SELECTED ABSTRACTS

POSTER PRESENTATIONS

IN ORDER OF PRESENTATION

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AMERICAN NEUROTOLOGY SOCIETY

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Improved Postoperative Speech Recognition and Processor Use with Early Cochlear Implant Activation

Ankita Patro, MD, MS; Nathan R. Lindquist, MD; Jourdan T. Holder, AuD, PhD
René Gifford, PhD; David S. Haynes, MD; Elizabeth L. Perkins, MD

Objective: To report speech recognition outcomes and processor use based on timing of cochlear implant (CI) activation.

Study Design: Retrospective cohort.

Setting: Tertiary referral center.

Patients: 604 adult CI recipients from 2011-2022, stratified by timing of CI activation (group 1: ≤10 days, n=47; group 2: >10 days, n=557).

Main Outcome Measures: Average daily processor use; CNC and AzBio in quiet at 1, 3, 6, and 12-month visits; time to peak performance.

Results: Both groups did not differ in gender (p=0.887), age at CI (p=0.109), preop CNC (p=0.073), or preop AzBio in quiet (p=0.114). Group 1 had higher average daily processor use than group 2 at the 1-month (11.5 vs. 9.9 hours/day, p=0.014) and 3-month (12.2 vs. 10.9 hours/day, p=0.042) visits, with no significant differences at 6 and 12 months. The early activation group had superior CNC performance at 3 months (54% vs. 43%, p=0.007) and 12 months (58% vs. 50%, p=0.044). Similarly, the early activation group had superior AzBio in quiet performance at 3 months (69% vs. 56%, p=0.008) and 12 months (72% vs. 63%, p=0.049). Both groups were equivalent in time to peak performance for CNC and AzBio. A very weak but significant negative correlation was found between timing of activation and AzBio scores (r_s = -0.10, p=0.021).

Conclusions: CI activation within 10 days of surgery is associated with increased device usage and superior speech recognition at both early and late follow-up visits. Using a large cohort, this study is the first to report outcomes related to timing of CI activation.

Professional Practice Gap & Educational Need: The impact of the timing of CI activation on postoperative outcomes such as processor use and speech recognition has not been reported. These findings are important for optimizing performance after implantation and counseling patients.

Learning Objective: To understand the impact of CI activation timing on speech and datalogging outcomes.

Desired Result: Providers will have knowledge about better postoperative speech perception and higher processor use with early CI activation. Coupled with other studies showing the safety of early activation, these results can be utilized to streamline activation within 10 days of implantation.

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

Indicate IRB or IACUC: IRB Exempt (221833, Vanderbilt University).

The Younger, the Better: The Effect of Age on Facial Nerve Recovery after Vestibular Schwannoma Resection

Robert J. Macielak, MD; Christine M. Lohse, MS
Katherine P. Wallerius, MD; Skye K. Lawlor, MD
Brian A. Neff, MD; Colin L.W. Driscoll, MD; Matthew L. Carlson, MD

Objective: To assess the influence of age on facial nerve recovery after vestibular schwannoma (VS) microsurgical resection

Study Design: Historical cohort study

Setting: Tertiary referral center

Patients: Patients with a House-Brackmann (HB) grade ≥III in the immediate postoperative period after microsurgical resection of sporadic VS

Interventions: Microsurgical resection

Main Outcome Measures: Complete recovery of facial nerve function to HB grade I at least 12 months postoperatively

Results: There were 6 patients with intracanalicular tumors and 100 with cerebellopontine angle (CPA) tumors eligible for study. Given the few patients with intracanalicular tumors, no further analysis was pursued in this subset. Median age for patients with CPA tumors was 49 years (IQR 40-60). There were 44 HB grade III, 19 grade IV, 15 grade V, and 22 grade VI assessments in the immediate postoperative period, and 35 HB grade I, 27 grade II, 26 grade III, 9 grade IV, 2 grade V, and 1 grade VI assessments at most recent evaluation. Univariable analysis of patient and tumor characteristics noted age (OR for 10-year increase of 0.69; 95% CI 0.50-0.93; p=0.02) and immediate postoperative HB grade (OR for 1-grade increase of 0.27; 95% CI 0.15-0.49; p<0.001) to be significantly associated with complete recovery. After multivariable adjustment for immediate postoperative HB grade, age remained significantly associated with complete recovery (OR 0.68; 95% CI 0.47-0.98; p=0.04).

Conclusions: After considering immediate postoperative HB grade, older age at surgery was found to significantly decrease the odds of complete facial nerve recovery, which can assist in intraoperative decision-making regarding extent of resection and postoperative counseling.

Professional Practice Gap & Educational Need: Knowledge of the effect of age on facial nerve recovery after vestibular schwannoma resection

Learning Objective: The learner should be able to identify patient and tumor characteristics that affect facial nerve recovery after microsurgical resection.

Desired Result: The desired result is that the provider will be able to counsel the patient on potential facial nerve recovery if paresis or paralysis is experienced in the postoperative period.

Level of Evidence: IV

Indicate IRB or IACUC: Mayo Clinic IRB Protocol #16-007363

ANS POSTER G003

Immunofluorescence Intensity Analysis in Human Temporal Bones in Patients with Meniere's Disease

J. Dixon Johns, MD; Rafal Olszewski, PhD; Ivan Lopez, PhD
Akira Ishiyama, MD; Michael Hoa, MD

Hypothesis: Analysis of human temporal bone specimens of patients with Meniere's Disease (MD) may demonstrate altered expression of gene products related to barrier formation and ionic homeostasis within cochlear structures compared to control specimens.

Background: MD represents a challenging otologic disorder for investigation. Prior studies have highlighted a number of phenotypic findings within the inner ear, including endolymphatic hydrops and atrophy of many cochlear structures. Despite attempts to define the pathogenesis of MD, there remain many gaps in our understanding, including differences in critical cell type-specific protein expression within the inner ear. Understanding these changes may facilitate the identification of more targeted therapies for MD.

Methods: Human temporal bones from patients with MD (n = 8) and age-matched control patients (n = 8) were obtained and processed with immunohistochemistry stains to detect known cell type-specific protein expression related to ionic homeostasis and barrier function in the cochlea. Immunofluorescence intensity analysis was performed to quantify protein expression in the stria vascularis (SV), organ of Corti (OoC), and spiral ganglion (SGN).

Results: Analyses of protein expression in the different regions of the cochlea (SV, OoC, SGN) suggest the possibility of differential expression of proteins related to ionic homeostasis and barrier function in the stria vascularis.

Conclusions: The results of this study support that there may be differences in the expression of proteins related to ionic homeostasis and barrier function within the cochlea, potentially supporting the role of targeted therapies to treat MD.

Professional Practice Gap & Educational Need: There continues to be a lack of knowledge regarding the expression of gene products within the inner ear structures and how they relate to the pathogenesis of MD. Immunohistochemistry analysis has provided many insights into the pathophysiology of many other disease processes within the inner ear and may similarly be utilized to gain better understanding in patients with MD.

Learning Objective: To 1) highlight differential degrees of expression of genes of interest within human temporal bone specimens in patients with MD compared to control, and 2) determine specific anatomic locations within the cochlea for these differentially expressed gene products.

Desired Result: This study will contribute to our understanding of differential expression of gene targets within the cochlea for patients with MD, allowing for a discussion on how these differences may contribute to disease progression and providing rational support for future studies aimed at identifying potentially druggable gene targets for Meniere's disease.

Level of Evidence: Level III – cohort and case-control studies

Indicate IRB or IACUC : The studies involving human participants were reviewed and approved by the University of California at Los Angeles Institutional Review Board (IRB protocol #10-001449). Appropriate informed consent for inclusion in the study was obtained from each temporal bone donor.

Design and Methods of the Early Age-Related Hearing Loss Investigation (EARHLI) Randomized Controlled Trial

Michael W. Denham, MPhil; Michelle L. Arnold, AuD, PhD
Victoria A. Sanchez, AuD, PhD; Frank R. Lin, MD, PhD
Jose A. Luchsinger, MD, MPH; Justin S. Golub, MD, MS

Objective: To describe the design and methods of the upcoming NIH-funded Early Age-Related Hearing Loss Investigation (EARHLI) randomized controlled trial, which will assess whether a hearing intervention versus a health education comparator affects cognition, social engagement, and brain connectivity

Study Design: Randomized controlled trial (RCT)

Setting: Single academic medical center

Subjects: 150 community-dwelling adults aged 55-75 years with borderline-to-moderate hearing loss (20-55 dB pure-tone average) and amnestic mild cognitive impairment

Interventions: Subjects will be randomized to a best-practices hearing rehabilitation program including hearing aids versus a standardized health education program comparator.

Main Outcome Measures: Subjects will be followed for one year to evaluate pre- vs. post- intervention change on: (1) Global and domain-specific cognitive performance on the Alzheimer Disease Cooperative Study Preclinical Alzheimer Cognitive Composite (ADCS-PACC) standardized assessment, Trail Making Test Part B, and the ADCS-Activities of Daily Living-Prevention Instrument; (2) Social engagement (social activity frequency, Community Integration Measure, Cohen's Social Network Index, and the UCLA Loneliness Scale); and (3) Brain cross-modal organization and functional/structural connectivity on fMRI.

Conclusions: When completed in 2027, the EARHLI trial will provide substantive evidence on the effects of hearing intervention on cognitive performance, social engagement, and brain organization/connectivity in middle-aged to older community-dwelling adults with hearing loss. In this presentation, we describe the design and methods of this first-in-kind trial that will help clarify whether there is a causal relationship between hearing loss and cognitive decline.

Professional Practice Gap & Educational Need: While many studies have demonstrated an association between hearing loss and cognitive decline, there remains a lack of evidence supporting a hypothesized causal relationship between the two.

Learning Objective: Attendees will understand the design and methods of an upcoming NIH-funded RCT that will help elucidate whether there is a causal relationship between hearing loss and cognitive decline.

Desired Result: Attendees will leave with an understanding of an ongoing RCT with implications to change clinical management of patients at risk of or experiencing cognitive decline.

Level of Evidence – Level I

IRB: Pending, Columbia University

ANS POSTER G005

Quality of Life with Cochlear Implantation Using the CI QOL-35 at a Tertiary Urban Medical Center: Our Experience

Kaitlyn A. Brooks, MD; Esther X. Vivas, MD

Objective: Assessment of quality of life (QOL) outcomes after cochlear implantation (CI) using the Cochlear Implant Quality of Life-35 questionnaire (CI QOL-35) at a tertiary medical center

Study Design: Retrospective cohort

Setting: Single institution tertiary care center

Patients: Patients 18 years and older who have undergone CI and completed a CI QOL-35

Interventions: Implementing CI QOL-35 from 2019 to 2022 to measure change in QOL after CI. Statistical analysis included two-tailed t-test and ANOVA. Significance was set at .05.

Main Outcome Measures: Differences in QOL among CI patients in each of the CI QOL-35 domains

Results: Inclusion criteria yielded 95 patients (44 female, 51 male) aged 20 to 93 years of age (mean 64.1 years) with 131 QOL surveys (64 pre-activation, 67 post-activation). QOL was significantly improved in post-activation scores when compared to pre-activation scores for all domains ($p<.001$). Number of months after implant activation did not affect post-activation QOL scores ($p>.05$). Most post-activation surveys (73%) were obtained within the first 12 months after CI. There was no statistical significance in pre-activation scores when adjusted for gender and age; post-activation QOL scores in the environmental domain, however, were statistically different between male and female patients ($p<.001$). Post-activation scores were not statistically significant when categorized by patient age. Mean follow-up was 19 months post-implantation (range 4 – 57 months).

Conclusions: Cochlear implantation patients experienced improved quality of life post-activation regardless of age and gender. There may be an early plateau for QOL improvement once the implant is activated.

Professional Practice Gap & Educational Need: CI QOL-35 is a relatively young quality of life measurement tool for CI patients and currently has little published data from its implementation. This data will both characterize QOL using the CI QOL-35 and determine if certain patient groups experience different QOL outcomes after CI.

Learning Objective: To understand timing of QOL improvement and change in QOL after cochlear implantation for patients from varied demographic backgrounds in a diverse, urban academic center

Desired Result: Providers will gain knowledge regarding improvement in QOL for patients after cochlear implantation, especially in regards to time after implant activation and patient demographics.

Level of Evidence: Level IV – Retrospective cohort

Indicate IRB: Emory University IRB #00107266

ANS POSTER G006

Hearing Loss, Cisplatin Use, and The Role of Sodium Thiosulfate and Audiological Evaluations – A National Database Study

Amiti Jain, BS; Dev Amin, MD; Anna Bixler, AuD; Irina Middleton, AuD
Zachary D. Urdang, MD, PhD; Thomas O. Willcox, MD; Rebecca C. Chiffer, MD

Objective: Leverage a national electronic health records database to investigate trends in incident cisplatin-related hearing loss (HL), audiological evaluations prior to cisplatin dosing, and use of peri-cisplatin-dosed sodium thiosulfate (STS) for oto-protection.

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

Setting: TriNetX US-collaborative database.

Patients: Patients experiencing HL, cisplatin, and STS treatment.

Main Outcome Measures: Incidence of cisplatin use (VA: AN2555), sensorineural/ototoxic HL (ICD-10: H91.0, H90.3), sodium thiosulfate (STS) use post-cisplatin (VA: M36726), and audiological evaluation pre-cisplatin (CPT: P1012897, P92557). Population proportion instances were normalized by number of visits recorded annually.

Results: 956,537 patients were reported with HL, a 102% increase in incidence from 2016-2021. Within 2016-2022, 41,249 patients received cisplatin. 6.5% developed cisplatin-related HL, an average increase of 0.5% annually. 43% of ototoxic HL incidents occurred within 60 days of the first cisplatin dose. 6.0% received audiological evaluations within 2 months prior to cisplatin. Excluding patients diagnosed with hepatoblastoma, due to dosing differences, and cyanide poisoning, 246 received STS post-cisplatin therapy, an average annual increase of 45%. Audiological evaluations pre-cisplatin use decreased annually by 2% and were weakly associated with cisplatin use ($R^2 = 0.62$). A balanced risk analysis trends towards oto-protection with STS use but lacks sufficient statistical power to conclusively measure an odds ratio.

Conclusions: Incident HL and cisplatin-related HL is rising. Yet, audiologic testing prior to cisplatin administration is scarce. STS use for oto-protection is increasing; however, there is inadequate data for statistically significant conclusions. This study highlights the need for ototoxicity monitoring practices for platin chemotherapy and the inconclusive efficacy for STS as an oto-protectant.

Professional Practice Gap & Educational Need: Trends for hearing loss cisplatin use, cisplatin-related HL, ototoxicity monitoring programs, and STS for oto-protection in the United States has yet to be described on the national level. This study illustrates these trends and highlights the need for more robust oto-toxicity monitoring, and more clinical trial data for STS as an oto-protectant.

Learning Objectives: 1) Recognize the increasing incidence of sensineural/ototoxic HL and the role of cisplatin 2) Appreciate the need for audiological evaluations prior to cisplatin use and STS as a potential oto-protectant.

Desired Result: Evidence informed action plans for enhancing ototoxicity monitoring programs and new clinical trials for systemic and intratympanic STS treatment for cisplatin-related HL.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

ANS POSTER G007

Impact of Comorbidities on Cochlear Implant Outcome

Sabina Dang, MD; James W. Bao, MSCI; David Lee, MD
Jordan Varghese, MD; Amit Walia, MD
Jay F. Picirillo, MD; Matthew Shew, MD

Objective: To examine the association between pre-operative comorbidities and cochlear implant (CI) speech perception outcomes.

Study Design: Retrospective cohort

Setting: Tertiary referral center

Patients: Adult patients (>18) who underwent CI at a tertiary referral center between Jan 2015 – Dec 2021

Exposure: Adult Comorbidity Evaluation 27 (ACE-27), a validated comorbidity index

Main Outcome Measures: Postoperative change in Consonant-Nucleus-Consonant (CNC) scores of the implanted ear at three, six, and twelve months.

