Academic hospital

Patients: 89 patients who underwent cochlear implantation

Interventions: Regional nerve block of the superficial cervical plexus or the greater auricular nerve

Main Outcome Measures: Perioperative opioid use reported as morphine milligram equivalents (MME)

Results: Out of 89 patients, 44 (49% female, 51% male) received a regional nerve block and 45 (46% female, 54% male) did not. Mean age for intervention group and control group was 68 and 64, respectively ($p=0.21$). Secondary outcome measures, including chronic pain and substance abuse, did not differ significantly between groups. On average, nerve block patients required slightly lower MME compared to patients who did not receive nerve blocks (43 MME vs 40 MME, $p=0.49$).

Conclusions: In this cohort of patients undergoing cochlear implantation, we found that the implementation of preoperative nerve blocks was associated with a trend towards lower MME requirements intra- and perioperatively. Although not statistically significant, phase 2 of this study is a prospective trial, in progress, to determine if preoperative nerve blocks can decrease outpatient narcotic usage. Using nerve blocks has the potential to significantly decrease opioid utilization following outpatient otologic surgery, reducing complications and the risk of opioid dependence.

Professional Practice Gap & Educational Need: According to the CDC, in the last two decades more than 564,000 people have died from opioid overdoses including both prescribed and illicit opioids. To mitigate the opioid crisis, multimodal pain regimens have become increasingly popular as a means of reducing the use of opioids for acute, postoperative surgical pain. Multiple surgical disciplines such as orthopedics and OBGYN have implemented the use of regional nerve blocks for managing postoperative pain with the benefit of reducing narcotic usage and a more favorable side effect profile (i.e. less drowsiness, constipation, nausea and vomiting, respiratory depression). The use of regional nerve blocks for otologic surgery, however, is not routinely practiced, and little research has been conducted regarding the utility and effectiveness of these blocks to reduce narcotic requirements which has the potential to directly impact prescribing practices among otolaryngologists.

Learning Objective: The purpose of this study is to provide data and an overview of the benefits associated with regional nerve blocks in neurotologic surgery. The retrospective component of our study presents perioperative opioid use related to nerve blocks. The prospective trial will provide data on preoperative anesthetic nerve blocks and their impact on outpatient opioid use.

Desired Result: Regional nerve blocks can effectively reduce acute surgical pain and postoperative opioid use in patients undergoing outpatient otologic surgery.

Level of Evidence – III

Indicate IRB or IACUC : UCSD IRB #800282, Approved 11/10/2021

A Historical Recount: Carl-Olof Nylén's Denied Passion

Ahmed S. Alzubaidi, BA; Khizur Kamran, BS
Omid Moshtaghi, MD; Sunny J. Taft, MD

WITHDRAWN BY AUTHOR

Modified Preauricular Approach for an Implantable Stimulator of the Distal Branches of the Auriculotemporal Nerve

Vivek Kanumuri, MD; Julian Purrinos, BS; Devin Kennedy, BS
Erin Williams, MS; Patrick Ganzer, PhD; Michael Hoffer, MD

Hypothesis: A preauricular approach can be used to reliably implant a nerve cuff on distal auriculotemporal branches.

Background: There is increased interest in the distal branches of the auriculotemporal nerve for a number of clinical applications including treatment of migraine, neuralgia, cardiac disease, and modulation of tinnitus. However, there has been limited anatomic description of branching patterns of these distal nerves specifically when considering potential non-invasive and invasive stimulation. In this cadaveric study, we demonstrated feasibility of placement of an implantable nerve cuff on the superficial temporal branches of the auriculotemporal nerve.

Methods: We performed cadaveric dissections using a modified pre-auricular approach to expose the course of the auriculotemporal nerve as it branches into tragal and superficial temporal branches. The number of major distal branches was counted, and diameter of the nerve at various points along its course was assessed. An implantable nerve cuff was then placed along a major superficial temporal branch and coupled to a mock stimulator/pulse generator placed in a tight subperiosteal pocket.

Results: At least one major superficial temporal branch and one major tragal branch of the auriculotemporal nerve was able to be identified in all cadaveric specimens. The average diameter of the largest superficial temporal branch just distal to its takeoff was 1.1mm. A nerve cuff was able to be reliably coupled to the largest superficial temporal branch.

Conclusion: A preauricular approach can be used to reliably identify a major superficial temporal branch of the auriculotemporal nerve and place an implantable nerve stimulator.

Professional Practice Gap & Educational Need: Anatomy and clinical applications of the distal branches of the auriculotemporal nerve

Learning Objective: The learner will gain an improved understanding of the anatomy of the distal branches of the auriculotemporal nerve along with potential clinical applications

Desired Result: This approach may represent an important clinical tool as we explore the effectiveness of stimulation of the superficial temporal nerve in treating otological and neurologic pathology

Level of Evidence – N/A

Indicate IRB or IACUC: Exempt

Immunolocalization of ACE-2 Receptor for SARS-CoV-2 in the Human Eustachian Tube

Miryam S. Saad; Ivan A Lopez, PhD
Gail Ishiyama, MD; Akira Ishiyama, MD

Hypothesis: Investigate expression of Angiotensin-Converting Enzyme-2 (ACE-2), a SARS-CoV-2 entry receptor, in the human Eustachian tube

Background: The Eustachian tube is an osseocartilaginous canal connecting the nasopharynx to the middle ear responsible for pressure equalization, secretion clearance, and protection from nasopharyngeal pathogens. SARS-CoV-2 RNA was isolated from the human mastoid and middle ear. The Eustachian tube may serve as conduit for SARS-CoV-2 entry into the middle ear.

Methods: Archival celloidin embedded specimens from 9 individuals with no auditory or balance disorders were studied. Sections containing the middle ear and Eustachian tube were immunoreacted with ACE-2 mouse monoclonal antibodies and secondary antibodies against mouse or HRP. Digital images were obtained using a Leica (SP8) laser confocal microscope.

Results: There is differential degree of ACE-2-immunoreativity detected in the mucosal epithelium of the Eustachian tube and middle ear. There is strong expression of ACE-2 on the apical ciliated cuboidal cells of the middle ear mucosa over the cochlear promontory, and moderate expression of ACE-2 on the apical ciliated columnar cells near the opening of the Eustachian tube into the middle ear. Goblets cells could be visualized and were ACE-2 non-immunoreactive. There was lower expression of ACE-2 within the ciliated cuboidal near the aditus ad antrum.

Conclusions: ACE-2 expression in the Eustachian tube supports the possibility of a transmucosal route for SARS-CoV-2 entry into the middle ear from the nasopharynx. Continuity of ACE-2 expression suggests that SARS-CoV-2 which infects the nasopharynx may then track to infect the ciliated epithelium of the Eustachian tube and then subsequently the middle ear.

Professional Practice Gap & Educational Need: The route for SARS-CoV-2 entry into the middle and inner ear is unknown. Identifying SARS-CoV-2 entry proteins in the Eustachian tube and middle ear is clinically significant to understand a potential route of viral entry to the middle ear.

Learning Objective: To describe ACE-2 receptor expression distribution in the human eustachian tube and middle ear.

Desired Result: Identifying ACE-2 expression in the eustachian tube and middle ear can help elucidate the route for SARS-CoV entry into the middle ear with significant implications for diagnostics, therapeutics, and otologic procedures.

Level of Evidence – Level IV

Indicate IRB or IACUC: #10-001449, UCLA