Results: A total of 983 patients underwent CI and 625 had comorbidity data available. 32 patients were excluded due to age <18 years, leaving a total of 593 patients for analysis. 29.2% of patients had comorbidity scores of zero; 31.4% had comorbidity scores of one; 27.5% had comorbidity scores of two; 12.0% had comorbidity scores of three. ACE-27 scores were negatively associated with change in CNC at three months ($p=0.044$, $R^2 = 0.0081$, $\beta = -2.6$, 95% CI = -5.1 to -0.072) and twelve months ($p=0.043$, $R^2= 0.010$, $\beta = -3.1$, 95% CI = -6.1 to -0.10). This effect persisted in a multivariate analysis controlling for duration of hearing loss, hearing aid use, and sequential CI at three months ($p=0.017$, $\beta = -3.4$, 95% CI = -6.1 to -0.62) and twelve months ($p=0.011$, $\beta = -4.20$, 95% CI = -7.4 to -1.0). However, comorbidities were no longer significantly associated with worse outcome when age was added to this model. Instead, age was a significant factor in this multivariate analysis (three months [$p<0.001$, $\beta = -0.47$, 95% CI = -0.65 to -0.30], twelve months [$p<0.001$, $\beta = -0.42$, 95% CI = -0.64 to -0.24]).

Conclusions: We present the largest cohort evaluating medical comorbidities in the CI population to date. Our findings suggest that medical comorbidities as assessed by ACE-27 and age may impact postoperative word recognition scores.

Professional Practice Gap & Educational Need: There continues to be significant variability in CI postoperative word recognition scores. This variability results in challenges for preoperative counseling. Current models using duration of hearing loss, age of onset, etiology, hearing aid use, etc. only account for about 20% of variability in outcome. The role of medical comorbidities in CI outcome is poorly studied and may have implications for preoperative counseling.

Learning Objective: To determine whether medical comorbidities as assessed by the ACE-27 index are associated with postoperative word recognition scores in CI patients.

Desired Result: Practitioners will have an increased understanding of the impact of medical comorbidities and age on CI outcome allowing for improved perioperative counseling.

Level of Evidence - IV

Indicate IRB or IACUC: Washington University in St. Louis IRB# 201911036

ANS POSTER G008

Volumetric Tumor Growth Rate in Intracanalicular Vestibular Schwannoma Predict Audiometric Decline

Hyun Seo Jung, MD, MS; Daniel Morrison, MD
Garrett G.A. Casale, MD; Sergio Ferrante, MD
Terence Imbery, MD; Bradley W. Kesser, MD

Objective: To evaluate the relationship between growth rate of untreated vestibular schwannomas and the rate of change in audiometric parameters

Study Design: Retrospective case series

Setting: Single tertiary medical center

Patients: 48 vestibular schwannoma patients with complete imaging and audiometric data, evaluated between the years 2004-2019

Interventions: Tumor observation

Main Outcome Measures: Volumetric tumor growth rate (VTGR), pure tone average (PTA), speech reception threshold (SRT), and word recognition score (WRS)

Results: We identified 48 vestibular schwannoma (VS) patients with sequential surveillance data. Audiograms were used to calculate the rate of change for PTA, SRT and WRS for each patient. Similarly, serial surveillance MRI data were used to calculate the VTGR (average +8.8mm^3/month, range -35.2 to +131.2mm^3/month). Average follow up duration was 899 days (range 148 – 3493 days). Multivariate linear regression analyses were performed to evaluate correlations. For intracanalicular (Koos I) tumors, there was a statistically significant ($p = 0.002$) and highly linear (*Pearson correlation coefficient = 0.786*) relationship between VTGR and PTA decline. For larger tumors with CPA extension, there was no correlation observed. There was no statistical correlation between VTGR and change in SRT or WRS for any size of tumor.

Conclusions: Volumetric tumor growth rate and the rate of change in patient PTA exhibit a highly linear relationship for intracanalicular (Koos I) tumors, while this relationship is lost once the tumor extends into the CPA. These data support our prediction that the effects of tumor compression on the acoustic nerve may play an important role in the pathophysiology of audiometric decline in VS patients.

Professional Practice Gap & Educational Need: There remains a lack of consensual understanding of the nature of relationship between tumor growth and audiometric decline in the setting of vestibular schwannoma. Clarification of this relationship will help guide surgeons in counseling VS patients being observed with serial imaging.

Learning Objective: 1) Attendees will understand the potential relationship between volumetric tumor growth rate and decline in audiometric performance. 2) Attendees will discuss the compressive effects of vestibular schwannoma within the internal auditory canal leading to audiometric to decline in audiometric performance.

Desired Result: Further investigation into the relationship between tumor growth and audiometric performance will help guide shared decision making between the surgeon and patient when considering intervention for vestibular schwannoma.

Level of Evidence – Level IV

Indicate IRB or IACUC : University of Virginia Health System IRB #20669

Cochlear Implantation Decreases the Odds of Developing Dementia, Neuropsychiatric, and Incident Adverse Life Event Outcomes – A Multi-National Database Study

Zachary D. Urdang, MD, PhD: Amiti Jain, BS: Natalie M. Perlov, BS
Thomas L. Haupt, BS; Thomas O. Wilcox, MD
Rebecca C. Chiffer, MD; Richard K. Gurgel, MD

Objective: Determine whether cochlear implantation (CI) affects the odds of developing dementia, neuropsychiatric conditions such as depressive disorder, and incident adverse life events (ALEs) which are a subset of social determinants of health with negative implications.

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

Setting: TriNetX is a live HIPPA-compliant federated cloud electronic health record research network representing pooled data from about 110-million patients from 70 healthcare organizations in the United States, Brazil, and India.

Patients: Subjects with bilateral sensorineural hearing loss (SNHL) (ICD10 H91.0), with and without CI (CPT 69930).

Main Outcome Measures: Odds-ratios with 95% confidence intervals (OR, 95% confidence interval) for incident dementia (ICD-10 F01, F03, G30), neuropsychiatric (ICD-10 F20.xx-F45.xx), and ALEs (ICD-10 Z55.xx-Z65.xx) after SNHL diagnosis, stratified by CI.

Results:
There were 13,861 cochlear implant recipients in this study. The average age was 55.4 years old, with 49% female patients. 809,315 control patients with SNHL were identified. After 1:1 propensity-score matching for SNHL- and dementia-related risk factors, the risk of developing dementia among CI recipients was 1.37% compared to 2.46% in controls (OR: 0.55, 0.46-0.66), 8.07% compared to 12.79% for any new neuropsychiatric diagnosis (OR: 0.60, 0.55-0.65) with dissociative disorder having the strongest protective association, and 3.01% compared to 4.02% for any new ALE (OR: 0.74, 0.65-0.85) with food insecurity having the strongest protective association.

Conclusions: CI for SNHL decreases the odds of developing dementia, neuropsychiatric, and ALEs. This study represents the largest cohort-controlled study examining the protective association of CI.

Professional Practice Gap & Educational Need: There is a strong association between SNHL and dementia. It is unknown whether treating SNHL with CI decreases the risk of dementia. The current study demonstrates that CI decreases the odds of developing dementia. This is also true for neuropsychiatric and social (ALE) outcomes. Better delineation of these associations will improve patient consultation for CI.

Learning Objectives: 1) Demonstrate that CI decreases the odds of developing dementia. 2) Understand the growing number of neuropsychiatric and social determinants of health outcomes (such as ALEs) improved by CI.

Desired Result: Improved understanding of the benefits of CI in decreasing odds of dementia, neuropsychiatric diagnoses, and incident ALEs.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt

Chemical Chaperone 4-Phenylbutyric Acid Ameliorates Cdh23 Compound Heterozygous Non-Syndromic Sensorineural Hearing Loss

Jessica H. Pham, BA; Da Sun, PhD; Jing Yuan, PhD; Bo Li, PhD
James Xu, BS; Qing Yin Zheng, PhD; Wei-Jia Kong, PhD

Socioeconomic Disparities in the Pursuit of Care at a High-Volume Institution for Surgical Resection of Vestibular Schwannomas

Eric Y. Du, BS; Omid Moshtaghi, MD MS; Sahar H. Assi, MD
Marc S. Schwartz, MD; Rick A. Friedman, MD, PhD
Peter R. Dixon, MD, MS

Objective: Increased surgical resection volume for vestibular schwannomas (VS) has been associated with improved patient outcomes, including reduced risk of prolonged hospital stay and readmission. Possible disparities in the pursuit of care at these high-volume institutions remain unknown.

Study Design: Retrospective cohort epidemiological study.

Setting: National Cancer Database (NCDB), a hospital-based registry of over 1,500 facilities in the United States.

Patients: Adult VS patients (age >18 years) treated surgically.

Interventions: High- vs. low-volume facilities, defined using a facility volume threshold of 25 cases per year. A risk-adjusted restricted cubic spline model was used to identify this risk threshold as an inflection where decrease in negative outcomes plateaued with increasing volume.

Main Outcome Measures: Sociodemographic factors, including race, ethnicity, income, insurance status, and rurality. Multivariable analyses were adjusted for patient and tumor characteristics including age, sex, Charlson-Deyo score, and tumor size.

Results: 10,048 patients were identified (median [IQR] age: 51 [41, 60] years, 54% female, 87% Caucasian). Patients with Spanish/Hispanic ethnicity (OR 0.71 [0.52, 0.96]), income below median (OR 0.63 [0.55, 0.73]), and Medicare, Medicaid, or other government insurance vs. private insurance (OR 0.63 [0.53, 0.74]) had reduced odds [95% CI] of treatment at a high-volume facility. Further sensitivity analyses in which facility volume was operationalized continuously reinforced direction and significance of these associations.

Conclusions: Socioeconomic disparities exist in the propensity for VS patients to be treated at a high-volume facility. Further work is needed to understand the nature of these associations and whether interventions can be designed to mitigate them.

***Define Professional Practice Gap & Educational Need:** Recent literature has demonstrated associations between increased hospital surgical volume and improved outcomes in vestibular schwannoma care, encouraging referral to surgical centers of excellence. There is a paucity of research in possible disparities in the pursuit of care at one of these institutions.

***Learning Objective:** Demonstrate the socioeconomic inequities in the pursuit of VS surgical care at a high-volume institution.

***Desired Result:** Given demonstrated benefits, there are trends towards regionalization of VS care to high volume centers of excellence. Improving knowledge about the disparities in pursuit of care at these institutions, which likely includes increased logistical complexity and travel, will encourage insurance providers and programs to provide expanded coverage in the goal of improved equity.

***Level of Evidence -** Level IV

***Indicate IRB or IACUC:** Exempt

Analysis of Vestibular Testing Results Using Unsupervised Clustering Techniques

Connor L. Pratson, MD; Krystal M. Riska, PhD, AuD
Kayla W. Kilpatrick, PhD; Maragatha Kuchibhatla, PhD
David M. Kaylie, MD; Calhoun D. Cunningham III, MD
Steven J. Eliades, MD, PhD

WITHDRAWN BY AUTHOR

Elevated Body Mass Index Associated with Cerebrospinal Fluid Leak after Lateral Skull Base Surgery: A Systematic Review and Meta-Analysis

Frederick G. Durrant, BS; Brendon K. Warner, MD
Shaun A. Nguyen, MD; Joshua J. Sturm, MD, PhD
Ted A. Meyer, MD, PhD

Objective: To determine if body mass index (BMI) increases the risk of cerebrospinal fluid (CSF) leak following lateral skull base surgery.

Data sources: CINAHL, PubMed, and Scopus were searched from January 2010 to September 2022 for articles published in English.

Study selection: Articles that reported BMI or obesity with and without CSF leaks following lateral skull base surgery were included.

Data extraction: Two reviewers (FGD, BKW) independently performed study screening, data extraction, and risk of bias assessment. Risk of bias was assessed with ROBINS-I. Publication bias was assessed by funnel plot.

Data synthesis: A total of 11 studies and 9,112 patients met inclusion criteria. Meta-analysis of mean difference (MD), odds ratio (OR), proportions, and risk ratio (RR) were calculated using RevMan 5.4 and MedCalc 20.110. BMI for patients with CSF leak following lateral skull base surgery (28.37 kg/m^2) was significantly greater than BMI for patients without CSF leak following lateral skull base surgery (26.03 kg/m^2) with a MD of 2.26 kg/m^2 ([95% CI 0.91 to 3.62], p = 0.001). The proportion of patients with BMI > 30 kg/m^2 that had a CSF leak was 12.7%, and the proportion of patients with BMI < 30 kg/m^2 (control) that had a CSF leak was 7.9%. The OR for CSF leak following lateral skull base surgery in patients with BMI > 30 kg/m^2 was 1.94 ([1.40 to 2.68], $p < 0.0001$) and the RR was 1.85 ([1.39 to 2.47], $p < 0.0001$).

Conclusions: Elevated BMI increases the risk of cerebrospinal fluid leak after lateral skull base surgery.

Professional Practice Gap & Educational Need: There is disagreement amongst retrospective reviews on the impact of obesity on CSF leaks after lateral skull base surgery.

Learning Objective: To understand the effect of modifiable risk factors on post-operative complications, specifically CSF leaks following lateral skull base surgery.

Desired Result: Statistically significant difference in the mean BMI of patients with CSF leaks compared to those without CSF leaks, as well as increased risk of CSF leak in patients with elevated BMI.

Level of Evidence: Level IIa.

Indicate IRB or IACUC: Exempt.

ANS POSTER G014

Dural Venous Sinus Thrombosis in Postauricular Craniotomies for Vestibular Schwannoma Resection

Hunter L. Elms, MD; James C. Campbell, MD; David M. Straka, MD
Howard W. Francis, MD; David M. Kaylie, MD
Calhoun D. Cunningham, III, MD

Objective: Characterize the incidence, risk factors, and patient outcomes of dural venous sinus thrombosis identified on postoperative imaging after retrosigmoid or translabyrinthine craniotomy for vestibular schwannoma resection.

Study Design: Retrospective case-control

Setting: Single tertiary academic referral center

Patients: 81 patients with vestibular schwannomas aged 19-82 years, 58% female.

Interventions: Retrosigmoid or translabyrinthine craniotomy with postoperative MRI/MRV.

Main Outcome Measures: Association between rate of thrombus and operative approach, patient age, sex, BMI, tumor size, dominant sinus, operative time, laterality, and perioperative CSF leaks was analyzed. Postoperative complications including hydrocephalus, deep vein thrombosis (DVT), intraventricular hemorrhage (IVH), and chronic headache were compared.

Results: Translabyrinthine craniotomy was associated with the highest relative risk of thrombosis (OR = 11.1944 [1.3847 - 90.4984], p = 0.007), followed by male sex (OR = 2.6518 [1.0580 - 6.6466], p = 0.035). Patient age, BMI, tumor size, dominant sinus, operative time, laterality, and perioperative CSF leak were not associated with increased rates of dural venous thrombosis. Complications were rare with no hydrocephalus, 1 chronic headache patient in each group, 1 DVT in the thrombus group, and 1 IVH in the non-thrombotic group.

Conclusions: Translabyrinthine approach and male sex most strongly predicted postoperative dural venous thrombosis after postauricular craniotomy for vestibular schwannoma resection. Complication rates did not differ significantly between patients without and without thrombi.

Professional Practice Gap & Educational Need: understanding of risk factors and management of dural venous thrombosis after vestibular schwannoma surgery

Learning Objective: characterize clinically significant risk factors for dural venous thrombosis in vestibular schwannoma surgery

Desired Result: identification of risk factors for and complications of dural venous thrombosis after vestibular schwannoma surgery

Level of Evidence - III

Indicate IRB or IACUC : Exempt

Differences in Subjective Music Appreciation between Bilateral and Single-Sided Deafness Cochlear Implant Recipients

Alex W. Yang, MD; Elicia Pillion, AuD
Charles A. Riley, MD; Anthony M. Tolisano, MD

Objective: To compare changes in music appreciation after cochlear implant (CI) surgery for patients with bilateral and single-sided deafness (SSD).

Study Design: Retrospective cohort.

Setting: Tertiary-care military medical center.

Patients: Adult CI recipients from November 2019 to September 2022.

Interventions: Unilateral or bilateral CI surgery.

Main Outcome Measures: Musical questionnaire subset from Cochlear Implant Quality of Life (CIQOL) – 35 Profile Instrument Score (maximum raw score of 15). Functional CI assessment was measured with CI-alone speech-in-quiet (SIQ) scores (AzBio and CNC).

Results: 29 adults underwent CI surgery for SSD and 20 adults for bilateral deafness (7 sequentially implanted). Every patient group had clinically significant improvements ($p<0.001$) in mean SIQ scores in the most recently implanted ear (Azbio SSD: 12% to 62%, bilateral: 19% to 71%, sequential: 14% to 71%). SSD adults on average had higher music QOL scores at baseline (SSD: 11.21; bilateral: 7.31; sequential: 9.00, $p<0.001$). No group had significant increases in raw score at the first post-operative visit (SSD: 11.45, $p=0.67$; bilateral: 8.15, $p=0.36$; sequential: 10.57, $p=0.46$). By the most recent post-implantation evaluation (median 10.1 months for SSD, 10.3 months for bilateral, 10.0 months for sequential), SSD adults had a significant increase in raw score from baseline (11.21 to 12.48, $p=0.03$), whereas bilaterally deafened (7.31 to 8.85, $p=0.18$) and sequentially implanted (9.00 to 10.14, $p=0.59$) adults had nonsignificant increases.

Conclusions: SSD patients demonstrate higher baseline music appreciation than bilaterally deafened individuals regardless of unilateral or bilateral implantation, and are more likely to demonstrate continued improvement in subjective music appreciation at last follow-up even when speech perception outcomes are similar.

Professional Practice Gap & Educational Need: This data adds to the emerging literature related to music and its improvements on the quality of life of CI patients. SSD is also a more recent indication for CI and this study highlights how SSD patients differ from traditional bilaterally deafened patients in regards to subjective music appreciation.

Learning Objective: To provide evidence that SSD CI patients are expected to have greater improvements in subjective music appreciation than bilaterally deafened CI patients.

Desired Result: These results can be utilized by practitioners to inform SSD patients about the benefits of cochlear implantation in regards to complex auditory stimuli as well as drive future research utilizing SSD CI patients given their simultaneous experience with both a natural and electrical hearing ear.

Level of Evidence: Level III

Indicate IRB or IACUC: Institutional Review Board approval from the Department of Research Programs at the Walter Reed National Military Medical Center was obtained (WRNMMC-2020-0290)

Community Health Worker Assessment of Central Auditory Processing in Children using a Novel Tablet-based Platform in Rural Nicaragua

Torri E. Lee, BA; Catherine C. Rieke, AuD; Jay C. Buckey, MD
Christopher Niemczak, AuD, PhD; Marvin A. Quiroz, MD
Karen M. Mojica; James E. Saunders, MD

Objective: Evaluate the administration of a portable, tablet-based central auditory processing (CAP) test battery to Spanish-speaking children by minimally trained community health workers (CHW) in Nicaragua

Study Design: Cross-sectional study.

Setting: Community-based settings in Chontales, Nicaragua.

Patients: Spanish-speaking children and adolescents (n=210, average age 12, range 8-18 years old)

Main Outcome Measures: Completed tests with valid responses (Tablet-based pure tone average (PTA), Gap Detection Threshold, Fixed Level Frequency Threshold (FLFT), Masking Level Difference (MLD), Hearing and Noise Test (HINT), Dichotic Digits Test (DDT), and Frequency Pattern Recognition Test (FPR).

Results: All CAP tests were successfully completed except for the FPR, which exhibited high variability. Of the remaining 2,310 administered tests, there was an overall successful completion rate of 92.9% with missing data in 96 tests and 59 invalid results in GDT (21, 5.0%) and MLD (38, 9.0%). Invalid GDT and MLD tests were significantly associated with increased PTA ($p<0.001$) and shorter completion time ($p=0.001$), respectively. Test validity was not associated with age. In the valid responses, CAP tests (GDT, MLD, HINT) results were independent of PTA ($p=0.203$-0.891). Only DDT results were correlated with age and PTA ($p<0.001$).

Conclusions: Pediatric CAP testing can be successfully completed by minimally trained CHWs in rural low-resource settings using a tablet-based platform. Hearing acuity (PTA) was associated with performance on DDT. Inadequate training was felt to be responsible for high variability of FPR.

Professional Practice Gap & Educational Need: CAP testing that can be administered without an audiologist is not currently accessible for communities at high risk for central auditory processing deficits in areas where healthcare resources are lacking.

Learning Objective: To understand the impact of administering a portable CAP test in underserved communities using self-administered, tablet-based training.

Desired Result: To provide the attendee with the knowledge of a new mobile-based platform for CAP testing that could be used for future clinical investigations where a trained audiologist is not readily accessible.

Level of Evidence - Level V

Indicate IRB or IACUC: Dartmouth Health Institutional Review Board STUDY02000479 – approved 7/14/2020

ANS POSTER G017

Which Vestibular Test is Best for Diagnosing a Peripheral Vestibular Disorder?

Cameron Fattahi; Janice Chung; Divya A. Chari, MD

Objective: The utility of individual vestibular tests in the diagnosis of vestibular disorders is unclear and debate remains over which test is optimal. Herein, we seek to characterize the predictive power of widely used vestibular tests in the differentiation of peripheral and central vestibulopathy.

Study Design: Retrospective chart review.

Setting: Tertiary academic medical center.

Patients: 90 adult patients in a multidisciplinary vestibular clinic between 01/2016 and 01/2022.

Interventions: Calorics, rotary chair, and video head impulse test (vHIT)

Main Outcome Measures: (1) Receiver operating characteristic (ROC) analysis of individual test parameters for area under the curve (AUC) as an indication of predictive value and (2) Logistic regression analysis of test combinations for identification of optimal test battery for differentiation of peripheral and central vestibulopathy.

Results: The best overall predictive parameter of peripheral vestibulopathy was rotary chair time constant (AUC-ROC, 0.78; 95% confidence interval, 0.69-0.88). Rotary chair time constant also demonstrated the highest sensitivity (79%) and specificity (73%) based on clinical parameters. However, the combination of vHIT and calorics improved prediction to above that of either individual test (AUC-ROC, 0.75).

Conclusions: In our data set, rotary chair time constant most consistently differentiated peripheral and central vestibular disorders. However, the combination of vHIT and caloric testing improved the predictive capabilities for identifying peripheral vestibular dysfunction compared to either test alone.

Professional Practice Gap & Educational Need: Differentiating peripheral and central vestibular disorders can be challenging. In some cases, various vestibular tests can give discordant results. Improved understanding of the relative predictive power of vestibular tests may help clinicians in the diagnostic workup of patients with dizziness and imbalance.

Learning Objective: To better understand the utility of vestibular testing in the diagnostic workup of peripheral and central causes of dizziness.

Desired Result: Rotary chair testing offers clinical benefit over vHIT and calorics in the diagnosis of peripheral causes of dizziness

Level of Evidence – Level IV

IRB: 2019P000438, Massachusetts Eye and Ear

Modesty Concerning the Therapeutic Effect of Radiosurgery for Vestibular Schwannoma: A Systematic Review and Comparative Analysis of Long-term Data

Kevin M. Guy, MS, Matvey V. Karpov, Peter G. Volsky, MD

Objective: Reconcile the high rates of tumor stability observed among sporadic vestibular schwannomas (VS) that are untreated and those treated with stereotactic radiosurgery (SRS).

Data Sources: PubMed, Google Scholar, and Web of Science.

Study Selection: Terms 'vestibular schwannoma,' 'radiosurgery,' or well-known variations, without language restrictions, were applied to articles published before September 6, 2022 reporting 10-year tumor control of VS treated with SRS, and excluding studies with greater than 10 percent of subjects with neurofibromatosis 2 (NF2).

Data Extraction: Two-reviewer extraction and tabulation.

Data Synthesis: Twenty-one studies, 4513 VS treated with SRS, with a mean 10-year progression free survival rate of 91.5% (85%-100% SD 4.3%) comprised the study population. As a control group we selected published data from a national cohort of 1543 observed VS (more than 10 years). In comparison, SRS reduced the absolute risk of tumor growth by 8.5% compared to no treatment [mean ARR was 0.085 (SD 0.040)]. The mean NNT for one patient to benefit from SRS was 16(SD 11). In relative comparisons, the mean RR and RRR were 0.493 (SD 0.246) and 0.507 (SD 0.246), respectively. Lack of data reporting standards nullified attempts at meta-analysis.

Conclusions: For VS that are not neurosurgically critical, two facts refine the therapeutic benefit of SRS: (1) for all tumors (regardless of prior growth behavior), SRS reduces the absolute risk of tumor growth by 8.5% compared to no treatment; and, (2) that the proportion of "uncontrolled" tumors under observation is reduced by 50.7% after SRS.

Professional Practice Gap & Educational Need: The therapeutic benefit of SRS relative to the natural history of vestibular schwannoma is unknown. Without this knowledge, providers are limited in the ability to counsel patients about the relative benefits and risks.

Learning Objective: For the management of vestibular schwannomas that are not neurosurgically critical, two facts are important to better appreciate the therapeutic benefit of SRS: (1) for all tumors (without consideration of prior growth behavior), SRS reduces the absolute risk of tumor growth by 7.8% compared to no treatment; and, (2) that the proportion of "uncontrolled" tumors under observation is reduced by 50.7% after SRS.

Desired Result: Surgeons and radiation oncologists will quantitatively appreciate limitations of therapeutic benefit of SRS in cases of observable vestibular schwannomas.

Level of Evidence – Level II

Indicate IRB or IACUC: 22-06-NH-0122, Eastern Virginia Medical School Institutional Review Board.

Closing the Gender Gap: Progress of Neurotology Compared to Other Skull Base Specialties

Shrey Patel, MS; Emily Gall, MD; Jacob Kosarchuk, MD
Christian Soneru, MD; Kathryn Noonan, MD

Objective: There has been recent increased attention to gender make-up within neurotology and related subspecialties. This study seeks to evaluate changes within neurotology compared to other skull base specialties.

Study Design: Information regarding fellows training in the past ten years, current fellowship directors, and current faculty were extracted from the American Neurotology Society (ANS) website and related sources, tabulated, and summarized. Chi-square analysis was done to compare the proportional make-up of female fellows within related fields.

Setting: Demographic data from all skull base fellowship programs from 2012 to 2022.

Main Outcome Measures: Proportional gender make-up of neurotology fellows compared to other skull base specialties and over the past decade.

Results: In the past decade in neurotology, males constituted 89 of 128 (69.53%) fellows, 25 of 29 (86.2%) fellowship directors, and 132 of 170 (77.64%) faculty. Within rhinology, males constituted 211 of 279 (75.63%) fellows, 32 of 35 (91.4%) fellowship directors, and 113 of 141 (80.14%) faculty. In neurosurgical programs, males constituted 94 of 105 (90%) fellows, 43 of 44 (97.73%) fellowship directors and 120 of 133 (90%) faculty members. In neurotology, the proportion of female fellows increased (12%, $p=0.06$) from 2012-2017 to 2018-2022. Neurosurgery and rhinology had statistically insignificant increases of 4% and 9%. The increase in neurotology was not significantly higher than increases within rhinology ($p=0.87$) and neurosurgery ($p=0.86$).

Conclusions: The proportion of female fellows within neurotology has not increased significantly, similar to other skull base specialties. Limitations include use of publicly available data and changes in faculty make-up over the past ten years.

Professional Practice Gap & Educational Need: There is a clear gender gap within neurotology and other related specialties.

Learning Objective: Evaluate the current gender make-up neurotology fellowship and compare it to other skull base specialties.

Desired Result: Further understand the relationship between same gender mentorship and recruitment within skull-base specialties.

Level of Evidence – Level IV

Indicate IRB or IACUC: Exempt

VM-PATHI Correlates with Cognitive Function Improvement after Successful Treatment in Patients with Vestibular Migraine

Evan J. Patel, MD; Maxwell Hum, BA; Adam Z. Gardi, BA
Kristen K. Steenerson, MD; Habib G. Rizk, MD
Jeffrey D. Sharon, MD

Objective: To assess changes in cognitive function in vestibular migraine patients undergoing treatment.

Study Design: Prospective cohort

Setting: Single-institution tertiary care center

Patients: Thirty-four patients with vestibular migraine were included in the study. Average age at diagnosis was 47.9 years-old. The majority of patients were female (91.2%).

Intervention: Vestibular therapies included mindfulness-based stress reduction (58.8%), pharmacologic (32.4%), and others (8.8%).

Main outcome measures: Pre- and post-treatment questionnaires were collected including the Cognitive Failures Questionnaire (CFQ), Vestibular Migraine Patient Assessment Tool and Handicap Inventory (VM-PATHI) and Dizziness Handicap Inventory (DHI).

Results: Median time between pre- and post-treatment questionnaire was 4.4 months (range 2.8-15.6. months). CFQ scores decreased only in subjects who responded to treatment, as defined by those with a positive change in VM-PATHI score (average decrease 6.5, $p = 0.03$). CFQ scores did not improve in subjects who had no improvement in their vestibular condition, as defined by no change or a negative change in VM-PATHI score ($p = 0.53$). Univariate linear regression showed that VM-PATHI score change was highly predictive of CFQ change ($p < 0.01$, r-squared = 0.36). Multivariate regression demonstrated that VM-PATHI ($p = 0.03$) and not DHI ($p = 0.10$) predicted changes in CFQ score.

Conclusions: Self-reported cognitive dysfunction improves with successful treatment of vestibular migraine.

Professional Practice Gap & Education: Given the association of cognitive impairment and vestibular symptoms, cognitive function tests are being incorporated into evaluations of patients with vestibular migraine. There is limited data to support the correlation of self-reported surveys which assess dizziness compared to those which analyze cognitive function.

Learning Objective: To demonstrate the correlation of vestibular symptoms with cognitive function after treatment in patients with vestibular migraine.

Desired Result: Attendees will understand that VM-PATHI is a reliable predictor of cognitive improvement after treatment in patients with vestibular migraine.

Level of Evidence - Level III

IRB: University of California San Francisco IRB #18-25365 (approved 2/26/19)

Diagnosis and Management of the Dizzy Patient- Survey of the American Neurotological Society

Pawina Jiramongkolchai MD, Nedim Durakovic MD, Joel Goebel MD

Objective: To study the attitudes, preferences, and practice patterns of members of the American Neurotological Society (ANS) in the diagnosis and management of the dizzy patient.

Study Design: A 17-item survey was emailed to members of the ANS.

Main Outcome Measure: Comfort level in managing the complex dizzy patient.

Results: Of the 123 members of the ANS that completed the survey, the majority were male (81%), over the age of 40 (83%), in academic practice (70%) with over 11 years in practice (70%). Despite dizziness being one of the most common conditions seen in clinic, the majority of respondents (59%) felt least comfortable treating vestibular pathology, especially vestibular migraines (24%) and central vertigo (13%), when compared to other neurotologic disorders. A multidisciplinary approach to managing vestibular patients was frequently employed with close collaboration with neurology (95%) and physical therapy (96%). Despite lower comfort level and higher utilization of other subspecialities, an overwhelming majority of ANS members (90%) surveyed felt that neurotologists were best suited to managing vestibular patients. Furthermore, there was a trend towards significance of increased exposure to vestibular pathology during residency and fellowship and comfort level in treating vestibular disorders in practice.

Conclusion: Compared to other neurotologic disorders, ANS members were least comfortable in treating the complex dizzy patient. Given the trend towards increased comfort in evaluating dizziness with more exposure during training in residency and fellowship, future residency and fellowship curriculums may benefit from a more formal instruction on vestibular disorders.

***Professional Practice Gap & Educational Need:** Dizziness is common condition that affects up to 35% of individuals during their lifetime. Neurotologists are often involved in the care of dizzy patients. However, because of the subtleties of presentation, management can be complex.

***Learning Objective:** To understand the attitudes, preferences, and practice patterns of neurotologists in managing the complex dizzy patient.

***Desired Result:** Formal curriculum on vestibular disorders during residency and fellowship may improve comfort level in the management of the complex dizzy patient.

***Level of Evidence**: V

***Indicate IRB or IACUC**: Exempt

ANS POSTER G022

Histopathological Comparison of Sporadic Vestibular Schwannoma and NF2

Susan Ellsperman, MD; Ivan Lopez, PhD
Gail Ishiyama, MD; Akira Ishiyama, MD

Objective: To describe the location and characteristics of vestibular schwannomas (VS) in patients with sporadic VS and with neurofibromatosis type 2 (NF2)

Study Design: Retrospective chart and histopathological review

Setting: Tertiary academic institution

Patients: Subjects with known sporadic VS and NF2 with temporal bones previously donated to a histopathology lab

Interventions: Surgical resection or observation with serial imaging

Main Outcome Measures: The anatomic location of schwannoma, previous treatment, and destruction of sensory structures within the temporal bone was determined.

Results: Sixteen temporal bones were included in analysis; six from patients with NF2 and 10 from patients with sporadic VS. Patients in the NF2 group(67 years; range 41-89) were younger at the age of death than patients in the sporadic group(84.6 years, range 58-101; $p = 0.054$). Prior surgical resection was performed in two of the NF2 temporal bones(2/6, 33.3%) and five of the sporadic VS temporal bones(5/10, 50%). Translabyrinthine approaches were used most often(6/7, 85.7%). In patients with NF2 without surgical resection, the cochlea morphology, organ of corti (OC) hair cells, and spiral ganglion neurons (SGN) were preserved in all temporal bones(4/4, 100%). In the two post-surgical temporal bones, there was abnormal cochlear morphology and loss of OC and SGN cells in both specimens and fibrosis in one of the two specimens. In patients with sporadic VS, cochlear morphology, OC, and SGN structures were preserved in only 60%(3/5) of unoperated temporal bones. There was ossification in one unoperated specimen(1/5, 20%). In sporadic VS cases that underwent resection, the cochlear morphology and OC were damaged in all specimens(5/5, 100%). One specimen(1/5, 20%) had preserved SGNs and no cochlear fibrosis. The other four postoperative temporal bones(4/5, 80%) had degenerated SGNs and fibrosis.

Conclusions: Cochlear morphology, OC hair cells, and SGNs are well preserved in patient with NF2 who did not undergo surgical resection. Results in patients with sporadic VS are variable.

Professional Practice Gap & Educational Need: cochlear implantation is a rehabilitation option for patients with sporadic VS and NF2. Patient outcomes are variable, and predicting performance is challenging. Preservation of the OC HCa, SGNs, and lack of cochlear morphology changes may explain why patients with large tumor burden have better than expected CI performance outcomes.

Learning Objective: Sensory epithelia is well preserved in unoperated temporal bones in patients with NF2.

Desired Result: Contribute to understanding of NF2 disease process and potential rehabilitation options.

Level of Evidence – Level IV

Indicate IRB or IACUC : IRB # 10-001449

ANS POSTER G023

Long-Term Results of Hybrid Cochlear Implantation

Mandy Salmon, BS; Alexandra E. Quimby, MD, MPH
Hannah S. Kaufman, AuD; Jason A. Brant, MD
Douglas C. Bigelow, MD; Michael J. Ruckenstein, MD, MSc

Objective: Characterize long-term hearing outcomes in patients implanted with Hybrid L24 devices.

Study Design: Retrospective case series.

Setting: Tertiary academic center.

Patients: Adult patients implanted with Hybrid L24 cochlear implants between 2014-2021.

Interventions: Pure tone audiometric testing.

Main Outcome Measures: Changes in low-frequency pure tone average, LFPTA (125, 250, 500 Hz) over time; proportion of patients with preserved LFPTA ($\leq$ 80 dB) at last follow-up; incidence of residual hearing loss (LFPTA >80 dB).

Results: 30 ears in 29 patients underwent hybrid CI (mean age 59 years, 65% female, 50% right ears). The median follow-up time was 24.1 months (interquartile range, IQR 12 – 53.5 months). The mean pre-operative LFPTA was 31.7 dB. The median time to first audiometric follow-up post-implantation was 32.5 days (IQR, 24-50 days); the mean LFPTA across all implanted ears at first follow-up was 45.1 dB and no patient had experienced loss of residual hearing at first follow-up. At 1 month (n=25), the mean LFPTA was 46 dB; at 12 months (n=17), 51.6 dB; at 24 months (n=17), 50.7 dB; at 36 months (n=13), 54.9 dB; and at $\geq$48 months (n=10), 57.2 dB. One-way repeated measures ANOVA demonstrated a significant effect of test interval for each frequency ($F(29,7) = 5.77$, $p<0.0001$). Six patients had loss of residual hearing during the follow-up period, with an incidence rate of 0.0065 (time at risk=917.8 months). Kalan Meier curve demonstrates the hearing loss distribution during the follow-up period.

Conclusions: Cochlear implantation with the L24 device appears to offer good rates of hearing preservation both immediately and long-term post-implantation.

Professional Practice Gap & Educational Need: A number of options for hearing preservation cochlear implantation are available but few have been studied in the long-term post-implantation. The present study offers a cohort of individuals implanted with the hybrid L24 cochlear implant on whom data was collected in the long-term ($\geq$ 48 months post-implantation) in order to demonstrate changes in preserved low-frequency hearing over time post-implantation. Our findings will aid physicians in counselling patients and providing evidence-based recommendations regarding options for hearing preservation cochlear implantation.

Learning Objective: Appreciate the distribution of hearing changes over time post-hybrid L24 cochlear implantation.

Desired Result: Audience members will learn the long-term outcomes of Hybrid L24 cochlear implantation.

Level of Evidence – IV

Indicate IRB or IACUC : University of Pennsylvania, protocol no. 850966

ANS POSTER G024

Malignant Otitis Externa: What is the Role of Surgery?

Lisa Zhang, MD; Joseph Bonanno; Woo Yul Byun; Yin Ren, MD, PhD

Objective: Malignant otitis externa (MOE) is typically managed with long-term broad-spectrum antibiotics. The role of surgical management on clinical outcomes is currently not well understood. This study compares long-term functional outcomes of MOE patients managed with or without surgery.

Study Design/Setting: Retrospective cohort, tertiary academic center

Methods: Patients diagnosed with MOE between January 2010 to September 2022 were included. Univariate analyses compared symptoms at initial presentation and long-term (≥1 year) outcomes between surgical and non-surgical patients.

Results: A total of 23 patients were included (78% male, mean age 69 +/- 13 years, median follow-up 305 days). Twenty-two (96%) were diabetic. Seventeen (74%) underwent surgery (76% mastoidectomy, 24% external ear canal biopsy). Poor FN function (House-Brackmann [HB] ≥3) at initial presentation significantly predicted surgical intervention ($p=0.02$). Following surgery, there were no differences in HB scores between surgical versus nonsurgical patients at either immediate or long-term follow-up ($p>0.05$). There were no differences in the degree of hearing loss, degree of diabetes control, rate of insulin dependence, incidence of immunosuppression, or Charlston Comorbidity Index ($p>0.05$). No significant differences in the length of stay (9 vs. 6 days, $p=0.2$), rate of readmission (31% vs. 17%, $p=0.5$) or 5-year overall survival (78% vs. 67%, $p=0.6$) were observed.

Conclusions: Long-term outcomes for patients with MOE remains poor. Patients with poor FN function at presentation were more likely to undergo surgery. Patient comorbidities, including severity of diabetes, were not predictive of undergoing surgery. However, surgery did not impact the length of stay, rate of readmission, or mortality.

Professional Practice Gap & Educational Need: To provide data regarding predictors of patients requiring surgical debridement following diagnosis of MOE as well as long-term outcomes associated with surgical vs. medical management.

Learning Objective: Patients with poor facial nerve function were most predictive of requiring surgical management. Patient comorbidities, including severity of diabetes, were not significantly predictive of who ultimately proceeded to surgery. Surgery did not appear to impact length of stay, readmission, or overall survival.

Desired Result: Providers will be able to better identify surgical candidates when diagnosing patients with MOE and describe long-term outcomes in these patients.

Level of Evidence – Level IV

IRB: The Ohio State University, IRB #2022H0178 06/23/2022

The First Year Impact of the COVID-19 Pandemic on Otologic and Neurotologic Surgical Volumes: Disproportionate Changes in Military Practice

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John P. Marinelli, MD; Samuel A. Spear, MD
Isaac D. Erbele, MD

Objective: The COVID-19 pandemic appears to have reduced surgical volume in otolaryngology surgeries during its first year. The objective of this study was to determine the impact on otologic and neurotologic surgical volumes in military and civilian facilities.

Study Design: Database review

Setting: Military and civilian practices

Patients: Tricare beneficiaries with Current Procedural Terminology (CPT) codes related to otologic or neurotologic surgery

Interventions: Changes in care delivered in response to the COVID-19 pandemic

Main Outcome Measures: Change in surgical volume between 2020 and averages of 2017-2019

Results: Over the study period, there were an average of 9.5 million beneficiaries covered per year. During the first calendar year of the COVID-19 pandemic, there were 4,570 otology- and neurotology-related cases performed, a reduction of 13% ($p<0.0001$, Incidence Rate Ratio = 0.87, 95% CI 0.83-0.90) compared to the three years prior (5,233 cases/yr). This reduction was principally in the cases performed in military facilities (39% reduction), rather than care delivered in civilian institutions (5% reduction, $p<0.0001$). Bone-anchored hearing aid surgeries had the greatest reduction (30%), followed by stapedectomies (27%), and vestibular surgeries (25%). Cochlear implantation was relatively stable (4% reduction), while schwannoma excision cases slightly increased (+8%).

Conclusions: There was a reduction in the number of otology and neurotology cases in 2020, and this reduction in surgical volume disproportionally affected military facilities. Lower acuity cases were affected to a greater degree, however, cochlear implantation and schwannoma excision rates appeared largely unchanged.

Professional Practice Gap & Educational Need: Lack of understanding of the impact of the COVID-19 pandemic on the volume of otology and neurotology-related cases.

Learning Objective: Describe the impact of COVID-19 related policies on otologic and neurotologic surgical volumes in military and civilian facilities, and what type of cases were impacted.

Desired Result: Recognize the types of cases affected by policies related to the COVID-19 pandemic and appreciate the disproportionate reduction in volume of cases within the military.

Level of Evidence - IV

Indicate IRB or IACUC: Exempt

Immediate Continuous Positive Airway Pressure use following Middle Cranial Fossa Repair of Spontaneous Cerebrospinal Fluid Leaks with Hydroxyapatite Bone Cement

Evan C. Cumpston, MD; Douglas J. Totten, MD
Rick F. Nelson, MD, PhD

Objective: As continuous positive airway pressure (CPAP) after skull base surgery can lead to pneumocephalus, timing for resuming CPAP postoperatively is controversial. We determined the safety of immediate CPAP use after middle cranial fossa (MCF) spontaneous cerebrospinal fluid (sCSF) leak repair with bone cement.

Study Design: Prospective cohort study.

Setting: Tertiary referral center.

Patients: 13 consecutive patients with temporal bone sCSF leaks and OSA using CPAP between July 2021 and October 2022. Postoperative high-resolution temporal bone CT was obtained to assess skull base reconstruction followed by immediate CPAP use.

Interventions: Patients were instructed to resume CPAP use immediately following repair of sCSF leaks with bone cement.

Main Outcome Measures: Postoperative skull base defects on CT, pneumocephalus or intracranial complications.

Results: There were no residual skull base defects on postoperative imaging. Average age was 55.5 [standard deviation] [±8.8] years. 30.8% (4) subjects were male, 69.2% (9) female. The average BMI was 45.39 [±15.1]. 53.8% (7) of repairs were right and 46.2% (6) were left. 53.9% of patients had multiple defects identified intraoperatively. The average number of defects was 1.85 [±0.99]. The average defect size determined by preoperative imaging was 6.57mm [±3.45]. All patients had encephalocele identified intraoperatively. All skull base repairs were primary. No postoperative complications occurred. One patient developed a contralateral sCSF leak 2 months following repair. There were no recurrent sCSF leaks.

Conclusions: Immediate postoperative CPAP use is safe in patients undergoing MCF sCSF leak repair with bone cement due to the robust skull base repair.

Professional Practice Gap & Educational Need: As use of CPAP after skull base surgery can lead to pneumocephalus, timing for resuming CPAP postoperative is controversial.

Learning Objective: To determine the safety of immediate CPAP use after middle cranial fossa spontaneous cerebrospinal fluid leak repair with bone cement.

Desired Result: Determine the safety of immediate CPAP use after MCF repair of sCSF leaks with bone cement.

Level of Evidence - III

Indicate IRB or IACUC : Exempt

Evaluation of Hydroxyapatite Use in CSF Leak Repair during Skull-Base Surgery

Rema Shah, BS; Sen Ninan, MD; Hemali Shah, BS
Nofrat Schwartz, MD

Objective: To evaluate the efficacy and outcomes of using a transmastoid approach with hydroxyapatite to repair lateral skull-base CSF leak

Study Design: Retrospective cohort study

Setting: Tertiary-level-care hospital

Patients: Patients aged 18+ who underwent surgery between 2013-2022 for spontaneous CSF leak

Interventions: trans-mastoid approach for skull-base repair using Hydroxyapatite cement

Main Outcome Measures: failure rate of repair; location, size and patient demographic factors of all repairs

Results: Of the 55 patients (60 total repairs, 5 bilateral repairs) that underwent CSF leak repair using hydroxyapatite cement, 50 patients had successful repairs (91.9%) and 5 patients had failed repairs (9.1%). The average defect size in failed repairs was 1.12cm, compared to 0.81cm for successful repairs. Additionally, 4 out of 5 (80%) of the failed repairs were in the tegmen tympani region. Average time to recurrent symptoms was 1.75 years in the failed repair cohort. 4 out of the 5 (80%) patients with failed repairs were given Diamox prior to their second procedure. 3 out of those 5 (60%) were in women and 4 out of 5 (80%) were former smokers. 3 patients (5.4%) received shunts to relieve cranial pressure. 2 patients (3.6%) had complications of either infection or hearing loss.

Conclusions: Transmastoid approach utilizing Hydroxyapatite is successful for CSF leak repair, with a low complication and failure rate. Women, prior smoking history and patients with larger defects in the tegmen tympani region may opt for alternative materials or approach for repair. Longer follow-up is warranted as recurrence of symptoms might be delayed. In cases of BIH, shunt placement may prevent failures.

Professional Practice Gap & Educational Need: Hydroxyapatite is not a traditionally utilized material for CSF leak repair and this study helps to elucidate its growing value in skull base surgery.

Learning Objective: Investigate and understand the patient population best served with hydroxyapatite

Desired Result: Raise awareness about the operative success of transmastoid approach with hydroxyapatite as a repair material

Level of Evidence - Level IV

Indicate IRB or IACUC: EXEMPT

Yale School of Medicine, IRB ID: 2000032898; Board determined study EXEMPT on 5/16/2022

Quantification of Fat Graft Retention in the Translabyrinthine Approach Using MRI Volumetric Analysis

Adam S. Vesole, MD; Scott B. Shapiro, MD; Ravi N. Samy, MD
Myles L. Pensak, MD; Joseph T. Breen, MD

Objective: To better characterize the viability of autologous free fat grafts over time, determine clinical/patient factors that may affect free fat graft survival and assess the clinical impact of free fat graft survival on patient outcomes in the translabyrinthine approach for lateral skull base tumor resection.

Study Design: Retrospective chart review.

Setting: Tertiary neurotologic referral center.

Patients: Forty-two patients (≥18 years old) who underwent translabyrinthine approach for tumor resection with mastoid defect filled by autologous abdominal fat graft, and subsequently underwent > 1 post-operative brain MRI scans.

Intervention(s): Microsurgical resection of tumor, post-operative MRIs

Main Outcome Measure(s): Rate of fat graft volume loss; Fraction retention of original fat graft volume; Initial fat graft volume; Time to steady state fat graft retention; Rate of post-operative CSF leak and/or pseudomeningocele formation.

Results: Patients were followed post-operatively with MRI for a mean of 31.6 months with a mean of 3.2 post-operative MRIs per patient. Initial graft size was a mean of 18.7 cm^3 with a steady state fat graft retention of 35.5%. Steady state graft retention (<5% loss per year) was achieved at mean of 24.96 months post-operatively. No significant association was found in multivariate regression analysis of clinical factors (BMI, age, sex, diabetes mellitus, smoking history, tumor size) impact on fat graft retention and CSF leak/pseudomeningocele formation. Additionally, initial fat graft size, rate of fat graft resorption and percent retention at steady state did not significantly impact the CSF leak/pseudomeningocele formation.

Conclusions: There is a statistically significant logarithmic decline in fat graft volume over time in mastoid defects, reaching steady state in 2 years with 35.5% retention. Rates of CSF leak and pseudomeningocele formation were not significantly affected by initial fat graft volume, rate of fat graft resorption or percent retention at steady state. Additionally, no analyzed clinical factors significantly influenced fat graft retention over time.

Professional Practice Gap & Educational Need: Autologous free fat grafts are routinely used for translabyrinthine mastoid defects, but the clinical implications of initial fat graft size and viability are not well understood.

Learning Objective: To characterize the viability of autologous free fat grafts in the mastoid cavity and any clinical/surgical factors that may influence graft resorption. To determine the impact of fat graft size and viability on the rate of CSF leak or pseudomeningocele formation.

Desired Result: Understanding that size and viability of the fat graft may not significantly increase the risk of CSF leak or pseudomeningocele formation. Additionally, knowledge of a logarithmic pattern of fat graft resorption may be useful to other otolaryngology fat graft applications.

Level of Evidence – IV

Indicate IRB or IACUC: IRB #2020-0472, Approved 6/24/2020, University of Cincinnati

ANS POSTER G029

Severe and Profound Hearing Loss in Patients with Multiple Sensory Impairments: Increased Incidence of Cognitive Impairment

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Jason Lee, MD, PhD; Linda D'Silva, PT; Jennifer A. Villwock, MD
Hinrich Staecker, MD, PhD

Objective: Determine odds of incident cognitive impairment among patients with severe to profound hearing loss and co-existing multisensory impairment.

Study Design: Prospectively recruited cross-sectional case-control study

Setting: Tertiary care neurotologic/audiologic outpatient clinic

Patients: 14 prospectively recruited aging (age 50+) patients with severe and profound hearing loss were pooled for analysis with 180 previously enrolled patients with demonstrated multisensory impairment.

Interventions: Patients with severe and profound hearing loss were identified and underwent point-of-care multisensory testing and cognitive testing.

Main Outcome Measures: Multisensory testing using the Affordable, Rapid Olfactory Measurement Array (AROMA) for olfaction, pure tone audiometric evaluations, and the Timed 'Up and Go' test for gait and balance. Cognitive impairment was assessed via the Montreal Cognitive Assessment for the hearing impaired (HI-MoCA).

Results: A total of 194 patients were included. 34% (n=66) screened positive for cognitive impairment. Olfactory dysfunction, gait impairment, and sensorineural hearing loss were all significantly ($p<0.05$) associated with higher odds of cognitive impairment (ORs 3.17, 3.71, and 3.23, respectively in a multivariate model). Subjects with dysfunction in all domains were at highest risk for cognitive impairment (OR 15.2, $p < .001$) compared to impairment in 2 domains (OR 5.09, $p < .001$). Severe and profound hearing loss had higher odds (OR 8.32) compared to mild-moderately severe hearing loss (OR 2.81) of having incident cognitive impairment.

Conclusions: Dysfunction of the olfactory, auditory, and balance systems is associated with significantly increased odds of cognitive impairment. Patients with severe and profound hearing loss were more likely to have cognitive impairment.

Professional Practice Gap & Educational Need: There is emerging evidence that hearing loss increases the risk for development of dementia later in life. Other sensory domain deficits are similarly associated with dementia. Earlier intervention and rehabilitation of sensory losses such as hearing may theoretically decrease this risk. More prospective and long-term cohort studies are needed to further characterize this link.

Learning Objective: To demonstrate the link between hearing loss and incident cognitive impairment in aging adults, and to further characterize the role of multiple sensory impairments as additive in their effect on cognition.

Desired Result: Participants will have an improved understanding of multisensory impairment and the risk of cognitive impairment.

Level of Evidence – Level III

Indicate IRB or IACUC : University of Kansas Medical Center IRB #145682).

Disparities in Sporadic Vestibular Schwannoma Initial Presentation Between a Public Safety Net Hospital and Private Hospital at the Same Zip Code 2010-2020

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Objective: Evaluate initial vestibular schwannoma presentation disparities in patient populations presenting to a public safety net hospital (PSNH) versus tertiary academic medical center (TAMC) in the same zip code.

Study Design: Retrospective chart review.

Setting: TAMC and affiliated PSNH

Patients: All patients (n=545) >18 years presenting for initial evaluation of vestibular schwannoma between 2010-2020 at TAMC (n=475) and affiliated PSNH (n=70).

Main Outcome Measures: Ethnicity, insurance, maximum cerebellopontine angle (CPA) and internal auditory canal (IAC) tumor size, hearing status, and initial treatment recommendation.

Results: Average age at diagnosis was not significantly different at 51.5±13.8 (TAMC) vs. 52.3±12.3 (PSNH) years old. 57% (TAMC, n=272) and 51% (PSNH, n=36) patients were female. As anticipated, significant differences in patients ' insurance existed with majority (73.1%) privately insured at TAMC while majority (77.1%) Medicaid at PSNH. The racial and ethnic profile of patients were also significantly different with TAMC having 63.2% White and 8.2% Hispanic/Latinx patients, while PSNH having only 4.3% White but 58.6% Hispanic/Latinx patients. Average maximum CPA or IAC+CPA tumor size was larger at PSNH (24±13mm) than TAMC (21±9mm) but not significantly different; however, hearing status was significantly more impaired at PSNH than TAMC with mean pure tone average 53dB vs 43dB, respectively, and word recognition score 53% vs 68%, respectively. Initial treatment recommendations may have included more than one option, with TAMC patients offered 66.5% surgery, 31.4% observation, and 5.1% radiation, while PSNH patients offered 51.4% observation, 48.6% surgery, and 8.6% radiation.

Conclusions: Hearing status was worse in patients presenting to PSNH than TAMC, and tumor size was larger on presentation to PSNH though not statistically significant. Despite worse hearing status and larger tumor size, the majority of PSNH patients were initially offered observation compared to TAMC where most patients were initially offered surgery.

Professional Practice Gap & Educational Need: There exists a significant gap in the literature demonstrating how racial and socioeconomic status influence vestibular schwannoma presentation and outcome. The way these factors affect initial vestibular schwannoma presentation and evaluation in a public safety net hospital versus tertiary academic medical center in the same zip code has not been established.

Learning Objective: To increase understanding and awareness of how demographic and socioeconomic factors influence vestibular schwannoma presentation and outcomes.

Desired Result: Given that racial and socioeconomic factors contribute to healthcare outcomes, we hope to further elucidate these disparities when comparing initial vestibular schwannoma presentation and treatment recommendation in tertiary academic medical center and public safety net hospital patient populations.

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

Indicate IRB or IACUC : IRB Exempt (University of Southern California HS-21-00412, 8/4/2021)

Cytokine Profiling of Cerebrospinal Fluid and Cyst Fluid in Cystic Vestibular Schwannoma

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Olena Bracho, BS; Tricia Scaglione, AuD
Rita Bhatia, MD; Fred F. Telischi, MD
Christine T. Dinh, MD

Hypothesis: Profiling of cyst fluid from cystic vestibular schwannoma (VS) will reveal increased levels of inflammatory cytokines

Background: There is evidence that cystic VS have increased peritumoral adhesion to surrounding structures such as the facial nerve. This may be secondary to factors within the tumor microenvironment (TME) that promote inflammation, increased vascularity, and tumor progression. Cytokines can take on several of these functions in the TME such as (1) polarization of macrophages, (2) induction of angiogenesis. Here, we analyze the cytokine profile of cyst fluid from patients with cystic VS and describe macrophage phenotypes within tumor

Methods: Tumor, CSF, and cyst fluid were collected from cystic VS patients from 2018 to 2022. Eighty cytokines were measured using a human cytokine array. Immunofluorescence was performed for CD80 and CD16 to detect macrophage subtypes within the tumor. Descriptive statistics and paired t-tests were used to compare cyst fluid features to surrounding CSF and to CSF from normal controls.

Results: Although CSF and cyst fluid demonstrate similar cytokine profiles overall, cyst fluid had greater protein expression levels ($p<0.0001$). Specifically, cytokines implicated in angiogenesis (angiogenin, TIMP) and macrophage polarization (IL-8, MCP-1, IGFBP-2, NAP-2, OPN) were noted to be present at high levels. In addition, immunofluorescence of tumor specimens demonstrated the presence of pro-tumorigenic macrophages.

Conclusion: CSF and cyst fluid from cystic VS patients expressed cytokines that have been linked to tumor progression and pro-tumor macrophage polarization. CSF and cyst fluid demonstrated similar cytokine profiles, suggesting analyzing CSF can provide information about the VS TME.

Professional Practice Gap & Educational Need: Knowledge of cystic vestibular schwannoma characteristics

Learning Objective: The audience will understand factors that may promote tumor adherence in cystic vestibular schwannoma

Desired Result: Increased practitioner understanding of vestibular schwannoma tumor biology

Level of Evidence – N/A

Indicate IRB or IACUC : University of Miami Institutional Review Board approved protocol (#20150637).

An Update on the Epidemiology and Clinicodemographic Features of Meniere's Disease

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Michael J. Ruckenstein, MD

Objective: To characterize clinicodemographic features of Ménière's disease (MD) using current diagnostic criteria.

Study Design: Retrospective case-control.

Setting: Tertiary academic center.

Patients: Cases were patients seen in otorhinolaryngology clinic with MD diagnoses meeting AAO-HNS diagnostic criteria. Controls were patients without MD seen at any outpatient clinic, matched by year of encounter, from 1/1/2012–7/31/2022.

Results: Of 806 patients screened using ICD-10 codes for MD, we identified 480 cases—168 definite and 312 probable. We identified 499 matched controls. The mean age at initial presentation for cases and controls was 49 and 51 years, respectively. Forty-seven percent of cases and 37% of controls were male (p=0.002). MD cases had a significantly higher proportion of white patients (79% versus 68%, p<0.0001) and significantly lower proportion of black patients (5% versus 19%, p<0.0001). The mean time since MD symptom onset was 6.7 years, with a mean attack duration of 4.6 hours; 25% reported a positive family history, and 7% had bilateral disease. Fluctuating symptoms reported during attacks were tinnitus (87%), aural fullness (66%), and hearing (83%). The proportion of patients with a history of headaches, including migraines, was similar between cases (44%) and controls (43%). MD patients were significantly less likely to have renal and autoimmune conditions (p=0.006; p=0.002) but similarly likely to have cardiac comorbidities (p=0.223).

Conclusions: There is a low prevalence of true MD, and even lower prevalence of definite MD, among patients with recorded MD diagnoses. We present an updated review of the epidemiology of MD, and have identified distinguishing clinicodemographic features of this population.

Professional Practice Gap & Educational Need: Most past descriptive studies of MD were performed prior to the implementation of current diagnostic criteria, and thus likely include and are confounded by patients with vestibular migraine and those that would not meet today's diagnostic criteria. The true epidemiology of MD is not yet understood.

Learning Objective: To describe the clinicodemographic presentation of a true MD cohort when compared with a control population of patients without MD seen at any outpatient clinic at our institution over the same time period.

Desired Result: To provide an updated understanding of the epidemiology of MD, including demographics, comorbid conditions, and prevalence of definite MD, probable MD, and misdiagnoses using updated AAO-HNS 2015 diagnostic criteria.

Level of Evidence: Level IV

Indicate IRB or IACUC: Approved by the University of Pennsylvania Institutional Review Board. Approval #831279.

Audiologic Outcomes for Cochlear Implant Recipients Following CT Modeling of Electrode Array Position Intervention

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Objective: Determine differences in audiologic outcomes between two cohorts of cochlear implant (CI) recipients before and after implementation of image-guided cochlear implant programming (IGCIP) which uses post-op CT scans to map electrode position for patient-specific CI programming.

Study Design: Retrospective review of audiologic outcomes for CI recipients before (2018-2019) and after (2019-2020) implementation of IGCIP.

Setting: Tertiary-care academic medical center.

Patients: 101 adult CI recipients.

Intervention(s): CI programming without knowledge of post-op electrode location (2018-2019 group) and with knowledge of post-op electrode location (2019-2020 group).

Main Outcome Measure(s): Pre- and post-operative CNC and AzBio in quiet scores. Cohen's d used to express effect size (ES).

Results: Improvements from baseline in CNC and AzBio in quiet scores at 3-, 6-, 12-, and 24-month follow-ups were observed in the 2019-2020 cohort compared with the 2018-2019 cohort yet were statistically insignificant. The largest difference between cohorts was at 24-months for both CNC (+11.4%, d=0.46, 95% CI -0.21, 1.15) and AzBio in quiet (+19.2%, d=0.57, 95% CI -0.05, 1.21).

Conclusions: While improvements were statistically insignificant in our relatively small cohorts, the medium ES for difference in 24-month AzBio in quiet scores and approaching medium ES for difference in 24-month CNC scores may yield significant results with larger sample sizes. Prior work evaluating individuals undergoing IGCIP after standard programming demonstrated that many individuals show substantial improvement with very few not improving. These most recent findings support that IGCIP may be, at a minimum, substantially equivalent to standard CI programming. Further investigation into how IGCIP is used by audiologists and larger prospective studies of implementation are warranted.

***Professional Practice Gap & Educational Need:** CI outcomes vary widely among recipients. Patient-specific electrode mapping and programming might decrease cross-channel interactions and improve hearing outcomes.

***Learning Objective:** Appreciate the potential utility of patient-specific CI electrode mapping for individualized audiologic programming.

***Desired Result:** Increase awareness of image-guided electrode mapping for individualized CI programming.

***Level of Evidence –** Level

***Indicate IRB or IACUC:** Medical University of South Carolina IRB #00049700

ANS POSTER G034

Positive Correlation between Quality of Life and Speech Recognition Outcomes following Cochlear Implantation

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Objective: To investigate the relationship between Cochlear Implant Quality of Life-10 Global (CIQOL-10) and speech recognition scores 6 and 12 months after cochlear implantation (CI).

Study Design: Retrospective cohort.

Setting: Tertiary referral center.

Patients: 124 patients undergoing CI between 2018-2020 who completed CIQOL-10 questionnaire at 6 and/or 12 months.

Main Outcome Measures: CIQOL-10, CNC and AzBio in quiet and noise scores. Institution benchmark scores for CNC were 38% and 48% at 6 and 12 months, respectively. Institution benchmark scores for AzBio in quiet were 40% and 52% at 6 and 12 months, respectively.

Results: Median CIQOL-10 scores were 31.5 (IQR: 28.8-37.3) at 6 months and 34.0 (IQR: 29.0-37.5) at 12 months with a median improvement of 8.0 (IQR 6.0-12.3) at 6 and/or 12 months (n=34). Six months following implantation, there was a positive correlation between quality-of-life and CNC (r=0.248, p=0.029) and AzBio in quiet (r=0.300, p=0.011), and at 12 months, there was a positive correlation between quality-of-life and CNC (r = 0.343, p<0.001), AzBio in quiet (r=0.291, p=0.006), and AzBio in noise (r=0.290, p=0.046) scores. Patients who met benchmark CNC scores scored significantly greater on CIQOL-10 than those who did not at 6 months (33.7 vs 29.6, p=0.009) and 12 months (34.2 vs 29.5, p=0.001). Those who met benchmark AzBio scores demonstrated a similar relationship with CIQOL-10 at both 6 (33.8 vs 29.0, p=0.007) and 12 months (33.8 vs 29.8, p=0.010).

Conclusions: CIQOL-10 and speech recognition outcomes are positively correlated 6 and 12 months after CI. Patients who met benchmark speech recognition scores had significantly greater quality-of-life scores.

Professional Practice Gap & Educational Need: The relationship between the validated CIQOL-10 and speech recognition outcomes has yet to be established. There is also a lack of knowledge regarding the quality of life for those who meet benchmark score on speech recognition measures versus those who do not meet benchmark scores.

Learning Objective: Attendees will understand the relationship between quality of life and speech recognition scores and be able to compare quality of life scores for those who meet benchmark speech recognition measures scores and those who do not.

Desired Result: Attendees will recognize that there is a positive correlation between CIQOL-10 and speech recognition outcomes post-cochlear implantation. They will also understand that those who are meet benchmark scores have higher quality of life than those who do not meet benchmark scores.

Level of Evidence – IV

Indicate IRB or IACUC : Vanderbilt University Medical Center #221833

National Trends in Cochlear Implantation Across the Department of the Defense: A Case for Inclusion as a General Otolaryngology Core Competency

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Samuel A. Spear MD; Isaac D. Erbele MD

Objective: With ongoing national expansions in cochlear implantation (CI) candidacy criteria, more patients qualify for CI today than ever before. Among United States veterans and military servicemembers, the prevalence of qualifying degrees of hearing loss secondary to occupational noise exposure exceeds the general population. The primary aim of the current work was to evaluate CI trends across the military health system.

Study Design: Database review.

Setting: Military and civilian practices.

Patients: Department of Defense (DoD) beneficiaries who underwent CI.

Main Outcome Measures: CI rates between 2010-2019.

Results: A total of 3,573 cochlear implants were performed among DoD beneficiaries from 2010-2019. The majority of patients were ≥64 years of age (55%), with the next most commonly implanted age group being 0-4 (14%). From 2010-2019, annual CI increased at a rate of 7% per year (Pearson's correlation $r=0.97$, $p<0.0001$). CIs performed within military practices increased at a similar rate of 6% per year ($r=0.77$, $p=0.009$).

Conclusions: Although the number of devices implanted is rapidly increasing among DoD beneficiaries, current utilization rates forecast that it would take over 30 years before all of those who qualify actually receive cochlear implants. A similar projection likely exists across the general public, especially considering the aging demographic in the West and continual expansions in FDA labeling. These data suggest that widespread expansion of the procedure to general otolaryngology practices will be required to meet current and future demands for CI. For this reason, CI should be considered for "key indicator" designation among residency training programs.

Professional Practice Gap & Educational Need: Data surrounding cochlear implant utilization among the general United States population suggest widespread underutilization. However, there is little to date that characterizes current trends among DoD beneficiaries, or informs future projections surrounding the improvement of utilization rates.

Learning Objective: Describe rates of CI across the United States military health system between 2010-2019.

Desired Result: Practitioners and researchers would appreciate that current trends show year-over-year increase in CI, but it is likely insufficient to address underutilization. To improve utilization rates in the United States, consideration should be given to steps necessary for a significant revamp of practice patterns.

Level of Evidence: IV

Indicate IRB or IACUC: This research was deemed IRB exempt.

Risk Factors and Outcomes in Pediatric Patients Undergoing Stapedotomy

David S. Lehmann, MD; Madelyn Wang, BS; Ewen Chao, MD
Robert Saadi, MD; Huseyin Isildak, MD

Objective: To report our outcomes on the efficacy of stapes surgery in the pediatric population

Study Design: Retrospective study

Setting: Single-institution, academic tertiary care center

Patients: Patients aged <21 who underwent stapedotomy between September 2013 and July 2020.

Interventions: Stapedotomy with perichondrial graft and bucket handle prosthesis

Main Outcome Measures: Postoperative Air Bone Gap (ABG) at 3 months

Results: 20 patients (13 female and 7 male), age 6 to 20, were included. 50% had unilateral disease and 50% had bilateral disease. 2 patients had a family history of hearing loss, 13 had a history of a previous otologic procedure, with 1 having previously had a stapes surgery. Mean preoperative ABG was 34.5 dB (SD 11). 4 patients did not have postoperative audiograms available. At three months, the mean postoperative ABG was 20.6 dB (SD 10.2), with a mean improvement in ABG of 17.0 dB (SD 12.1). 64% of patients had a closure of their ABG to 20dB or less. Patients with previous otologic surgery had less improvement in ABG, although this did not meet statistical significance ($p = 0.139$). Other complications included 1 patient who had an intraoperative TM perforation, 1 patient had severe postoperative dizziness, and 1 patient required revision surgery for adhesions.

Conclusions: Pediatric stapedotomy can be effective and safe. Unlike our previously published results in adult patients, age within the pediatric population did not show correlation to improvement in ABG. Patients with previous otologic surgery may have had a worse outcome, although our small sample size was unable to show significance for this.

Professional Practice Gap & Educational Need: Performing stapes surgery in the pediatric population still remains controversial. Additional studies are needed to demonstrate safety and efficacy of pediatric stapedotomy and to elucidate appropriate patient populations for surgery.

Learning Objective: To understand the audiometric and demographic data of pediatric otosclerosis patients. Increase providers' familiarity with outcomes of pediatric stapedotomy.

Desired Result: Encourage practitioners to pursue stapedotomy in appropriate pediatric patients.

Level of Evidence: IV

Indicate IRB or IACUC : Penn State Hershey Medical Center IRB (STUDY00014969)

ANS POSTER G037

MRI Enhancement Patterns after Resection of Sporadic Vestibular Schwannoma

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Omid Moshtaghi, MD MS; Marc Schwartz, MD; Rick A. Friedman, MD, PhD

Objective: Compare MRI enhancement patterns following retrosigmoid and translabyrinthine vestibular schwannoma (VS) resection.

Study Design: Cohort study.

Setting: Tertiary center.

Patients: 185 patients who underwent resection (93 retrosigmoid, 92 translabyrinthine) of sporadic VS and ≥ 2 postoperative contrast-enhanced MRIs.

Interventions: VS resection.

Main Outcome Measures: Qualitative analyses of enhancement patterns. Adjustment for tumor size by multivariable logistic regression.

Results: After surgeon-reported gross total resection, linear enhancement was present in 24/141 (17.0%) and nodular enhancement in 2/141 (1.4%) cases. Both patterns showed high rate of spontaneous resolution, with 3/24 (12.5%) of linear enhancements persisting on ≥ 2 scans and no nodular enhancements (0/2) persisting. Among patients with less than gross total resection, when present, nodular enhancement was more likely to persist (3/5, 60.0%) than linear enhancement (3/8, 38.0%, $p<0.001$). Approach was not associated with odds of nodular enhancement (OR for retrosigmoid vs. translabyrinthine 0.36, 95%Cl 0.05-1.89, $p=0.2$). Gross total resection was associated with reduced odds of nodular enhancement for translabyrinthine (OR 0.07, 95%CI 0.00-0.63, $p=0.04$) but not retrosigmoid (OR 0.09, 95%CI 0.00-2.76, $p=0.13$).

Conclusions: Postoperative enhancement should be interpreted in the context of surgeon-reported resection extent. When gross total resection is reported, a high rate of spontaneous resolution is observed regardless of enhancement pattern. With less than gross total resection, nodular enhancement is more likely to persist. Retrosigmoid approach does not appear to be associated with increased risk of residual, but the surgeon may better predict resection completeness with the translabyrinthine approach.

Professional Practice Gap & Educational Need: In VS patients, MRI surveillance is the imaging of choice for monitoring tumor recurrence after resection, although the protocol remains unclear. Furthermore, little research has been done utilizing MRI to determine regrowth across tumor resection approaches. The retrosigmoid approach has the disadvantage of not being able to see tumor at the fundus, which means tumor might be left behind unknowingly. We evaluated the differences in enhancement of two approaches to better understand the relationship between resection approach and likelihood of tumor regrowth.

Learning Objective: The audience can utilize the findings of our study to assist in their evaluation risk of tumor regrowth in VS patients post resection via retrosigmoid or translabyrinthine approach using MRI with contrast.

Desired Result: The goal of our study is to present additional data surrounding the gold standard for tumor surveillance post operatively and better identify patterns of tumor regrowth for varying approaches.

Level of Evidence - III

Indicate IRB or IACUC: IRB: 180978; University of California, San Diego; Approved 10/3/2018

Audiometric Outcomes following the Middle Cranial Fossa Repair of Superior Semicircular Canal Dehiscence

Hong-Ho Yang, BS; Isaac Yang, MD; Quinton S. Gopen, MD

Objective: To evaluate the audiometric outcomes following the middle cranial fossa approach (MCF) for superior semicircular canal dehiscence (SCD) repair

Study Design: Retrospective review

Setting: Tertiary referral center

Patients: Cases from 2012 to 2022 with sufficient, properly calibrated preoperative and postoperative audiogram data

Interventions: The MCF repair of SCD

Main Outcome Measures: Air conduction threshold (AC), bone conduction threshold (BC), and air bone gap (ABG) at each frequency, pure tone average (PTA) (AC 500-3000Hz)

Results: Among 202 repairs, 57% were bilateral SCD disease and 9% had prior surgery on the affected ear. The approach significantly narrowed ABG at 250Hz, 500Hz, and 1000Hz. The narrowing of ABG was achieved by both decreased AC and increased BC at 250Hz, but mediated primarily by increased BC at 500Hz and 1000Hz. PTA remained in the normal range for cases without prior ear surgery (mean 21dB preop, 24dB postop). PTA remained in the mild hearing loss range for cases with prior ear surgery (mean 33dB preop, 35dB postop).

Conclusion: This is the largest study examining the audiometric outcomes following the MCF approach for SCD repair. Findings of this investigation support that the approach is effective and safe with long-term hearing preservation for most.

Professional Practice Gap & Educational Need: Low case numbers in prior series (n<50) with overall conflicting results.

Learning Objective: To understand the mechanism, magnitude, and direction of change in audiogram metrics following the procedure.

Desired Result: Evidence presented in this study can inform surgeons' perioperative considerations and counseling.

Level of Evidence: V

Indicate IRB or IACUC: UCLA #22-000259

ANS POSTER G039

Idiopathic Intracranial Hypertension in Patients with and without Pulsatile Tinnitus: Clinical Correlates

Jatin P. Vemuri, BS; Jonathan R. Widmeyer, BA; Jonathon Jacobs, BS
Aristides Sismanis, MD; Warren Felton, MD; Scott Haines, MD
Daniel H. Coelho, MD

Objective: Pulsatile tinnitus (PT) is very common in patients with idiopathic intracranial hypertension IIH. However, little is known about why some patients with IIH develop PT and others do not. The purpose of this study is to determine which clinical findings associated with IIH differ between patients with and without pulsatile tinnitus (PT), potentially elucidating a pathophysiologic mechanism.

Study Design: Retrospective, age-matched, cohort study

Setting: Tertiary referral center

Patients: Adults seen in an outpatient neuro-ophthalmologic IIH clinic diagnosed by modified Dandy criteria, with documented presence/absence of PT.

Main Outcome Measures: BMI; blood pressure; Humphrey's visual field mean deviation; visual acuity; retinal nerve fiber layer (RNFL) measured on OCT scan; pre-treatment CSF opening pressure; sleep apnea; snoring; migraines; headaches; transient visual obscurations (TVOs); dizziness; trigeminal neuralgia; facial paralysis

Results: Statistical analysis found no significant difference in CSF opening pressure, (33.6 vs. 33.5, p=.956). Differences were found in BMI (45.1 vs. 37.7, p =.003), pulse pressure (60.1 vs. 51.6, p =.020), snoring (65% vs. 42%, p =.044), sleep apnea (60% vs. 15%, p < .001) and migraines (70% vs. 37.5%, p =.003). Multivariate analysis showed that sleep apnea (adjusted odds ratio 13.9, 95%CI (2.3, 83.5)), migraines (4.1, 95%CI (1.2, 13.9)), and BMI(1.085, 95%CI (1.008, 1.168)) were all independently associated with PT.

Conclusions: Counterintuitively, Presence of pulsatile tinnitus does not correlate with severity of intracranial hypertension. However, PT is highly associated with obesity and its sequelae.

Professional Practice Gap & Educational Need: Currently the causative factors of pulsatile tinnitus within the context of IIH are poorly defined. These data are important for increasing understanding of the pathophysiologic process involved in this symptom.

Learning Objective: At the conclusion of this presentation, participants should be able to recognize the clinical correlates of IIH that are most associated with pulsatile tinnitus in this patient population.

Desired Result: Providers will have additional knowledge about clinical factors that may influence the presence or absence of pulsatile tinnitus in the IIH patients. These results may be able to guide additional symptomatic treatment that was not previously clear.

Level of Evidence - Level III

Indicate IRB or IACUC : VCU Health IRB: HM20020839 - Exempt

ANS POSTER G040

Superior Semicircular Canal Dehiscence Repair using Cement via a Transmastoid Approach

Hemali P. Shah, BS; Jacqueline Ihnat, BS; Sen Ninan, MD
Allison Reeder, MD; Nofrat Schwartz, MD

Objective: To assess the efficacy of superior semicircular canal dehiscence (SSCD) repair via a transmastoid approach using hydroxyapatite bone cement capping.

Study Design: Retrospective case series.

Setting: Tertiary referral center.

Patients: Patients ≥18-years-old diagnosed with SSCD between 2012-2022.

Interventions: Transmastoid approach with hydroxyapatite bone cement capping.

Main Outcome Measures: Failure rate (lack of symptom resolution or dehiscence on postoperative imaging) and/or need for revision surgery. Dehiscence location and size were assessed from preoperative CT temporal bone scans.

Results: Nineteen patients (22 ears) were included. Mean age was 52.2 years (SD=9.5 years) with 47.4% female patients (n=9). Predominant location of SSCD was apical (72.7%, n=16), followed by posterior limb (9.1%, n=2) and anterior limb (9.1%, n=2); dehiscence location was determined to be posterior-apical for two ears (9.1%). Mean dehiscence size was 2.9 mm (SD=1.4 mm). Median follow-up time was 12.5 months (IQR:3.8-37.0 months). Failure rate was 9.1% (n=2). Both cases demonstrated persistent SSCD on postoperative imaging; one case had an apical dehiscence of 1.6 mm persistent at 4 months, and one had a posterior-apical dehiscence of 2.3 mm persistent at 8 months after surgery. No patients experienced postoperative complications.

Conclusions: Transmastoid approach for SSCD repair with hydroxyapatite bone cement capping has a relatively low failure rate alleviating the need for middle fossa approach. No pattern was identified among failed cases of SSCD repair for this approach. To our knowledge, this case series represents the largest for this approach and material combination for SSCD repair, demonstrating that transmastoid repair with bone cement represents a promising approach for effective management of patients with SSCD.

Professional Practice Gap & Educational Need: Given that SSCD is a rare, relatively newly introduced condition, there is a need to accumulate knowledge and share experiences of different surgical treatment methods in order to identify the best options for patient care. There is a paucity of literature on the transmastoid approach with bone cement repair of SSCD.

Learning Objective: We aim to provide attendees with exposure to the technique of transmastoid repair of SSCD with hydroxyapatite bone cement and the impact of this outcome on symptom resolution and imaging confirmation of successful repair.

Desired Result: We aim to have attendees consider implementing the transmastoid approach and hydroxyapatite for SSCD repair in their future patient care.

Level of Evidence - Level V

Indicate IRB or IACUC : This study (IRB#2000032898) was deemed exempt on 5/16/2022.

ANS POSTER G041

Use of a Soft Cervical Collar Improves Surgeon Ergonomics during Otologic Surgery

Sunder Gidumal, MD; Mia Saade, BA; Zachary Schwam, MD
Kevin Wong, MD; Maria Mavrommatis, MD; Enrique Perez, MD
Maura K. Cosetti, MD

Objective: To determine whether surgeon use of a soft cervical collar during endoscopic and microscopic otologic surgery is feasible and impacts surgeon ergonomics as measured by inertial sensors

Study Design: Prospective, randomized, cross-over trial

Setting: US-based otolaryngology training program

Patients: Otolaryngology residents and fellows

Interventions: Use of a soft cervical collar during simulated otologic surgery

Main Outcome Measures: Time spent in high-risk angles of neck and back flexion and extension; average angle of neck flexion, extension, rotation, and lateral bending; validated assessment of neck pain; average daily phone use

Results: 15 subjects met criteria for inclusion. 10/15 (67%) were male. 7/15 (47%) were PGY1-2. 7/15 (47%) reported a history of neck pain. None reported prior spinal steroid injections or surgery. Across all subjects, use of the soft cervical collar significantly reduced time spent in high-risk angles of neck flexion/extension during both endoscopic (56% vs 35%, $p<0.05$) and microscopic (60% vs 32%, $p<0.05$) otologic surgery. There was no effect on back flexion or extension. There was no difference in time spent in high-risk neck or back angles between endoscopic and microscopic surgery. Average angles of neck or back flexion, extension, lateral bending, and rotation were not significantly different for subgroups with more operative experience, increased phone use, perception of good posture, or history of neck pain.

Conclusions: Use of a soft cervical collar during simulated otologic surgery significantly reduced time spent in high-risk neck positions. These data support feasibility of soft collar use during otologic surgery and hold promise for reduction in the high rates of neck pain reported by neurotologists.

Professional Practice Gap & Educational Need: Improving surgeon ergonomics for otologic surgery

Learning Objective: To identify a therapeutic intervention to mitigate neck pain in surgeons caused by assumption of high-risk cervical neck flexion and extension

Desired Result: To demonstrate that use of a readily-available soft cervical collar reduces risk of neck pain in otologic surgeons

Level of Evidence - II

Indicate IRB or IACUC : Exempt

Skull Thinning in Patients with Superior Semicircular Canal Dehiscence

Douglas J. Totten, MD, MBA; Leah Dauterman, BS; McKenzie Stewart
Evan Cumpston, MD; Rick F. Nelson, MD, PhD

Objective: To use skull thickness to determine if an isolated skull thinning process occurs in patients with superior semicircular canal dehiscence (SSCD).

Study Design: Retrospective cohort study.

Setting: Tertiary referral center.

Patients: A power analysis required 28 patients per cohort. 38 SSCD patients (with absent bone overlying superior canal on CT) and 44 control patients without SSCD for whom imaging was obtained for unrelated reasons.

Main Outcome Measures: Thickness of calvarium and ipsilateral extracranial zygoma in SSCD and control patients as measured using standardized 3D slicer measurements of high-resolution temporal bone computed tomography scans obtained at a single tertiary referral center.

Results: 37 SSCD patients (58 SSCD ears) and 44 control patients (88 ears) were assessed for thickness of ipsilateral calvarium and extracranial zygoma. SSCD patients were slightly older than control patients (55 [standard deviation:15] vs. 48 [18] years; p=0.02) while BMI was similar (32 [10] vs. 30 [8] kg/m^2); p=0.10). Females comprised 25 (65%) of SSCD patients and 28 (64%) of control patients while 35 (95%) of SSCD patients and 33 (79%) of control patients were white. SSCD patients had mean calvarium thickness of 2.13 (0.42) cm and mean zygoma thickness of 4.75 (0.47) cm compared with 2.42 (0.46) cm and 5.08 (0.82) cm for control patients (ratio: 0.45 vs. 0.48, respectively [p=0.06]). There was a significant association between zygomatic and calvarium thickness ($p<0.0001$).

Conclusions: Patients with SSCD have thinner intracranial and extracranial skull thicknesses. This suggests SSCD does not develop via an isolated intracranial skull base thinning process but rather from a systemic and/or developmental bone formation process.

Professional Practice Gap: Etiology of SSCD is poorly understood. This study attempts to elucidate whether SSCD occurs as a result of an isolated skull base defect or a more systemic process.

Learning Objective: Patients with SSCD may globalized skull base thinning due to systemic processes rather than isolated bone defects.

Desired Result: Clinicians will gain further understanding regarding the pathophysiology of SSCD prompting additional research into understanding this complex disease process

Level of Evidence: IV

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

Catastrophizing as a Predictor of Vestibular Treatment Outcomes

Danielle M. Gillard, MD; Maxwell Hum; Adam Gardi
Lind Centore, PhD, NP; Jeffrey D. Sharon, MD

Objective: Determine the levels of catastrophizing in patients with vestibular disorders and evaluate their relationship with patient reported outcome measures.

Study Design: Prospective cohort study.

Setting: Tertiary care neurotology clinic.

Patients: Patients presenting to clinic with various vestibular disorders who were recruited to participate in in a prospective treatment outcomes study.

Interventions: Patients were given the Dizziness Handicap Inventory (DHI) and the Dizziness Catastrophizing Scale (DCS) both pre- and post-treatment. The DCS is a modified Pain Catastrophizing Scale (PCS).

Main outcome measures: A linear regression was performed to determine the relationship between DCS and pre an post-treatment DHI.

Results: 46 subjects completed both the DHI and the DCS pre and post treatment. Pretreatment patients with higher DCS scores had higher DHI scores ($p<0.001$). There was a significant improvement in both DHI score ($P<0.001$) and DCS ($p<0.001$) after treatment. Patients with higher baseline DCS scores showed less improvement in their post-treatment DHI scores ($p=0.025$). Patients who had improved DCS scores during treatment were more likely to show improved DHI scores ($p<0.001$). There were 10 patients who reported worse DHI after treatment and they had lower improvement in DCS score ($p=0.004$) and were more likely to report worse DCS scores after treatment ($p=0.047$).

Conclusions: Catastrophizing is associated with higher pre-treatment DHI scores, and worse treatment outcomes.

Professional Practice Gap & Educational Need: Patients with vestibular disorders can be difficult to treat and often present with high levels of anxiety surrounding their diagnosis and it can be difficult to determine why certain patients fail treatment or show less improvement than expected.

Learning Objective: 1. To understand the relationship between dizziness handicap and patient catastrophizing. 2. Understand how catastrophizing may affect the results of treatment interventions for vestibular disorders.

Desired Result: Understand that patients with high levels of catastrophizing may have higher subjective handicap due to their dizziness and may be less likely to show improvement with treatment interventions. Understand that interventions that focus on catastrophizing and anxiety regarding diagnosis may help improve treatment outcomes.

Level of Evidence: V

Indicted IRB or IACUC: IRB Approval 18-25365- February 26, 2019 and 21-33311, May 18, 2021

ANS POSTER G044

Characterizing Demographic and Treatment Parameters in Gamma Knife Radiosurgery for Vestibular Schwannoma

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Kanwar Singh, MBBS; Sunitha S. Varghese, MD; Amit Mahajan, MD
Nofrat Schwartz, MD

Objective: 1) Introduce the use of efficiency index (EI) as an alternate method for evaluating efficacy and safety of radiosurgical treatment plans and 2) characterize the relationship between EI, conformity index (CI) and tumor and cochlea volumes in Gamma Knife radiosurgery (GKRS) for vestibular schwannoma

Methods: Retrospective chart review was performed for 181 patients who underwent GKRS for vestibular schwannoma at a tertiary care center between 2006-2021. CI and EI, which refers to a ratio of useful energy to total energy deposited, were calculated. Linear regression analyses were conducted to evaluate associations between EI, CI and tumor and cochlea volumes.

Results: Mean tumor EI was 43.36% and mean tumor CI was 0.78. Mean cochlea EI was 1.38%. There was a positive correlation (R^2= 0.356) between EI and smaller tumors (volume < 1cc), though there was a lack of correlation (R^2= 0.001) between EI and tumor volume overall. Correlation between CI and tumor volume was weak (R^2= 0.080) irrespective of size. There was no significant association between EI and CI (R^2=0.015) or between cochlea EI and cochlea volume (R^2= 0.041).

Conclusions: EI is a novel measure for assessing treatment plan quality in GKRS, combining conformity, gradient and mean dose. EI appears to be higher in tumors with smaller volume (< 1cc), suggesting that GKRS may allow for more effective delivery of energy within the tumor matrix for smaller vestibular schwannomas. Forthcoming analyses exploring the relationship between EI and tumor progression will prove critical in determining its utility in effective treatment planning for GKRS.

Professional Practice Gap & Educational Need: GKRS represents an important modality in the management of vestibular schwannomas. Literature on how to optimize radiosurgical treatment planning based on tumor and cochlea characteristics, as well as likelihood of tumor progression, remains limited.

Learning Objective: Attendees will be able to 1) describe the efficiency index as an alternate measure for evaluating the quality of a radiosurgical treatment plan 2) describe the relationship between tumor volume, cochlea volume and efficiency and conformity indices in GKRS for vestibular schwannoma

Desired Result: Optimizing the quality of GKRS planning in the treatment of vestibular schwannomas

Level of Evidence - IV

Indicate IRB or IACUC: Yale University Institutional Review Board. IRB Protocol ID: 0704002523.

ANS POSTER G045

Middle Ear Secretions following Surgery for Cerebrospinal Fluid Leak is Often Effusion and Not a Residual Leak

Ophir Handzel, MD; Omer Ungar, MD; Rosh Sethi, MD, MPH
Lei Ouyang Tanaka, MD; Rani Abu Ita, MD
Daniel J. Lee, MD; Judith S. Kempfle, MD

Objective: Characterize middle ear effusion present two months after surgery for temporal bone cerebrospinal fluid (CSF) leak.

Study Design: A retrospective chart review.

Setting: Two tertiary referral academic centers.

Patients: All patients with middle ear effusion two months after surgery for temporal bone CSF leak were included. The indication for surgery was an active CSF leak with or without a history of otogenic meningitis. The presence of effusion was established based on microscopic otoscopy aided by tympanometry.

Interventions: All middle ears with effusion two months after surgery were sampled for the presence of β 2transferrin or had a ventilation tube placed.

Main Outcome Measures: Persistent fluid leakage from tympanostomy tube, p resence or absence of β 2transferrin, residual air-bone gap recorded on audiogram.

Results: 93 ears underwent surgery to repair a CSF leak, 82 via middle fossa, 11 through transmastoid approaches. Twenty-seven ears (29%) had middle ear effusion two months after surgery. Fourteen ears were sampled for β 2transferrin and seven (50%) were positive. Additional thirteen patients received a tympanostomy tube. Seven (54%) of these middle ear remained dry and required no further interventions. In six persistent pulsatile secretions indicated the need for revision surgery. The β 2transferrin positive ears underwent revision surgery.

Conclusions: Postoperative middle ear fluid after surgery for temporal bone CSF leak may represent effusion rather than an ongoing leak. Revision surgery should be reserved for patients with a proven active leak. Middle ear effusion is likely caused by mucosal irritation from long-standing CSF rather than Eustachian tube dysfunction.

Professional Practice Gap & Educational Need: The prevalence of temporal bone CSF leaks is rising. Middle ear effusion in the presence of a bone defect can represent CSF, especially following corrective surgery. It is often assumed that in these circumstances, revision surgery is necessary. We present data demonstrating a high prevalence of middle ear effusion that is not an ongoing leak following primary surgery for CSF leak and does not necessitate revision surgery.

Learning Objective: Be aware of the possibility that middle ear effusion after corrective surgery for CSF leak is an effusion that does not a revision surgery.

Desired Result: Clinicians will include the presented data in their work-up of patients with middle ear effusion after surgery for CSF leak and will not offer all patients revision surgery.

Level of Evidence - IV

IRB: The study was approved by the Tel-Aviv Sourasky medical center (Israel) ethics committee number TLV-10-0312 and by the Massachusetts Eye and Ear (Boston, MA) IRB number 2019P000714.

Sporadic Vestibular Schwannoma in a Pediatric Population: A Case Series

Nikitha Kosaraju, BA; Lindsay S. Moore, MD
Jip Y. Mulders, MSc; Nikolas H. Blevins, MD

Objective: To describe the characteristics, management, and outcomes of pediatric patients with sporadic vestibular schwannoma (VS).

Study Design: Retrospective case review

Setting: Tertiary care center

Patients: 8

Interventions: Microsurgery, stereotactic radiosurgery (SRS), or observation

Main Outcome Measures: Tumor control

Results: 8 patients fulfilled inclusion criteria (sporadic unilateral VS; age < 21) with a mean age of 17 years (range 14-20). 62.5% were female. Average tumor size was 17.5mm (range 3-37mm). 50% underwent genetic testing with unremarkable findings. 5/8 (62.5%) were treated with microsurgery, 2/8 (25%) with observation, and 1/8 (12.5%) with Cyberknife SRS. 1 (20%) surgical patient had recurrence after a subtotal resection and went on to have SRS. 2 surgical patients had poor facial nerve outcomes (HB 6/6), while the other 6 patients remained HB1. One observed patient has remained radiographically stable for 2.5 years. The other experienced tumor growth and underwent microsurgery. The patient who underwent SRS has remained radiographically stable for 7 years.

Conclusions: We describe one of the largest reported cohorts of sporadic VS in the pediatric population. Genetic testing is critical to exclude neurofibromatosis type 2 but is often otherwise unrevealing. Given long expected lifespan and subsequent high risk of growth/regrowth and need for intervention, along with risk of secondary malignancy with SRS, microsurgery remains the preferred treatment. However, SRS or observation could be considered in select situations, with the potential benefit of preserved facial nerve function. Patients who elect for either should be counseled on the need for lifelong surveillance and the higher risk of poor facial nerve outcomes in salvage surgery if SRS fails.

Professional Practice Gap & Educational Need: Sporadic VS in the pediatric population is rare. Early identification and referral to tertiary care center can facilitate the most appropriate treatment and surveillance plan.

Learning Objective: To better understand the management of pediatric patients presenting with VS and negative genetic testing.

Desired Result: Pediatric patients with radiographic findings of VS will be referred to genetic testing and tertiary care centers.

Level of Evidence - V

Indicate IRB or IACUC : Stanford University IRB #39350

Speech Perception is Related to Quality of Life after Cochlear Implantation in Older Adults

James W. Bao, MSCI; Amit Walia, MD; Dorina Kallogjeri, MD
Matthew A. Shew, MD; Kevin Y. Zhan, MD; Craig A. Buchman, MD
Cameron C. Wick, MD

Objective: To assess the relationship between quality of life and speech perception outcomes in older adult cochlear implant (CI) recipients.

Study Design: Retrospective review and cross-sectional survey study.

Setting: Tertiary care center.

Patients: Traditional CI recipients 65-years and older implanted between 2015 and 2020.

Interventions: Cochlear Implant Quality of Life (CIQOL-35) survey completed within 1-year of most recent speech perception testing.

Main Outcome Measures: CNC words in the implanted ear; AzBio in quiet and + 10 dB SNR in the binaural everyday listening condition; CIQOL-35 responses

Results: 217 CI recipients returned CIQOL-35 surveys. Their demographics, otologic history, comorbidity index, and cognitive screen were collected alongside pre- and postoperative speech perception outcomes. Median age at implantation was 76 years (range 65-97) and median age at CIQOL-35 was 78 years (range 65-100). Datalogging showed mean daily use was 12 hours; 8 users were < 4-hours per day. The mean CIQOL-35 global was 48.1 (SD 10.8), which is comparable to normative data. Subdomain scores ranged from 35.3 ± 14.2 (listening effort) to 63.0 ± 20.5 (social). Bivariate analysis showed CIQOL-35 global had moderate correlation with AzBio quiet (r=0.413) and AzBio noise (r=0.537). A multivariable regression model using AzBio in noise, duration of hearing loss, age, and cognitive screen explained 38% of the CIQOL-35 global score variability (R^2=0.378). AzBio in noise was the most significant single variable.

Conclusions: Older adult CI users demonstrate CIQOL-35 scores inline with normative adult data. AzBio in noise performance is the strongest predictor of global CIQOL-35 performance.

Professional Practice Gap & Educational Need: Cochlear implant outcomes are more than just speech perception scores. This study evaluates how speech perception and quality of life are related in older adult recipients, which will help better inform patient expectations.

Learning Objective: Appreciate what factors influence cochlear implant quality of life in older adult recipients.

Desired Result: Improve preoperative patient counseling by learning about how patient variables and speech outcomes influence the CI users' experience.

Level of Evidence: IV

Indicate IRB or IACUC : IRB# 202108164

Long-term Contralateral Hearing Outcomes following Labyrinthectomy

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Caleb J. Fan, MD; Jake C. Lucas, MD; Seilesh C. Babu, MD

Objective: To quantify contralateral hearing loss after labyrinthectomy for Ménière's disease (MD) over a 14-year follow-up period.

Study Design: Retrospective chart review.

Setting: Tertiary neurotology referral center.

Patients: A total of 1394 adult patients were identified, of which 356 underwent labyrinthectomy (LAB). The remainder were translabyrinthine (TLAB) acoustic neuroma resection cases that served as a control group in which contralateral MD was unlikely to develop.

Interventions: Labyrinth removal with or without tumor resection.

Main Outcome Measures: Pure-tone average (PTA) 4-tone (500, 1000, 2000, 4000); PTA-Low (250, 500, 1000); PTA-High (2000, 4000); SRT, speech recognition threshold; SRS, speech recognition score.

Results: The average follow-up period was 5.8 years. The change in 4-tone PTA from baseline to last follow-up was similar for both LAB and TLAB groups (5.5 ± 7.1 dB and 4.4 ± 8.0 dB, $p = 0.634$). Likewise, upon PTA stratification there was minimal difference in the change of PTA-High (6.5 ± 7.5 dB and 5.4 ± 10.1 dB, $p = 0.700$) and PTA-Low (3.6 ± 9.0 dB and 2.9 ± 7.7 dB, $p = 0.778$) at last follow-up. SRT and SRS metrics were also similar [(4.3 ± 9.2 dB and 3.5 ± 8.8 dB, $p = 0.758$) and (0.0 ± 0.1 dB and 0.1 ± 0.2 dB, $p = 0.493$)].

Conclusions: We report minimal new-onset contralateral hearing loss after labyrinth removal for unilateral MD. This suggests that the audiometric manifestation of contralateral MD is clinically insignificant in the post-operative period.

Professional Practice Gap & Educational Need: Some neurotologists are interested in using vestibular-evoked myogenic potential (VEMP) testing to predict the development of contralateral MD. Given our finding of minimal contralateral sensorineural hearing loss after labyrinthectomy, such VEMP testing may not be necessary for routine cases.

Learning Objective: When unilateral MD is refractory to medical management, treatment with labyrinthectomy may be indicated. Violation of the labyrinth results in complete loss of hearing on the operated ear. For this reason, careful evaluation of hearing function in the contralateral ear prior to surgery is required to ensure that the patient's iatrogenic single sided deafness does not progress to bilateral hearing loss in the post-operative period.

Desired Result: This report suggests that few post-labyrinthectomy MD patients develop contralateral low-frequency (<2000Hz) sensorineural hearing loss in two contiguous frequencies at 30 dB or higher, which would be consistent with MD.

Level of Evidence: Level III

Indicate IRB or IACUC: Ascension Providence Hospital, RMI20220175.

Cochlear Implantation Outcomes in Non-surgical Vestibular Schwannoma Patients

Samuel J. Cler, BS; Matthew Shew, MD; Nedim Durakovic, MD; Kevin A. Zhan, MD
Jacques A. Herzog, MD, Craig A. Buchman, MD, Cameron C. Wick, MD

Objective: To assess the clinical scenarios and speech perception outcomes of patients with a vestibular schwannoma (VS) managed non-surgically who received an ipsilateral cochlear implant (CI).

Study Design: Retrospective review

Setting: Tertiary care center

Patients: Sporadic or Neurofibromatosis Type-2 (NF-2) VS patients with bilateral sensorineural hearing loss and tumors managed by observation or stereotactic radiation.

Interventions: Cochlear implantation ipsilateral to a VS

Main Outcome Measures: Audibility; CNC words

Results: Six patients with ages ranging from 13-86 years underwent cochlear implantation ipsilateral to an observed or irradiated VS. Mean tumor size was 15.5 mm (range 11-25 mm). Five of the patients demonstrated no tumor growth in the preceding 18-months, the exception being a 13-year-old with an observed NF-2 tumor. All patients achieved meaningful sound awareness with a mean CI PTA of 21.3 dB HL (range 18-38 dB HL). Two patients underwent gamma knife radiation and subsequent CI achieving CNC scores of 0% and 48%, respectively; the poor result associated with NF-2. Four patients observed their tumors and achieved CNC scores of 36%, 42%, 78%, and 0%; the poor result associated with NF-2. Both NF-2 patients had sound awareness without open-set speech and performance waned over time.

Conclusions: The decision to forgo surgical intervention for a VS does not preclude hearing rehabilitation with a CI. This report adds to the limited published data on this topic. While open-set speech can be achieved, CI results are expected to be more variable and likely worse in NF-2 patients afflicted with a higher tumor burden.

Professional Practice Gap & Educational Need: Off-labeled cochlear implantation with vestibular schwannomas is increasing. This report is meant to help educate clinical decision making in these challenging scenarios.

Learning Objective: Understand outcomes associated with cochlear implants in the setting of non-surgically managed vestibular schwannomas.

Desired Result: Improve patient counseling for those considering cochlear implantation in the setting of an ipsilateral vestibular schwannoma.

Level of Evidence: V

Indicate IRB or IACUC : Washington University School of Medicine - IRB #202111194 (approved: 11-30-2021)

ANS POSTER G050

Validating Automated Segmentation for Vestibular Schwannoma Volumetric Measurement

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D. Bradley Welling, MD, PhD; Wenli Cai, PhD
Matthew G. Crowson, MD, MPA, MASc

Objective: There is a trend towards measuring vestibular schwannoma (VS) tumor volumes on MRI, however this has been limited by difficulties with tumor segmentation (delineating tumor boundaries). Manual segmentation is laborious and subject to human variability. Machine learning approaches could automate segmentation in a reliable fashion. Our objective is to validate an automated MRI segmentation tool for VS.

Study Design: Retrospective study

Setting: Tertiary referral centers

Patients: 242 patients with VS from a single institution on The Cancer Imaging Archive (TCIA); 10 individuals with VS from our institution.

Interventions: A nnU-Net was trained on the TCIA data to develop a model to automatically segment VS on T1-post contrast MRI. This model was applied to 10 MRIs from our institution, and the automated segmentation results were compared with our manual segmentations.

Main Outcome Measures: Dice coefficient, which measures agreement between ground truth (manual) and predicted (automated) segmentations on a scale from 0-1 (1 indicating perfect agreement).

Results: The model detected 7/10 VS; the 3 that were not detected were <0.02 cc. For those that were detected, the mean Dice was 0.87 (SD 0.14). There was one outlier with Dice of 0.55 (manual 0.361 cc, automated 0.901 cc) – on review, hyperintense petrous bone had been included as tumor in the automated segmentation.

Conclusions: Automated segmentation for VS is a promising approach that can be translated to patient populations from different institutions and MRI technologies. Failure to detect small tumors may reflect biases in training data. Further work is needed to refine accuracy, and human review of automated results is warranted.

Professional Practice Gap & Educational Need: VS tumor volumes more accurately reflect the size of these irregularly shaped masses and have been shown to be more sensitive in detecting tumor growth than linear measurement. However, volumetric measurement is not being done in practice at most institutions because of difficulties with tumor segmentation. An understanding of the approaches and challenges in measuring tumor volumes is increasingly important and relevant in the management of VS.

Learning Objective: To understand the challenges in development and implementation of automated segmentation tools for VS.

Desired Result: Attendees will understand the importance of volumetric measurement for VS and gain an appreciation for the approaches and challenges in implementing this.

Level of Evidence – Level IV

Indicate IRB or IACUC: Exempt under Mass General Brigham IRB Protocol # 2021P000710, approved 3/17/2021

The Role of Machine Learning and Motion Analysis in Enhancing Multidisciplinary Neurovestibular Care: A Systematic Review

Munib Ali, BSc; Christopher Yam, MSc; Mariam Kabalan, BA
Katie de Champlain, MSc, MD; Justin K. Chau, MD

Objective: Various modalities evaluating human posture and dynamics are used to assist in characterizing balance disorders. Limited tools have attained adequate testing parameters to help delineate inner ear pathology. Machine learning shows promise to aid in the diagnosis and classification of vestibular pathologies. This systematic review synthesizes the latest evidence on the efficacy of machine learning as an adjunct to various motion analysis tools in the detection of vestibular disorders.

Data sources: MEDLINE, Cochrane, Web of Science & SCOPUS were searched for English studies, using synonyms and keywords from inception to October 5, 2022.

Study selection: Studies were screened by two independent reviewers. Primary investigations assessing machine learning-based motion analysis data (eg. posture, stability, and gait) on patients with vestibular disorders were included.

Data extraction: The Risk of Bias tool for Non-randomized Studies (RoBANS) was utilized by two reviewers independently for quality appraisal. Reported demographics, testing modalities, hardware, algorithms, and testing parameters were extracted.

Data synthesis & results: 949 abstracts were identified; 45 studies eligible for full text review. 16 studies with 2173 individuals were extracted with 8-69% female patients and age range 22-64 years. Posturography with force-plate center-of-pressure was most common (63%) followed by gait/pose estimation with inertial measurement unit accelerometry (37%). The support-vector machine (SVM) +/- Gaussian kernel was the strongest machine learning algorithm. Overall test parameters of these algorithms performed well (area under the curve 0.86-0.98, sensitivities 65-100%, specificities 63-93%, and accuracies 78-98%).

Conclusions: Machine-learning augmentation of motion analysis data achieves excellent testing parameters for detecting various vestibular pathologies. Emerging paradigms including machine vision should be explored.

Professional Practice Gap & Educational Need: Machine learning is a rapidly growing enterprise that will continue to enhance the quality of neurovestibular care in otolaryngology. As such, students, trainees, and clinicians alike should be aware of its uses and applications.

Learning Objective: By the end of this session, the participants will be able to appraise and compare the role of various machine learning models as well as the utility of motion analysis for the detection of vestibular pathology.

Desired Result: Otologists and neuro-otologists should consider autonomous and cost-effective adjuncts and alternatives to vestibular testing.

Level of Evidence – Level III

Indicate IRB or IACUC: Exempt.

ANS POSTER G052

Designing an Evaluation and Treatment Algorithm for Patients with Ear Fullness and No Objective Abnormalities

Kelly Lee, BS; Richard Adamovich-Zeitlin, BS; Maja Svrakic, MD

Objective: To make recommendations for an evaluation and treatment algorithm for patients who present with ear fullness without abnormalities on external/middle ear exam, standard audiometric studies, or imaging results.

Study Design: Retrospective chart review.

Setting: Tertiary referral center.

Patients: Adult patients presenting with ear fullness and/or otalgia without external, middle, and/or inner ear pathologies.

Interventions: Review of clinical diagnosis and treatment.

Main Outcome Measures: Demographics; laterality and duration of symptoms; rates of temporomandibular joint (TMJ) dysfunction, intermittent Eustachian tube dysfunction (iETD), anxiety/depression, migraine disorder, and NOS (not otherwise specified); and efficacy of treatments used.

Results: Women were more likely than men to complain of ear fullness and/or otalgia, and were also more likely to present with no objective abnormalities ($p<0.05$). Most of these patients were diagnosed with a single condition, with temporomandibular joint (TMJ) dysfunction representing 55.5% of cases. TMJ dysfunction was also most prevalent in patients who were diagnosed with multiple conditions, making up 31.2%. Anxiety/depression made up only 1.0% of patients who were diagnosed with a single condition, but 15.9% of multiple assessments.

Conclusions: 84.6% of patients presenting with unexplained ear fullness were diagnosed with TMJ dysfunction, iETD, migraine disorder, anxiety/depression, or a combination of these conditions. Anxiety/depression may have a role in contributing to otologic symptoms, and optimizing treatment may further alleviate symptoms of ear fullness.

Professional Practice Gap & Educational Need: Ear fullness is a common complaint among otolaryngology clinics, but its etiology is not always well-known, presenting a diagnostic and treatment challenge.

Learning Objective: To illustrate that ear fullness can present in conditions such as TMJ dysfunction, intermittent Eustachian tube dysfunction, and migraine disorders, and that anxiety/depression can be a contributing factor.

Desired Result: Provide a systematic approach in assessing and treating ear fullness in patients with no otologic objective abnormalities.

Level of Evidence - Level IV

Indicate IRB or IACUC : IRB Exempt #22-0321-NH, Northwell Health

Characterizing the Cognitive Burden of Peripheral and Central Vestibular Disorders

Ricky Chae; Steven D. Rauch, MD; Divya A. Chari, MD

Objective: Cognitive impairment has been reported to be the major determinant of low quality of life (QOL) scores in vestibulopathic patients. There is no consensus about whether cognitive impairment presents differently in patients with peripheral and central vestibular disorders.

Study Design: Cross-sectional cohort.

Setting: Tertiary referral center.

Patients: Adults with peripheral vestibular disorders (benign paroxysmal positional vertigo, Meniere's disease, unilateral vestibular hypofunction, labyrinthitis, superior canal dehiscence syndrome) and central vestibular disorders (vestibular migraine, persistent postural perceptual dizziness).

Interventions: Patient reported outcomes measures.

Main Outcome Measures: Subjects completed surveys to assess dizziness, general cognitive function, and specific cognitive domains, including memory, executive function, attention, and spatial ability. Comorbid anxiety and depression were assessed with validated questionnaires.

Results: Patients with peripheral vestibular disorders (n=18) reported significantly less subjective burden as measured by surveys of dizziness ($p<0.01$), general cognition ($p<0.01$), and memory and executive function ($p<0.05$) compared to patients with central vestibular disorders (n=12). Cognitive domains of attention and spatial ability were not significantly different in the two populations. Positive correlations were observed between anxiety/depression and memory for both peripheral ($r^2=0.48$, $p<0.05$) and central ($r^2=0.68$, $p<0.01$) vestibular disorders.

Conclusions: The type and degree of cognitive impairment may differ in patients with peripheral and central vestibular disorders. Further work is needed to elucidate the relationship between comorbid anxiety and depression and subjective cognitive impairment.

Professional Practice Gap & Educational Need: Cognitive impairment may present differently in patients with peripheral and central vestibular disorders. Psychiatric comorbidities like anxiety and depression may be more common in patients with central vestibular disorders.

Learning Objective: Assess the cognitive burden of central and peripheral vestibular disorders.

Desired Result: Improved awareness of the potential effect of cognitive impairment in patients with peripheral and central vestibular disorders.

Level of Evidence - Choose one value between Level I thru Level V

Indicate IRB: Massachusetts Eye and Ear (IRB# 2019P000438); University of Massachusetts Chan Medical School (IRB# 00000374)

Longitudinal Quantification of Endolymphatic Hydrops on Delayed Contrast-Enhanced FLAIR MRI and its Correlation with Changes in Hearing in Patients with Hearing Instability: A Pilot Study

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Objective: To characterize longitudinal variations in endolymphatic hydrops (EH) on delayed contrast-enhanced MRI and its correlation to changes in hearing in patients with hearing instability (HI).

Study Design: Observational prospective cohort study

Setting: Tertiary referral center

Patients: Adults ages 18-65 with HI.

Interventions:
Contrast-enhanced delayed FLAIR (fluid attenuated inversion recovery) MRI was performed 4-8 hours following intravenous gadoteridol (0.2 mmol/kg) in a cohort of HI patients at 3-6 month intervals, under a deep phenotyping protocol. MRI were performed at 3.0 T with an 8-channel head coil using 3D FLAIR and STIR (short tau inversion recovery) sequences with 0.8 mm isotropic resolution requiring ~ 12 and 4 minutes. Based on STIR (representing perilymph and endolymph combined fluid) and delayed FLAIR (representing perilymph fluid) MRI sequences, a custom developed MRI processing and analysis pipeline was utilized to quantify the volume of the perilymph and endolymph in the inner ear.

Main Outcome Measures: Volume of endolymph, volume of perilymph, changes in speech, hearing thresholds, and cervical and ocular vestibular evoked myogenic potentials.

Results: Changes in EH volume were quantified in a longitudinal fashion and correlated with clinical measures of hearing.

Conclusions: Longitudinal assessment of patients with HI utilizing contrast-enhanced delayed FLAIR MRI allows for detection of quantifiable changes in EH that correlate with changes in hearing. This methodology has the potential to better monitor HI over time and to help better evaluate potential treatments for HI in which EH hydrops is present.

Professional Practice Gap & Educational Need: HI disorders are poorly characterized and hearing loss in these disorders is often ineffectively treated. Using contrast-enhanced delayed FLAIR MRI and different clinical measures of hearing at multiple timepoints, we can better characterize the underlying pathophysiology of these disorders and its correlation to changes in hearing.

Learning Objective: Improved understanding of the correlation between endolymphatic hydrops and changes in hearing.

Desired Result: Clinicians will eventually have access to a reliable, easy to use, automated pipeline to quantify EH in patients with HI. This methodology will produce measurements of EH that correlate with hearing loss and may aid in the evaluation of potential therapies for EH in HI.

Level of Evidence - III

Indicate IRB or IACUC : NIH, NIDCD IRB: 000141-DC

ANS POSTER G055

Correlating VM-PATHI to Daily Dizziness Symptoms

Eric K. Kim, BA; Maxwell Hum, BS; Jeffrey D. Sharon, MD

Objective: Investigate the relationship between VM-PATHI (Vestibular Migraine Patient Assessment Tool and Handicap Inventory) scores and daily dizziness symptoms.

Study Design: Prospective cohort analysis of 49 patients with vestibular migraine (VM).

Setting: Tertiary referral center.

Patients: 49 patients diagnosed with vestibular migraine or probable vestibular migraine according to Barany Society criteria.

Interventions: Subjects reported their dizzy symptoms (on a scale from 0=no symptoms, 1=mild, 2=moderate, 3=severe) everyday for one month via automated text messaging linked to a cloud-based research database. Subjects completed VM-PATHI and Dizziness Handicap Inventory (DHI) scores at the end of the month. We examined the correlation between a composite of daily dizzy scores with VM-PATHI and DHI scores through linear regression.

Main Outcome Measures: Pearson's correlation coefficient, R-squared value.

Results: VM-PATHI showed a moderate correlation with daily dizziness symptoms (correlation coefficient: 0.51, R-squared: 0.26). DHI showed a lower correlation with daily dizziness (correlation coefficient: 0.27, R-squared: 0.07). Daily dizziness was a strong predictor of VM-PATHI score with univariate linear regression ($p=0.002$).

Conclusions: Daily dizziness symptoms are highly correlated with VM-PATHI score, providing further validation of VM-PATHI as a disease-specific outcome measure for patients with VM. VM-PATHI score is more closely linked with daily dizziness than DHI total score.

Professional Practice Gap & Educational Need: A reliable patient-reported outcome measure is required to objectively measure and track a VM patient's symptom severity. VM-PATHI was designed to address this need and requires further validation.

Learning Objective: Describe the relationship between VM-PATHI and daily dizziness symptoms in VM patients.

Desired Result: Clinicians and researchers will recognize the utility of VM-PATHI in caring for and studying VM patients, respectively.

Level of Evidence – IV.

Indicate IRB or IACUC : IRB # 19-29340, approved 02/03/2020.